MONITORING THE DEVELOPMENT OF COMMUNICATION AND LITERACY SKILLS AMONG LEARNERS WITH AN AUTISM SPECTRUM DISORDER.

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DECLARATION

I, Elizabeth Richardson, declare that the PhD thesis entitled "Monitoring the development of communication and literacy skills among learners with an autism spectrum disorder" is no more than 100,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

Signature

Date

14 May 2019

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1 INTRODUCTION TO THE RESEARCH

1.1 STUDY CONTEXT

Internationally, persons with a disability have been increasingly recognised in legislature as individuals with manifest rights inclusive of access to education without discrimination. The United Nations Rights of Persons with Disabilities [CRPD], (2007), the United Nations Conventions on the Rights of the Child [CRC], (1989) are explicit in their recognition of measures to support the rights of all individuals with disabilities to education. In 2016, the United Nations CRPD further articulated that a rights based approach to inclusive education needs to move far beyond token approaches to encompass;

> … a process of systemic reform embodying changes and modifications in content, teaching methods, approaches, structures and strategies in education to overcome barriers with a vison serving to provide all students of the relevant age range with an equitable and participatory learning experience and environment that best responds to their requirements and preferences. Placing students with disabilities within mainstream classes without accompanying structural changes to, for example, organisation, curriculum and teaching and learning strategies, does not constitute inclusion. (p.4)

In Australia, the Disability Standards for Education 2005 make explicit the obligation that education providers will take reasonable steps to ensure students of all abilities have access, inclusive of reasonable adjustments, to participation in education, on the same basis as students without disabilities. At the time this study commenced educators had no access to explicit curriculum content or assessment tools for students with additional learning needs. In particular, teachers tasked with delivering individualised learning programs for students with mild to profound intellectual disabilities and autism spectrum disorder (ASD) experienced significant challenges in identifying what was valid and achievable for their students to learn and how to plan effectively for future progress.

The 2007 United Nations Convention on the Rights of Persons with Disabilities was ratified with the intention of safeguarding the dignity of all people with a disability. The convention principles were later embedded in Australia's 2011 National Disability Strategy. Priority actions of the strategy pertaining to education sought to ensure that the educational outcomes of people with a disability matched those of people without a disability and that the latter had access to every opportunity to reach their full potential.

At a state level in Victoria, Australia, where this research was undertaken, the *Education and Training Reform Act 2006*, the *Disability Act 2006* and the *Disability Discrimination Act 2005* recognise and protect the rights of persons with a disability and provide a framework to ensure access for all students to high quality educational provision. The *Autism State Plan 2009*, developed by the Victorian State Government in consultation with stakeholders, considered a range of priorities for the full life span of individuals with ASD. Specifically, the education priority identified the creation of autism friendly schools that would be proactive in their approach to students with ASD, through the provision of a flexible curriculum and utilisation of appropriate teaching strategies (Department of Human Services, 2009).

1.1.1 Definition and prevalence of Autism Spectrum Disorder (ASD)

Autism is a lifelong neurodevelopmental disorder (American Psychiatric Association [APA], 2013). The use of 'spectrum' reflects the diversity of the impact and symptoms evidenced by individuals with the disorder (Phetrasuwan, Miles, & Mesibov, 2009). Some individuals may appear mildly impaired while others are profoundly affected in their communication, cognition and social interactions.

The *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.: DSM-V; APA, 2013) is most commonly used for diagnosis within Australia. The most recent diagnostic term, autism spectrum disorder (ASD; APA, 2013) subsumes previous diagnostic terms of the Diagnostic and Statistical Manual of Mental Disorders (4th ed.: DSM-IV-TR; American Psychiatric Association [APA], 2000) and is inclusive of autistic disorder, Asperger's syndrome and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS). Alternate criteria provided by the World Health Organization (WHO) International Classification of Diseases (ICD-10) (WHO, 1992) the Autism Diagnosis Observation Schedule (Lord, Rutter, DiLavore, & Risi, 2008) and the Autism Diagnostic Interview-Revised (Rutter, Le Couteur, & Lord, 2003) can also be utilised for diagnosis.

It has been estimated that 32 percent of children with ASD present with an intellectual disability (ID), 24% of children score in the borderline range when assessed on standard measures of intellectual ability and approximately 34 percent possess average to above average intelligence (Christensen et al., 2018). A minority of children diagnosed with ASD present without significant delays in their acquisition of language milestones. However, most engage in speech later than might be expected and the period taken to acquire language is extended. For many, it never reaches a mature level (Tager-Flusberg,

2007). Around 30% of the ASD population do not acquire functional language, and many perform poorly on assessments of non-verbal IQ tests (Rose, Trembath, Keen & Paynter, 2016; Bailey, Phillips & Rutter, 1996).

In 2017, a Victorian parliamentary inquiry into services for people with ASD identified an insufficiency of data relating to the prevalence of ASD in Australia (Family and Community Development Committee [FCDC], 2017). The Australian Bureau of Statistics (2015) Survey estimated 0.68% of the population were diagnosed with ASD. Although considered a conservative estimate, this figure represented a 42.1% increase from the previous 2012 survey, demonstrating the rapid increase in prevalence. In a longitudinal study of Australian children conducted by Randall et al. (2016) prevalence rates ranging between 1.5 and 2.5% were reported.

ASD prevalence has been estimated at 1 in 68 (Centers for Disease Control and Prevention [CDC], 2012) in the United States (US), and as high as 1 in 38 children within Korea (Kim et al., 2011). However, methods of diagnosis across studies and regions may impact on the manner in which prevalence rates are identified.

1.1.2 Current educational support for students with ASD

There is global evidence of increases in funding to facilitate the inclusion of individuals diagnosed with disabilities. Evident in countries ranging from Canada (Bennett & Wynne, 2006), United Kingdom (Kelsair, Maurin & McNally, 2011) and Australia (Victorian Auditor-General [VAGO], 2012) funding is provided to improve access for students with disabilities to local schooling. Typically, funding is utilised for a range of provisions including; appointment of teaching assistants to support individual students, transportation to school, additional paraprofessional support, teacher professional development, differentiation of curriculum materials and resources and adjustments school infrastructure to improve access (Slee, 2013).

At the time and in the state in which this study is based, Program for Students with Disabilities (PSD) funding is provided to Victorian schools by the Department of Education and Training (DET) in order to support students with identified disabilities. In a report emanating from an inquiry into services for people with ASD (FCDC, 2017), it was stated that between 55,000 and 80,000 of approximately 580,000 students require adjustments related to a disability. Within Victorian public schools, 25,000 students (4.2% of the student population) are currently identified as having moderate to severe

disabilities and are deemed eligible for PSD funding. Of these 25,000 students, approximately equal numbers are enrolled in specialist and mainstream schools. In excess of 5,000 students with ASD are funded within the PSD program, accounting for approximately 0.9% of total state enrolments of 580,000 students (FCDC, 2017).

A DET requirement, mandated for students who are deemed to be eligible for PSD funding, is the establishment of a Student Support Group (SSG). The SSG is ideally comprised of the principal, student, parent/s, teacher and support staff who have responsibility for identifying each student's needs, educational planning and reviewing learning progress, as well as the development of an Individual Learning Plan (ILP) specifying goals and strategies. ILPs are identified within education department guidelines as mandatory for all students with ASD, regardless of PSD funding status (DET, 2016a).

In 2012, the Victorian Auditor General's Office [VAGO] published a report in relation to programs for students with special learning needs. Content identified that the significantly increased number of students with ASD, in addition to increases in some other PSD categories, had placed considerable pressure on teachers and schools (VAGO, 2012). This related to the capacity of schools to manage the needs of funded learners, provide ILPs and a suitable school environment. Concerns were also raised about the inadequate monitoring of educational outcomes for learners with disabilities and the limited data available to measure the impact of teaching on those outcomes (FCDC, 2017; VAGO, 2012).

1.1.3. Increased interest in the validity of assessments for students with disabilities

Marion and Pellegrino (2006) suggested that in the US, the requirement that all students, including those with severe disabilities, be included in a range of assessments, on alternate achievement standards, led to an unexpected increase in learning gains outcomes for students. Some students with disabilities may be assessed against the grade level content standards in the same manner as their peers, or using alternate assessments based on existing standards. However, for students with the most significant and profound cognitive disabilities (<1% of the total student population), a range of alternate assessments based on alternate achievement standards are utilised (Marion & Pellegrino, 2006).

While these assessments in and of themselves cannot claim to progress student learning, it has been postulated that the associated development of teaching approaches and data collection, has provided opportunities for educators to identify greater learning capacity in these students than formerly (Quenemon, Rigney & Thurlow, 2002).Within Australia, as in other countries, concerns in relation to equity and quality of educational provision, particularly for Indigenous and disadvantaged students, have arisen in recent decades (Masters, 2013; Slee, 2013). This, amongst other factors, has led to increased demands for evidence-based educational assessment.

In 2007, the DET commenced a research partnership to develop the Abilities Based Learning and Education Support (ABLES) tool. This was designed to assist teachers to access and develop learning programs for students with disabilities. While not mandated for use in schools, the three ABLES assessments in the areas of communication and literacy, personal learning and interpersonal development were made accessible via the DET Insight Assessment Platform in 2017. The platform that was developed to provide a hub of assessments, aligned with the Victorian Curriculum F-10 for access by schools.

While the introduction of ABLES and the Victorian Curriculum Towards Foundation, have the potential to progress accountability requirements for learners with additional needs, there remains tremendous scope for the development of assessment tools that teachers could utilise at a school and classroom level to identify intervention points for instruction and to monitor learning for students with ASD.

1.2 EDUCATIONAL MONITORING AND ASSESSMENT APPROACHES

Assessments are routinely described in terms that identify the manner in which test results are designed to be interpreted. Norm-referenced assessments compare results to the performance of others. Ipsative-referenced assessments measure against the student's own previous performance. Criterion-referenced assessments utilise scoring to identify competence relative to a specific task or skill to allow for interpretation of individual performance.

Formative assessment is frequently used to establish a starting point for instruction. Summative assessments measure individual achievement, through such methods as class tests, semester examinations or an overall course grade (Sadler, 1998). Summative

assessments are also used beyond the classroom in high-stakes testing, such as in national examinations for school leavers, scholarship tests and international student testing, which seek to establish how individuals perform in relation to others. Additionally, results may be utilised to assist policy-makers in making judgements about the effectiveness of provision across the range of educational providers.

For the most part, these types of achievement tests are designed to provide results that allow for comparison with other students' performance. Typically, these results are norm-referenced to compare the results of the students taking the test to a representative or 'norm' sample who previously took the test. While ideal for the aforementioned comparison, norm-referenced data can be limited in its capacity to clarify what an individual student is able to demonstrate and what they have not yet mastered (Fuchs, Fuchs, Benowitz & Barringer, 1987). For example, a 62nd percentile score in mathematics identifies relative standing in relation to other students who took the same test, not specifics related to subject knowledge demonstrated by the individual being assessed.

Norm referenced assessments within schools create a poor fit for many students with ASD as they have a limited capacity to capture where students are in their development, as the learner's starting point for instruction will typically be lower than their same age peers. In addition, norm-referencing offers descriptions of students that tend to be deficit focused, with an emphasis on learning failures rather than learning achievements (Trent, Artiles, & Englert, 1998; Kleinert, Browder, & Towles-Reeves, 2009b).

Traditionally, assessments and the language of testing within the field of education have been used to judge the success of students in relation to their learning. In other fields, such as medicine, assessment approaches are utilised to 'understand' an individual's presentation, identify an intervention, and monitor and evaluate the overall efficacy of an evidence-based intervention. As these 'understanding' behaviours have been more consistently applied in educational settings, they have also fostered a requirement for assessments that inform this 'understanding' process (Masters, 2013).

Criterion-referenced approaches to assessment have gained in popularity since the introduction of a range of standards-based reforms in the 1990s. These assessments provide information about where a student is, relative to their knowledge, skills and understanding of an identified domain. Interpretations linked to criterion-referenced assessments require well-articulated descriptors of learning within a domain, consistent with a model of learning that allows for well delineated descriptions of progress.

Standards-based assessments are a form of criterion assessment. Developed as a psychometric model, they focus on acquiring and communicating evidence of student learning explicitly and are based on a probabilistic approach. The resulting statistical model identifies the patterns of varying competence likely in the data relative to the range of student ability. This representation of a typical pathway has merit in its capacity to describe and report student progress (Masters, 2013; Griffin, 2014).

1.2.1 Assessment and learning intervention for students with ASD

International policies and reports of programs for students with disabilities share key issues in relation to the capacity of governments and schools to develop pedagogy, curriculum and assessment that supports the range of student difference (Slee, 2013). In Australia, initiatives such as the National Assessment Program – Literacy and Numeracy (NAPLAN) and state curriculum standards are used to measure the progress of Australian students. However, they have limited capacity to measure the progress of students with significant disabilities. In Victoria, some educational assessments are mandated for all students regardless of disability (e.g. English Online for Prep students and NAPLAN), results are provided to specialist schools but not published as an accountability measure in the same manner as mainstream schools. This might be interpreted as an acknowledgement that schools catering exclusively for students with disabilities are unlikely to perform competitively with a norm-referenced population. Additionally, the absence of robust results makes it unlikely that these assessments can be used to measure progress or set learning targets as they are limited in their capacity to provide valid results for developmentally delayed students.

The Victorian Auditor General's report (VAGO, 2012) was critical of the lack of progress made in relation to improved accountability in monitoring the learning progress for students with disabilities, stating:

> Since 2006, DEECD has distributed more than 2.6 billion [dollars] to schools through PSD. However, DEECD does not have the information it needs to determine whether PSD funding is being used efficiently and effectively. Concerns raised about this by VAGO in 2007 still have not been adequately addressed and instead of having five years' worth of high quality data about the program, the department still knows very little about its impact on the educational outcomes of supported students. (p. viii)

Since 2010, Victorian schools have been able to access some curriculum materials designed to support students with disabilities through the Victorian Essential Learning Standards (VELS) curriculum. Initially released as 'Towards Level 1 VELS', materials were updated to reflect the shift to the AusVELS curriculum introduced in 2013. In 2015 the state's Victorian Curriculum and Assessment Authority (VCAA) released the Victorian Curriculum F-10, inclusive of the 'Towards Foundation' curriculum for students working towards the typical entry level of foundation. Curriculum levels identified as A-D were articulated with achievement standards in key curriculum areas identified for students with disabilities (see Appendix A). In 2016, Victorian schools were mandated to rate the progress of every student with a disability, including those operating at pre-foundation curriculum levels, consistent with Victorian Curriculum Standards assessment of typically developing students.

Currently, data does not exist at the national level in relation to outcomes for students with ASD or other disabilities. However, consistent with typically developing students, there is every reason to assume that there is significant variance in student learning at each year level (William, 2007; Masters, 2013). Given the likely range of impact of disability on each individual, age may be considered an even poorer predictor of likely attainment for students with additional learning needs. Individually focused assessments are needed to enable the measurement of performance outcomes over the long-term.

1.2.2 Differentiation for instruction

For students with ASD, teachers need to target instruction to the individual's current level of attainment in order to maximise the potential for learning growth. A range of evidence supports the premise that students learn best when teaching is targeted just beyond their current level of knowledge (Wood, Bruner & Ross, 1976). Vygotsky (1978) proposed that in order for learning to be maximised, teaching interventions should occur at the point where the student is most ready to learn, which he conceptualised as the 'zone of proximal development' (ZPD), defined as:

> …the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers (Vygotsky, 1978, p. 86).

Appropriate assessment and identification of a student's ZPD can be used by teachers to understand what a student can, cannot and is challenged to demonstrate. However, in many cases teachers working with students with ASD lack training and expertise (FCDC,

2017). This makes it difficult to identify a starting point for instruction and to implement educational programs for students who have a lowered starting point of skill and knowledge in comparison to other students.

1.2.3 Understanding what to teach

Students with ASD can create significant challenges for educators in relation to identifying their learning needs (Lindsay, Proulx, Thomson & Scott, 2013). This can be attributed not only to delayed development but also to the impact of atypical presentation associated with the core impairments of the disorder. This presentation is frequently inconsistent with general assumptions of typical development as identified in a range of research literature. Pellegrino, Glaser & Chudowsky (2001) argued that:

> Some types of knowledge are universally acquired in the course of normal development, while other types are only learned with the intervention of deliberate teaching. (p. 80)

Geary (1995) expressed a similar distinction between development and learning, identifying 'biologically primary abilities' and 'secondary cognitive abilities'. It is anticipated that knowledge and skills inclusive of language, causality and basic number concepts, are acquired as a feature of development through a child's play. However, secondary cognitive abilities are a result of instruction and learning effort, mostly acquired as a result of extended and explicit practice, delivered through formal schooling (Geary & Berch, 2016).

While this may appear true of typically developing children, it is evident that the aforementioned biological primary abilities are not always acquired in a like fashion by children with ASD. For many individuals these types of skills are only partially or fully realised after focussed and explicit instruction, combined with extensive opportunities for practice and generalisation (Kleinert et al., 2009).

For the most part, teacher training provides limited attention to atypical development, aligning with the premise that normal development will ensure that most children arrive at school primed with language and simple concepts, ready to engage in structured learning. Teachers are therefore confronted with a seemingly overwhelming task when it is evident that their students are developmentally unprepared to access anticipated learning content. Not only does the teacher's regular array of strategies provide a poor match for these students, the teacher is also required to research, understand and teach

content that is generally assumed to ‘not require teaching’ and therefore is unlikely to form a significant part of their knowledge or skill set.

For teachers working with young students in schools there are few educational assessments that focus on the development of biologically primary abilities and the learning transitions inherent in movement towards the development of secondary cognitive abilities (Geary, 1995). Assessments that have some capacity to measure these emergent capabilities for school students generally fall under the auspice of paraprofessionals, such as a speech pathologist or psychologist. In cases where paraprofessional support is accessible the student is usually removed from their regular classroom, for assessment by an unfamiliar person, who in due course may provide a report which is limited in its validity to inform planning for classroom instruction in an ongoing manner.

Unsurprisingly, targeted assessment delivered by a regular teacher and used to track learning is likely to have a greater capacity to inform and impact on the educator’s capacity to differentiate effectively for individual students during planning and instruction (Marion & Pellegrino, 2006). This highlights the pressing requirement for educational assessment instruments for learners with ASD that have the potential to bridge the gap between assessing primary and secondary abilities.

1.3 AIMS OF THE STUDY

This research study aimed to design and empirically validate an assessment instrument for identifying the communication and literacy skills of learners with ASD. Additionally, the research aimed to explore potential correlations between communication and literacy development for these learners.

Assessment influences the elements of both curriculum and teaching. A core belief within educational practice is that the elements of curriculum, assessment and instruction should provide a shared direction rather than working at cross-purpose. This ensures that what is important for students to learn is both taught and assessed in a connected manner (Masters, 2013). When this does not occur, assessment results are unlikely to reflect what has been learnt by students or be of benefit in targeting future learning interventions.

Many teachers working with students with ASD lack access to appropriate assessment tools, training and expertise in implementing differentiated educational programs for

these students. Therefore, there is a need to develop an assessment instrument that is relevant and inclusive of students with ASD across the continuum from pre-intentional to active engagement in communication and literacy development.

There is strong evidence that language provides a fundamental base to children's developing social and cognitive skills, as well as long-term academic outcomes (Bishop, 1997; Rutter, Mawhood, & Howlin, 1992; van Wingerden, Segers, van Balkom, & Verhoeven, 2014; Teale & Sulzby, 1986). Research provides evidence of the relationship that exists between a child's early development of language and later development of reading and writing skills (Bowyer-Crane et al., 2008; Lipka & Siegel, 2007; Fujiki, Spackman, Brinton, & Hall, 2004; Whitehurst & Lonigan, 1998). Significantly, for learners with ASD gains in verbal and/or augmentative expressive communication have been shown to correlate with increases in social interaction and reduction of inappropriate behaviours (Jurgens, Anderson & Moore, 2009; Lang et al., 2011). Given the potential significance of gains for learners it is therefore appropriate that the assessment tool designed in this study aims to support teachers in planning their instruction for students' early development of communication and literacy skills.

1.4 RESEARCH QUESTIONS

A number of research questions were prioritised consistent with the aims of the study. These questions related to the validation of a developmental framework for assessing and reporting the communication and literacy skills of young learners with ASD. A specific enquiry also related to patterns of communicative competency profiles, indicating consistencies with literacy development for learners with ASD. The research questions addressed are as follows:

- What is the developmental learning pathway that students with ASD typically progress through in the acquisition of communication and literacy skills?
- To what extent can appropriate points of intervention be determined along the communication and literacy developmental pathways?
- To what extent does a pattern emerge between communication and literacy development for learners with ASD?

1.5 DEVELOPMENT OF THE ASSESSMENT INSTRUMENT

As already stated, the specific aim of this study was to design and validate an assessment instrument for identifying the communication and literacy skills of learners with ASD. This instrument would draw upon and inform teacher observation with reference to the underpinning empirically validated learning framework supporting teachers to identify students' current competencies and plan for their future learning.

The study drew upon recommendations from Wilson (2005), Pellegrino et al. (2001) in the development of the research instrument. It reflects a shift towards standards-based and criterion-referenced assessments for students of all abilities. All Victorian schools invited to participate in the research project enrolled students funded under the PSD and diagnosed with ASD.

1.6 THESIS STRUCTURE

This thesis consists of eight chapters. The current chapter has provided the context and background for the research project, as well as the study's aims, research questions and the thesis structure.

Chapter 2 explores general theories related to learning, in addition to those that provide a lens through which to consider the impact of ASD on learning. The typical development of competency in communication and literacy is outlined and augmentative and alternative approaches utilised by learners with ASD referenced. Pragmatic challenges related to communication for students with ASD are highlighted and literacy approaches for learners with disabilities and ASD are explored.

Chapter 3 provides an overview of the measurement field, with the specific focus on Item Response Theory (IRT) and Classical Test Theory (CTT). It identifies the approaches used during the data analysis process that underpin evidential claims of the validity and reliability for both the assessment and theoretical framework.

Chapter 4 establishes the requirement for developing an evidence base for assessments that explicitly link measurement models and learning theory. It provides a frame of reference for the assessment approach used and introduces Wilson's (2005) 'four building blocks' design approach for construct centred instrument development.

Chapter 5 introduces the underlying purpose and the potential scope for the instrument's use, outlines the iterative development of the construct frameworks for communication

and literacy and the processes applied to the creation, selection and refinement of indicators reflecting the construct.

Chapter 6 explores the recruitment process and demographic profile of the test participants and the process of data calibration. The data generated by the draft instrument is reviewed and explored in relation to scoring, analysis of responses and fit statistics.

Chapter 7 outlines the processes used to confirm final version of the instrument. Data is recalibrated and fit statistics reviewed. Further analyses are explored that were utilised to ensure the consistency and validity of the standard levels proposed. Developmental learning statements for each standard of the communication and literacy framework are outlined.

Chapter 8 revisits the aims and context for the study and the construct centered design processes applied in the development of the research instrument and framework. Evidence of validity is presented as well as potential scope for further development of the instrument.

2 ESTABLISHING AN EVIDENCE BASE: A LITERATURE REVIEW

In order to develop a comprehensive and valid construct map to inform instrument development, researchers advocate for an extensive review of research in the related domains (Wilson, 2005; Masters, 2014; Mislevy & Haertal, 2006). This approach was utilised in this study to inform the theoretical base underpinning the instrument, with specific reference to the learning theories adopted, the impact of ASD on learning and the likely sequences of development within the domains of communication and literacy for learners with ASD.

2.1 LEARNING THEORIES UNDERPINNING THE CONSTRUCT

> Starting with a model of learning is one of the main features that distinguishes an evidence-based approach to assessment design from more traditional approaches based on curriculum frameworks or content standards. The learning model suggests the most important aspects of student achievement about which one would want to draw inferences and provide clues about the types of assessment tasks that will elicit evidence to support those inferences (Pellegrino, DiBello & Goldman, 2016, p. 6)

Approaches to assessment and intervention for children with ASD were for many years rooted in the work of behavioural theorists such as Skinner (1957), as demonstrated by Lovaas (1977, 1987), and the subsequent and continuing popularity of Applied Behavioural Analysis (ABA) based interventions (Howlin, Magiati & Charman, 2009). Behavioural theory has its basis in general learning models, as opposed to child development research. Skinner (1957) postulated that identified variables within a child's environment were the most significant factor in their development of language. For example, he perceived the child's production and imitation of sounds into speech as a process that was shaped by reinforcement, through a series of increasingly accurate approximations.

Educational assessment has a historical basis in trait and behavioural psychology. Mislevy (2016) identified that breadth may need to be added to this theoretical base in order for assessments to be designed and utilised in more integrated and interactive ways, consistent with approaches that highlight the value of social and cultural impact on human learning.

Greeno, Collins and Resnick (1997) suggested that as a situative, socio-cognitive perspective encompasses a good breadth in social and cognitive theories, an argument can be made that it is also encompassing of behavioural trait, and information processing perspectives.

> …the three perspectives [behaviourist, cognitive and situative] may constitute a kind of Hegelian cycle of thesis – antithesis - synthesis, in which behaviourism provides a thesis that focuses on the external aspects of activity, the cognitive view provides an antithesis that focuses on internal informational aspects, and the situative view may develop as a strength that unifies the strengths of the two earlier approaches (Greeno et al., 1997, p.40).

The socio aspect of socio-cognitive is inclusive of the linguistic, cultural and substantive patterns that provide structure to the manner in which individuals engage with the environment and each other (Mislevy, 2016). The cognitive aspect represents those cognitive patterns unique to each individual, occurring within the person, influenced by their experiences, and continually adapting to make sense of the unfamiliar.

Typically, socio-cultural theories identify the importance of social interaction in the development of language and the engagement of child and caregiver in joint action, which creates the social context in which children develop language and communication (Bruner, 1978; Fleer & Hedegaard, 2010; Mundy & Newell, 2007). The child is an active participant who experiences and learns from the affect their signalling has on others (Fleer, 2012). Over time, the child acquires a greater range of conventional and sophisticated communicative means with the addition of conventional language gained through the contingent responses of caregivers (Dunst, Lowe & Bartholomew, 1990; Sameroff, Seifer, Barocas, Zax & Greenspan, 1987; Morales et al., 2000). Within this paradigm, the social interactions experienced in the first year are perceived as the foundation for a child's later communication and language development (Fleer, 2013).

The quality of context and nature are perceived as highly influential in relation to the infant's capacity to acquire communication and language. This exploration of the emergence of communication is also consistent with a broader cultural perspective, that humans have a unique ability to acquire and share knowledge and to consider another's perspective (Bruner, 1975; Vygotsky, 1964).

A socio-cognitive perspective is inclusive of internal cognitive processes, interactions related to people, items and events, and social practises (Mislevy, 2016). The term 'resources' has been used to identify the unique within-person cognitive patterns formed by each individual's layering of past experiences, meaning-making and action selection in novel situations (Greeno, 1998;Young, 2009). The interaction of individuals, utilising within-person resources, in a broad range of situations and interactions with others who possess their own unique resources, is central to a situative psychological perspective (Fleer, 2013). Greeno (1998) suggested that the resources developed by individuals are also strongly bound to situations of learning.

Given that students with ASD often demonstrate considerable difficulties in generalising their knowledge and skills (Happé & Frith, 2006), a focus on the situative when developing assessments has significant implications. As a range of presumptions underpinning assessment practices relate to social and cognitive patterns, it is evident that some 'at risk' populations are particularly vulnerable and, as such, there are inherent issues related to validity and fairness that might be mediated, to a degree, by a situative perspective (Mislevy, 2016).

2.2 THEORIES UNDERPINNING THE IMPACT OF ASD ON LEARNING

2.2.1 Theory of Mind

Research relating to the development of theory of mind (TOM) have been used extensively to explore and explain the challenges experienced by learners with ASD. Frith and Happé (1994) proposed that the developmental impact of TOM impairment has the capacity to explain the difficulties children with ASD have in mentalising, or perceiving the thoughts of others. This limits their faculty to communicate normally and in turn creates a significant barrier to typical language development. Significant comprehension delays have been identified as one of the distinguishing markers separating autism from other specific language disorders. Given the nature of errors demonstrated by children with ASD in comprehension tasks, it would appear that they are challenged by the integration of real-world knowledge and linguistic information. Additionally, they appear to lack the knowledge of social events and expectations acquired by typically developing children, which might usually be applied to understand regularly occurring utterances (Rutter et al., 1992).

The theory provides a lens from which to understand the complex impact of ASD on the typical development of language and the distinctive impact of the disorder, in addition to the developmental delay experienced by most individuals with ASD. TOM deficits (Baron-Cohen, Leslie & Frith, 1985) have been widely referenced in understanding the communication, social and behavioural challenges present in ASD populations (Happé, 1993, Joseph, McGrath, & Tager-Flusberg, 2005).

2.2.2 Theories of neural system disorder

Studies that have employed neuroimaging demonstrate increasing evidence that the neural functioning that typically encompasses brain networks and regions in collaborative operation is disrupted in individuals with ASD (Just, Keller, Malave, Kana, & Varma, 2012). Functional magnetic resonance imaging (fMRI) have shown alignment with behavioural observations of poor TOM skills in individuals with ASD. Specifically, testing reveals reduced activation in brain regions associated with core TOM regions, in addition to under connectivity across several neural networks that are considered to be utilised in TOM tasks (Kana et al., 2015).

Studies by Schipul & Just (2016) identified that ASD participants engaged in learning tasks individuals took longer to learn tasks than the typically developing control group and the manner in which the brains of the ASD target group activated differently. The ASD group showed reduced neural adaptations, the severity of which aligned with the incidence and impact of ASD symptoms experienced by the individual. Initiated joint attention has been shown to place greater demand for interconnectivity across anterior and posterior brain regions, consistent with difficulties in initiated joint attention demonstrated by individuals with ASD (Mundy & Newell, 2007).

2.2.3 Central coherence theory

Central coherence theory acknowledges the exceptional perceptual abilities of many individuals with ASD while recognising that they may also be maladaptive. Early descriptions of children with ASD by Kanner (1943) noted their interest in detail and the "inability to experience wholes without full attention to the constituent parts" (p. 246) consistent with restricted and repetitive patterns of behaviour that are a diagnostic criterion for ASD (APA, 2013).

Frith (1989) contrasted the capacity of typically developing and ASD individuals to extract information and meaning from events in gestalt form, sacrificing details for a

broader, overall perspective. Conceptualised by Bartlett and Bartlett (1995) as a drive for meaning, Frith identified this capacity as central coherence "the natural human tendency to draw together several pieces of information to construct higher-level meaning in context" (Frith & Happé, 1994, p.121) and hypothesised that individuals with ASD showed weak central coherence, which leads to challenges in extracting the typically perceived 'gist' of information.

Vermeulen (2014) highlighted 'context blindness' as the limited capacity to draw upon contextual information for significant meaning, a relatively unexplored aspect of the weak central coherence theory. However, a deeper understanding of context blindness has significant potential to further understanding of the challenges experienced by individuals with ASD in using contextual information to construct meaning (Brown, Oram-Cardy, & Johnson, 2013).

Strong central coherence enables an individual to draw together a range of relevant information to flexibly construct meaning. However, there is clear evidence that many learners with ASD find it difficult to integrate details to understand a broader social context (Hill & Frith, 2003). Weak central coherence increases difficulties in understanding interpersonal relationships and perspective taking, both skills that are critical to comprehension in communication and literacy.

2.2.4 Executive functioning

Executive functioning refers to the complex cognitive skill set associated with the frontal brain lobes. Deficits in this area have the capacity to broadly affect the development of language and social understanding. The executive function skill set relates to problem solving, identifying alternates, limiting the impact of interference, using feedback in the environment to review progress towards a goal, and making required adjustments. A review of executive dysfunction in autism indicated that individuals with ASD performed poorly in most executive function tasks compared with control groups (Ozonoff & Strayer, 1997).

Goldberg (2002) likened the role of executive functioning to that of an orchestra conductor, while different parts of the brain or sections of the orchestra can function on their own, the result would be discordant and disorganised. The conductor plays a crucial role in coordinating and organising input from all areas of the orchestra, just as the frontal lobes coordinate and organises processes from the rest of the brain.

The impact of executive dysfunction on learners with ASD can significantly impact an individual's capacity to organise, retrieve information and apply adaptive behaviours and skills (Pellicano, 2012). Learners may demonstrate difficulty in sequencing steps towards a goal and applying inhibitory control. Intense attachment to routine is frequently seen in learners with ASD and individuals can become fixated on their need for repetition or adherence to a set pattern of interaction and/or events which can lead to challenges in the learning environment (Ozonoff, Pennington & Rogers, 1991).

These theories provide insight into the specific impact of ASD on learning and were considered in conjunction with the broader theories of learning and development previously articulated.

2.3 EXPLORING COMMUNICATION

This section of the literature review outlines typical language development in infancy and childhood, the role of the learner and environment in communication, and the impact of ASD on the development of communication skills. Bruner (2001) identified:

> We communicate with others with the goal of affirming or altering their intentional states and thereby to influence their actions, our communicative strategies are shaped by the fact that we organize our conception in terms of Agency, Specific Acts, Goals, Means and determinative Setting … It is thus not surprising that when the young child first masters speech, her non-linguistic communication is already pragmatically adept, devoted to getting things done in the world, and (absent autism) it rapidly gains in pragmatic adequacy. (p. 210)

Bruner (1983) highlighted the role of intention and the crucial role of joint attention as a precursor to language onset. His review of Austin's (1962) speech act theory led to his insight that communication not only coordinates action amongst people but is, of itself, a form of social action, seen in acts such as indicating, requesting, persuading and threatening. Similarly, Mundy & Newell (2007) identified joint attention as:

> …an expression of the exquisitely honed human capacity to coordinate attention with a social partner, which is fundamental to our aptitude for learning, language and sophisticated social competencies throughout life. (p.269)

Children typically acquire both communication means and functions through the predictable reactions of others in their environment. Initially, when caregivers respond to the pre-intentional signals an infant produces and engages with them in reciprocal social exchanges, their communicative functions and means become highly conventionalised (Bruner, 1975; Bates, 1979; Mundy et al., 2007; Tomasello et al., 2005). Through this

process, one individual affects the environment of another in such a manner that the receiver is able to construct an internal representation that matches the intent of the speaker.

It is recognised that verbal communication involves both parties in the creation of mutual metarepresentations of the other's mental state. Ninio and Snow (1996) considered the common developmental link between preverbal and verbal communication to be at a social interaction level. A metarepresentational approach to understanding the development of communication implies an underlying continuity between infants and adults, as both are reliant on mentalising to succeed in communicative settings (Papafragou, 2002; Jordan, 2002).

2.3.1 Typical language development

For most typically developing children, language acquisition is a robust process that occurs nearly universally in the first few years of life. Where language fails to flourish, there is a predominant view that the child's environment must be seriously deficient unless the child has a condition such as a disability or specific language impairment (Ninio & Snow, 1996; Pinker, 2009).

Notions of progressions, stages, phases, schemas and sequences have been utilised by developmental theorists to conceptualise and describe children's skill development relative to cognition, social interaction and language acquisition (Bates, 1976; Bruner, 1975; Piaget, Cook, & Norton, 1952). Child language researchers generally identify three major developmental periods: pre-linguistic, one-word and multiple word stages (Dore, Franklin, Miller & Ramer, 1976). The stages of communication development are discussed in the following sub-sections.

2.3.1.1 Pre-linguistic communication

In the first weeks and months of life, infants engage in a range of communicative behaviours, including recognising their caregivers' voices, developing eye gaze with a partner, vocal turn taking and responding to facial expressions (Fernald, 1992; Mundy et al., 2007; Sigafoos et al., 2000). Towards the end of the first year, infants begin to understand some words and actively respond to simple language related to familiar routines and games (Bruner, 1975). While non-verbal, these communications are common to typically developing infants and fulfil a range of functions, including requesting, rejecting, commenting, inviting, and directing joint attention (Bruner, 1975;

Carpenter, Nagell, Tomasello, Butterworth, & Moore, 1998; Sigafoos et al., 2000). While communicative intent is initially expressive, utilising simple gestures, such as pushing an item away to communicate rejection, over time these gestures are paired or replaced by more complex gestures, such as a shake of the head to indicate 'no', vocalisation and, eventually, speech (Bloom, 1995).

Bruner (1981) identified 'innate communicative intentions' that emerge during a child's first year. These intentions include behaviour regulation, evidenced by communication that is used to regulate another's actions in order to obtain or restrict events and actions in the immediate environment. Social interaction intentions drive communication attempts to direct another's attention to oneself, to further engagement and interaction. Joint attention is reflected by communication that directs another's attention to an object or event in order for it to be a shared focus (Mundy & Newell, 2007; Morales et al., 2000; Tomasello, Carpenter, Call, Behne & Moll, 2005; Prizant & Wetherby, 1987).

2.3.1.2 The emergence of words in communication

At around 12 months of age, typically developing toddlers begin to say recognisable words and respond to words and simple phrases. Over the ensuing six months, both receptive and expressive vocabulary continue to increase, focusing on naming people and objects of interest, concepts related to the development of object permanence (e.g. 'all gone', 'more'), and words associated with social rituals (e.g. 'hi', 'bye') (Bloom & Lahey, 1978).

At 18 months of age, the average number of words the child can use is between 50 and 100 (Fenson et al., 1994) and from this point on a child's language 'explodes'. Instead of learning by association, words are now acquired very quickly, sometimes after only a single exposure, as children begin to understand the referential nature of words. Towards the end of the second year, most children combine words to form 'telegraphic' utterances of two words (Brown, 1973). Language at this stage is reflective of the young child's view of what has value for them, namely what they can act on, interact with, and the to and fro of people and items that appeal to them (Pinker, 1999; Tager-Flusberg, Paul, & Lord, 2005).

Children become increasingly conscious of the conversational obligation to respond to language and are likely to respond to and initiate simple questions and engage in language exchange. While two-year-olds do not engage in complex mind-reading, there is

evidence that a child's early communication is scaffolded by some understanding that the mental states of others can be affected by verbal communication (Papafragou, 2002; Chapman, 1981).

2.3.1.3 Linguistic structure acquisition and elaboration of language

During the period between the ages of two and five years, a child's language typically evolves from telegraphic utterances to use of grammatical forms. During this period, vocabulary is notably expanding and use of grammatical forms are actively trialled. There is evidence of the child's attempts to apply a rule governed system through the use of over generalised forms (e.g. 'comed', 'mouses') (Pinker, 1999). Along with increasingly complex grammar, a child's use of sentence forms increases in both length and function.

Most sentence structures have been acquired by five years of age, although syntax undergoes further refinement as the child learns to elaborate their utterances through devices that enable more information to be condensed into an utterance (Loban, 1976; Tager-Flusberg et al., 2005). Vocabulary continues to grow and develop complexity and nuance, acquired through conversation and reading. Children of school age take into account their listener's viewpoint when constructing utterances and can deliver well-structured and detailed narratives (Asher, 1978; Tager-Flusberg et al., 2005).

2.3.2 Augmentative and alternative communication (AAC) approaches for learners with ASD

Evidence-based approaches to augmentative communication for learners with ASD reflect aspects of typical communication development whilst seeking to address core deficits of the disorder. It is estimated that 30% of individuals with ASD are nonverbal or do not acquire sufficient speech to engage in daily communication functions (Iacono et al., 2016). Therefore, the aim of AAC interventions is primarily focussed on explicitly teaching adaptive communicative behaviours (Howlin, Gordon, Pasco, Wade & Charman (2007).

For example, the Picture Exchange Communication System (PECS) is a structured intervention for teaching learners to communicate (Bondy & Frost, 1984). PECS identifies six phases which are taught sequentially and focus on the learner building their independence as a communicator. Learners use pictures and picture sequences to communicate increasingly complex information. Early phases focus on joint attention with a skilled partner and increases through direct requests and social functions of

communication whilst building core vocabulary. While speech development is sometimes an outcome, it is not usually the main goal of intervention (Iacono, Trembath & Erickson, 2016). However, this is only one approach. The range of AAC is broad and encompasses unaided modalities, such as manual signing, as well as aided modalities that employ picture symbols in books, boards and folders or technology devices, such as voice output devices or electronic tablets.

2.3.3 Impact of ASD on communication and language

> The case of autism reminds us vividly that language and communication are distinct domains. Communication appears intimately intertwined with our human ability to attribute mental states to ourselves and others. In contrast, language (syntax and phonology) is a self-contained module that can be intact even though the ability to think about thoughts is impaired. (Frith & Happé, 1994, p. 101)

While it would appear that some infants later diagnosed with ASD experience a 'normal' first year, others demonstrate evidence of significant impairment in pre-linguistic social communicative skills. Typically developing infants between 9-12 months of age are able to impute the notion that their own intentions lead them to engage in goal related behaviour towards others, and that goal related behaviour in others is indicative of that individual's intentions (Mundy & Newell, 2007). However, individuals with ASD demonstrate pronounced impairments in initiating joint attention with others which creates a substantial challenge for learners when considered in the context of Mundy & Newell's (2007) view that:

> …joint attention reflects mental and behavioural processes that facilitate human learning and development. The frequency with which infants engage in joint attention is related to their language, cognition, even when variance associated with general cognition is controlled. (p.270,)

Most infants can look to an adult and follow the focus of their attention however, within anecdotes and studies related to ASD, there is rich evidence of limited joint attention and a lack of sensitivity to a speaker's visual focus (Baron-Cohen, Allen, & Gillberg, 1992; Mundy & Newell, 2007; Baldwin, 1995). Research indicates that amongst individuals with ASD initiation of joint attention is chronically impaired (Morales et al., 2000; Mundy & Newell, 2007). From an early age, compromised communicative skills such as pointing and gesture show clear evidence of impairment and impact on the individual's capacity to direct and share attention (Baron-Cohen, Leslie, & Frith, 1985; Tomasello et al, 2005).

In the early stages of language development, communicative acts are primarily reflective of Bruner's (1981) behaviour regulation stage, inclusive of functions such as protest or object requests rather than social in nature. Kanner's (1943) seminal work identified dissociation between object and person intelligence amongst individuals with autism. Individuals with ASD patterns of communication tend to be focussed on their immediate needs and aspects of their environment, rather than in engagement with others through joint attention and social interaction. Younger children with high functioning autism show evidence of a relative lack of impairment in requests for objects, actions, protests and prohibition. However, they do not utilise language typically to engage in interactive functions, such as showing off, commenting, acknowledgement, initiating interactions, or requesting information (Prizant & Wetherby, 1989; 1993).

It has been surmised that the range of conversational speech acts that are absent or infrequently utilised by children with ASD all demonstrate a common emphasis on social rather than regulatory use. This pattern is well demonstrated when contrasted with the challenges associated with communicative functions inclusive of social interactions and joint attention (Prizant & Wetherby, 1989; 1993, Mundy & Newell, 2007: Tomasello et al., 2005).

Prizant and Wetherby (1989) suggested that a basic understanding of communicative behaviour can be conceptualised along two dimensions; communicative behaviours and communicative functions. Communicative behaviours or means are the tools utilised for communication, such as gestures, words and augmentative devices. Communicative functions are what is accomplished through the application of those means (e.g. requesting an action from another person). While words are commonly used in order to communicate, it is evident that they are not the only type of tool that can be utilised. Actions such as gesture, mime, and eye gaze, among others, can be utilised to engage a communicative partner in 'mind-reading'. However, while communication is possible without language, it also has the capacity to fail where language exists (Frith & Happé, 1994).

It has been widely reported that, among children with ASD, a pattern of unconventional and sometimes undesirable behaviour is used to express communicative intentions (Prizant & Wetherby, 1987; Carr & Durrand, 1985). The child's intended communicative behaviours may also fail to accomplish their intended purpose or function. A key measure of competence in communication is linked to an individual's capacity to monitor the

effectiveness of their communicative attempts and to note and repair failures that occur (Volden, 2004; Alexander, Wetherby & Prizant, 1997).

Communication challenges relating to the individual's understanding of intentionality and conventionality are evident amongst learners with ASD (Prizant & Wetherby, 1987). Bates (1979) defined communicative intent as:

> …signaling behaviour in which the sender is aware a priori of the effect that a signal will have on his listener and he persists in that behaviour until the effect is obtained or failure is clearly indicated.

Conventionality within communication signals references the degree to which meaning is shared via signals within a community (Prizant & Wetherby, 1987). This communicative behaviour is reliant on at least two dimensions: words, gestures and function; and relating to what objective is achieved through the interaction (e.g. object request, information provision).

As ASD is a developmental disorder, research and information on the typical development of communication and language offers an organisational framework on which to base assessment and educational approaches. However, as development is often disordered rather than simply delayed, children on the autistic spectrum may demonstrate differences to typical children in both developmental manner and sequence. Prizant and Wetherby (1989) stated:

> … It may be the relative timing of emergence of skills that is unique and not merely the sequence of development. Many of the behaviours displayed by autistic children that have been considered 'deviant' or 'aberrant' may be better understood and even considered legitimate and functional when the combination of skills available to the child is considered from a developmental perspective. Furthermore, normal developmental progressions within specific domains may still be applicable in planning interventions; however, they must be used flexibly. (p. 285)

The development of communication is a continuous process encompassing pre-verbal and verbal communication with pre-verbal communication serving as an essential precursor in the development of intentional use of language to communicate. Competent communicators develop as a result of a developmental interaction of cognitive, linguistic and social-affective capacities (Bruner, 1981; Tomasello, 2001; Tomasello et al., 2005)

2.4 EXPLORING LITERACY

Research relating to the development of reading and writing proficiency was reviewed to inform the theoretical framework of the literacy instrument. Theories that allowed for a developmental progression were deemed the most appropriate base upon which to build a framework to reflect the literacy development of learners with ASD.

Bruner's theory of development, outlined earlier in this chapter, was targeted for its capacity to explain the development of symbolic representation required for literacy and because of its capacity to provide a strong conceptual link to the construct underpinning the framework.

Due to the nature of ASD, many of the students for whom the assessment is intended may not be identified as readers or writers, in the traditional sense. Therefore, the review of research encompassed a broadly defined view of literacy, inclusive of a range of emergent literacy behaviours, to ensure that it reflected the diverse continuum of learner development. Perspectives that identified alternate pathways between pre-reading and reading behaviours are explored and articulated in the following review.

2.4.1 Developmental reading stages

The acquisition of reading skills is commonly described as containing stages or phases. Throughout the learning process, skills will develop and refine, with movement between reading phases generally attributed to a combination of internal and external causes. Internal causes may include general abilities such as vision, language, or memory, or identify specifics such as letter knowledge; external causes include both informal and formal instruction and practise (Ehri, 2007). In general, there is considerable agreement amongst theorists in the identification of stages that conceptualise the development of reading. These are broadly defined in the following section.

2.4.1.1 Pre and early reading stages

Ehri (1995) proposed four overall stages in the development of word reading which in the pre and early reading stages include: i/ pre-alphabetic and ii/ partial-alphabetic phases. These first two phases measure progress from the absence of knowledge, in relation to the alphabet and speech sounds, towards a basic understanding of the relationship between the sounds of speech and the alphabetic system. Within the second phase, learners utilise phonetic cue reading. This involves using some letters in words, usually those at the beginning, to formulate a word's pronunciation (Ehri, 1995; Stahl & Murray, 1998). This

transitional phase is typified by the use of partial letter sound correspondence strategies to decode words, which often results in reading errors.

Chall (1983) identified five stages of reading acquisition, from birth to adult. Stage 0 encompasses pre and early reading and identifies a period within which children of a literate culture that possesses an alphabetic writing system, accumulate significant knowledge of letters, words and books, in addition to their knowledge and control of language. They develop early insights into the nature of words, their sounds and capacity to be split into parts and joined with other words to create new words. Two decoding approaches are used across Chall's stages. In early stages, children primarily use text based strategies, applying a 'bottom up' approach that relies on sight words, word length and early letter-sound relationships. During these stages the child is more focussed on decoding than meaning making.

Frith (1986) suggested a three-phase model characterised by the utilisation of different reading strategies at each level. At the first logographic phase, readers are able to recognise words based on distinctive visual features or context, such as their name and common environmental print. At this stage, children are unaware of the capacity of individual letters and their combinations to represent letter sounds. These early experiences in environmental print identifications provide foundations for children in learning about letters and words. Initially children learn that print can be distinguished from non-print images, and although unable to read, they can point to familiar environmental images and label them.

Clay (1967) is widely attributed as a conceptual founder in the area of emergent literacy. Prior to the introduction of formal instruction, the emergence of literacy-related behaviours are seen as meaningful and important factors in a child's development of literacy (Bowman, Donovan, & Burns, 2001). The emergent literacy perspective identifies a child's knowledge, attitudes and skills as a precursor to conventional literacy (Whitehurst & Lonigan, 1998). Literacy acquisition is viewed as a developmental continuum, which commences in infancy and becomes more sophisticated through childhood as the result of exposure to oral and written language, as well as interaction with stories and texts (Morrow, O'Connor, & Smith, 1990).

2.4.1.2 Decoding stages

During Ehri's next stage full alphabetic readers use their complete knowledge of rules relating to grapheme-phoneme correspondence to read unfamiliar words. Readers engage in connection forming processes of linking print to pronunciations and meaning as they learn to recognise words. Practise enables them to progress in their capacity to recognise and store spelling patterns and orthographic sequences of words. Over time, these become embedded units of memory that are utilised in the recognition of new words (e.g. word endings such as -ing) (Ehri, 2007).

For Chall (1983), the decoding phase reveals a cognitive 'gearshift' from the previous stage as children employ 'top down' strategies focussed on meaning that enable them to shift from learning how to read, to reading in order to learn. Children previously relied on memory and contextualised guessing to read and must now abandon this approach and become "glued to the print" (Indrisano & Chall, 1995, p. 68) by shifting their focus to processing letters and sounds in order to progress. Similarly, Frith's alphabetic stage identifies readers as learning to visually represent words in a different format to earlier object and symbol concepts, and acquiring and using spelling-sound rules in order to read words. Frith (1986) asserted that this shift is best promoted by writing activities rather than through a focus on reading activities.

Through 'code based' instruction or phonics approaches, children recognise and utilise sound-symbol relationships and orthographic patterns between words to decode meaning (Stahl, 2001). As these early processes utilise the limited processing capacity available for enhancing comprehension, ideally this stage is short-lived. Once skills are established this frees more of the brain's processing for meaning making as children engage with more complex texts (Randi, Newman & Grigorenko, 2010).

Typically, children progress from identifying larger units in words to smaller sound units that exist within words. Initially, when words are spoken, a listener may be unaware of the phonemes that make up each word, as they are not articulated as separate parts but embedded as syllables within verbal language (Attwood, Frith, & Hermelin, 1988). The learning process focuses on the conscious isolation and perception of phonemes within speech (Gabig, 2010).

2.4.1.3 Fluency stages

Identified by Ehri (1985) as the consolidated alphabetic phase, this stage captures readers who can draw on their understanding of grapheme-syllable and grapheme-morphology relationships to decode words and commit them to lexical memory (Ehri, 1995). While Chall (1985) did not perceive this as the final stage of reading development, she conceptualised her readers as consolidating their learning from the previous stage. As the reader no longer focusses so heavily on decoding, they are in essence released from sustained attention to print, allowing them to read with greater fluency, speed and comprehension. Within Frith's final orthographic phase, readers are able to recognise a large number of words automatically and instantly access their meaning based on morpheme units. Repeated exposure to words enables the child to understand larger spelling patterns, improving their fluency and comprehension.

2.4.2 Approaches to literacy intervention

The United States' 2000 National Reading Panel's (NRP) Report has been highly referenced in studies as a standard for designing reading interventions. It identifies five areas of instructional practice for classrooms: phonemic awareness, phonics instruction, oral reading fluency, vocabulary, and text comprehension strategies (National Institute of Child Health & Human Development, 2000). A further study by Ehri et al. (2001) largely reflected these findings but identified that phonics instruction delivered in isolation did not maximise reading outcomes for learners and should be combined with other instructional approaches for optimum effect.

For learners in the state of Victoria, Australia, the national and state curriculums draw strong links to research approaches identifying that reading instruction is best achieved through a balanced approach inclusive of language activities and systematic phonics instruction. A review of the Australian Curriculum for English by Hornsby (2017) also highlighted the emphasis placed on meaning making:

> [The Australian] curriculum explains that phonic knowledge can only be used when combined with other cues in the text. In other words, phonics cannot work without meaning and structure. (p. 1)

The processes that build comprehension include: understanding word meanings; analysis of syntax and semantics in relation to word combinations; application of prior knowledge; skills in understanding inference; and metacognition in relation to processes involved (e.g. self-monitoring) (Randi, Newman, & Grigorenko, 2010).

2.4.3 Literacy approaches for learners with disabilities

Alberto, Fredrick, Hughes, McIntosh, and Cihak (2007) suggested that for some students with severe disabilities, literacy definitions that focus solely on recognising and comprehending words may provide too narrow a framework, limiting the opportunities for success. Broadening the lens to incorporate visual literacy, or the ability to obtain meaning through environmental images, such as pictures and logos, provides a broader scope for success and development across the range of learner abilities. Students at early stages in their literacy development are likely to utilise a range of symbolics and pictures to both send and receive information for extended periods, consistent with the use of AAC systems (e.g. picture exchange communication systems (Bondy & Frost, 1994) and computer-assisted communication.

Alberto and Fredrick (2000) outlined a visual literacy instructional model for teaching students to read pictures, containing five steps. Mastery is demonstrated when the student's response to the picture demonstrates understanding of what it represents through an action. Within step one, students identify people in pictures and at step two, identify objects. Step three integrates both objects and individuals in a broader scope. At step four, students are taught to identify actions from pictures and by step five, respond to simple sequences such as two-part instructions.

Cihak's (2007) study examined the impact of visual literacy instruction in relation to the recognition of pictures of familiar people, objects, actions and sequences, and the subsequent generalisation of this learning. While not the primary focus of the study, the researcher noted an overall reduction in inappropriate behaviours, including task avoidance and attention seeking behaviour consistent with results found by Bondy and Frost (1994), and Durand and Merges (2001). For many students with delayed and limited comprehension, visual literacy is strongly related to communicative competence.

A substantial body of the research relating to literacy skill development amongst learners with IDs, inclusive of learners with ASD, relates to the delivery and efficacy of sight word instruction (Conners, 1992: Houston & Torgeson, 2004). Browder, Wakeman, Spooner, Ahlgrim-Delzell, & Algozzinexya, 2006) argued that there was conclusive evidence that teaching sight words to students with both severe and moderate IDs was an effective intervention and demonstrated that subjects were able to identify pictures and symbols related to literacy.

There is an increased likelihood that students with additional needs will require shorter but more frequent instruction in comparison to peers without language disorders (van Weerdenburg, Verhoeven, Bosman, & van Balkom, 2011). Gersten, Fuchs, Williams & Baker (2001) used the term inefficiency rather than deficiency when describing the difficulties experienced by students with learning difficulties. Specifically, they identified the following comprehension challenges:

- Text structure knowledge - develops at a slower rate and shows reduced awareness of narrative and expository text structures.
- Vocabulary knowledge - is reduced in comparison to typically developing peers and therefore comprehension is reduced.
- Applying background knowledge - difficulty in identifying book themes and contributing to summaries and discussions.
- Fluency and comprehension - are reduced and most students demonstrate limited persistence with tasks.

These considerations are significant in terms of exploring literacy programs that focus on vocabulary, language and exposure to books in order to build the underlying competence that will support each child to reach their potential (Marvin & Wright, 1997; Sénéchal, Ouellette, & Rodney, 2006). There is evidence to suggest that interventions and educational approaches that fail to address these areas are ineffective in moving children forward.

A US report on recommended best practise intervention for reading development identified that 50% of learning disabled students do not respond to best reading practices, usually identified as phonics instruction (Al Otaiba & Fuchs, 2006). These students demonstrated clear differences to peers on assessments related to verbal memory, vocabulary, awareness of syntax, word segmentation, word naming, and verbal intelligence, as assessed by the Peabody Picture Vocabulary Test (Dunn & Dunn, 1981). Reduced vocabulary size for age and limitations in oral language also have the potential to impact on and explain the challenges seen amongst learners with autism in phonological awareness (Kjelgaard & Tager-Flusberg, 2001; Tager-Flusberg et al., 2005).

2.4.4 The impact of ASD on literacy development

The process of learning to read with meaning is particularly challenging for individuals with autism. Deficits related to communication, social interaction and cognitive

processing are characteristic of the continuum of ASD with intellectual abilities ranging from below to above average. There is clear evidence that in the reading domain, skills such as word recognition and comprehension may develop independently of each other (Randi, Newman, & Grigorenko, 2010). Regardless of placement on the spectrum, a capacity is evident amongst some children to decode words, however their comprehension is likely to be impaired (Nation, Clarke, Wright, & Williams, 2006).

Hyperlexia refers to a highly developed ability to read words far beyond what might be anticipated in relation to an individual's comprehension and intellectual capacity (Silberberg & Silberberg, 1967). Relatively common amongst children with ASD, hyperlexic readers demonstrate early and precocious word recognition and preoccupation. However, reading accuracy is frequently cited as exceeding comprehension and in some instances, reading has been reported as preceding speech (Aram, Rose, & Horwitz, 1984; Grigorenko et al., 2002; Goldberg, 1987).

Many students with ASD are non-verbal and generally require intensive instructional support and greater time to learn because of their unique learning characteristics (Browder et al., 2006). A complication related to phonics instruction is that within the ASD population, many students are non-verbal and reliant on AAC systems to communicate. However, the phonics instruction learning process is generally reliant on students producing sounds relative to both letters and words (Browder et al., 2006).

Individuals with ASD are likely to process information related to details at the expense of a broader perspective. As a result, when the focus of their attention is on details, the big picture meaning can be easily lost (Happé & Frith, 2006). For learners who have an impoverished vocabulary, approaches that break words apart may enhance decoding while undermining comprehension. This may occur when the learner with ASD perceives the intent of the activity is on the process of decoding. This is a likely outcome in situations when the learner does not have knowledge or functional use of the word that they are decoding and therefore focusses on what is reinforced, the articulation of letter sounds in accordance with a pattern and rule set. This is particularly significant when selecting instructional practises that focus on phonetic drills that emphasise the 'details' of sound blending without reference to the 'whole' of real words in context.

Dyson's (2015) review of research related to the literacy competence of children with ASD identified that an individual's capacity to demonstrate specific literacy skills was determined by overall reading and intellectual ability (Asberg & Sandberg, 2012).

Vocabulary and oral language comprehension have also been highly related to reading comprehension scores (Nation et al., 2006). Dyson (2015) stated that:

> Compared with children having no disabilities … children with ASD exhibited the greatest difficulty in reading comprehension. This was reported by a relatively large number of studies. Verbal ability (expressive language) also was found to be a weaker aspect of literacy for children with ASD. (p. 12)

However, it was also noted that there were substantial differences in performance, with some children unable to complete tasks while others scored far above average.

This extreme variance suggests that mean scores should be interpreted with caution due to the heterogeneity of reading ability across the spectrum (Whalon et al., 2009; Nation et al., 2006). Towgood, Meuwese, Gilbert, Turner & Burgess (2009) suggested that variability is the most defining aspect of ASD. Therefore, consistent with research findings, it is likely that amongst children with ASD, there will be great variability across learners in the skills they can demonstrate, but also within each individual, whose skill profile may be high for decoding and below average for comprehension (Dyson, 2015).

2.5 WRITING

Writing processes are complex and multifaceted and a range of research indicates that it is an area of particular challenge for learners with ASD (Anzalone & Williamson, 2000; Jansiewicz et al., 2006; Minshew, Goldstein & Siegel, 1997). Writing simultaneously integrates a range of cognitive, motor and linguistic processes when the writer engages in tasks such as planning, revising, writing, spelling and/or typing (Singer & Basher, 2004). While these processes are interrelated, it is of note to consider the key elements that work together for successful writers and the manner in which these elements create challenges for learners with ASD, even when managed in isolation from each other. Three key elements central to writing that are explored in this study relate to the linguistic, cognitive and motor processes.

2.5.1 Linguistic elements of writing

The complex nature of the writing process integrates a range of simultaneous functions including motor planning, linguistic processing and cognition (Singer & Basher, 2004). It is well documented that learners with ASD demonstrate considerable deficit in relation to the development of communication skills. Given the strong relationship that exists between oral language and writing development (Shanahan, MacArthur, Graham &

Fitzgerald, 2006), it is evident that the path to writing proficiency is replete with potential challenges for the learner with ASD.

A number of theorists have identified that phonics knowledge assumes greater significance during writing, although the phonics debate tends to be focussed primarily on its role in reading (Frith, 1986; Clarke, 1988; Hornsby & Wilson, 2011). Pearson (2004) stated:

> writing is the medium through which phonemic awareness and phonics knowledge develop - the former because students have to segment the speech stream of spoken words to focus on a phoneme and the latter because there is substantial transfer value from the focus on sound-symbol information in spelling to symbol-sound knowledge in reading. (p. 225)

Research has identified that spelling moves through numerous stages for children learning alphabetic scripts (Lutz, 2017). These developmental stages are generally consistently recognised across theorists but may differ in how they are labelled. Gentry (1982; 2000) built on Read's (1975) research describing five stages of spelling, as follows:

- Pre-communicative stage - alphabetic and made-up symbols and numerals are used but show no knowledge of letter sound correspondence. The child may lack knowledge of the full alphabet and left to right directionality.
- Semi-phonetic stage - there is recognition that letters can represent sounds in words, and alphabet knowledge becomes more complete. The child is likely to use invented spellings, which include letters representing some sounds in words.
- Phonetic stage - the child uses single or groups of letters to represent all speech sounds that they can hear in words. Although spelling is unconventional, it is systematic and therefore understandable.
- Transitional stage - most spelling conventions have been assimilated and common words are known and accurately written. There is a clear shift from dependence on phonology to visual and morphological information.
- Correct stage - almost complete mastery of the orthographic system and its rules are evident at this stage. Spellers understand prefixes, suffixes, alternate and irregular spelling, and have access to a range of strategies to check and self-correct their work.

2.5.2 Cognitive elements of writing

Research in relation to writing development for students with ASD identifies that writing processes may be challenging for these individuals with several factors likely to contribute to this outcome (Myles et al., 2003; Pennington & Delano, 2012). Writing is, in essence, a communicative act through which the writer seeks to engage an audience. Given the challenges experienced by individuals with ASD in perspective taking and mentalising, it would appear to follow that the development of writing that focuses on the specific demands of a range of different audiences would be problematic for individuals with ASD (Green et al., 2003; Pennington & Delano, 2012).

Comparisons of writing output between typically developing and ASD learners have identified that levels of visual motor integration and perception are predictive of handwriting quality for learners with ASD, although the same relationship was not found for the typically developing learners. Differences in visual-motor skills may therefore be an impeding factor in the development of writing proficiency (Hellinckx, Roeyers & Waelvelde, 2013).

2.5.3 Motor elements of writing

Some researchers (Smith, 2004; Ming, Brimacombe & Wagner, 2007) have identified dysfunction in motor planning as a 'soft' symptom of ASD, prevalent across the spectrum but not a requirement for diagnosis. Difficulties with handwriting can be a great source of stress and task refusal for learners with ASD (Broun, 2009). The effort required to engage in multiple, simultaneous tasks, such as composing and handwriting, can be extremely challenging for some individuals. Just et al. (2012) identified that for some individuals, the physical impact of tasks can create significant constraints when available resources of blood and oxygen for the component tasks are reduced and brain area coordination is compromised.

Research into handwriting skills for learners with ASD shows evidence of a range of challenges. Hellinckx et al. (2013) found that learners wrote work of poorer quality than typically developing children of the same age. Specifically, learners with ASD wrote more slowly, wrote larger and with greater irregularity and made poorer connections between letters.

2.6 LINKS BETWEEN LANGUAGE AND LITERACY DEVELOPMENT

Clay (1975) argued that the reciprocity between writing and reading is highly beneficial to each learner's construction of their early systems of literacy, as is the acquisition of language that promotes processing across both reading and writing domains. Scarborough (2005) identified the importance of children's ability to use language (receptively and expressively), vocabulary, story and sentence recall skills, in addition to the frequently cited phonological awareness and letter naming skills.

Reading is frequently identified as a multi-dimensional process that involves interaction amongst a range of variables and elements. Therefore, the development of a single element, such as expressive language, can directly or indirectly enhance another, such as decoding (Scarborough, 2005; Stanovich, 2000). Ensuring teachers use language at an appropriate level of simplicity, so that it is matched to the student's vocabulary and language processing speed, is also a priority (Bishop, 2000; Nation et al., 2006).

Children with disabilities demonstrate clear deficits in language and phonological skills (Snowling, 2000). While the delay in language impacts on the acquisition of reading skills, the lack of reading skills in turn limits the child's capacity to further develop their language and vocabulary (Kamhi & Catts, 2012). Students experiencing language delay are doubly disordered in the sense that the alternate reading pathways, phonological awareness and meaning, are both compromised (Catts, Fey, Tomblin & Zhang, 2002). Studies indicating links between the size of a child's vocabulary and their capacity to access an increasingly refined range of phonetic sequences suggest that phonological awareness deficits are a result of delayed vocabulary development (Gabig, 2010; Snowling & Hulme, 2005).

2.7 CHAPTER SUMMARY

For the purpose of designing an assessment instrument, the preceding review informed the conceptual and developmental sequences of learning in relation to communication and literacy skills for learners with ASD. From this, a hypothetical construct would be created and items developed to reflect both the construct and learning theories highlighted in this literature review. The review drew upon the findings of a range of research to develop a reference frame for understanding what is common to the linguistic development of learners with ASD and to explore potential differences. The following chapter explores

the field of measurement with explicit reference to IRT and CTT and how a psychometric approach can be utilised to provide evidence of instrument validity and reliability.

3 MEASUREMENT, ITEM RESPONSE AND CLASSICAL TEST THEORIES

This chapter explores the field of measurement with an emphasis on IRT, also known as latent trait theory, and CTT. It outlines key outputs for analysis generated in relation to IRT and the data analysis techniques used in this study to calibrate and assess the quality of the research instrument. The data analysis approaches used are drawn from both IRT and CTT, providing a theory-based framework that scaffolds the development of psychometric tools and provides measures of validity and reliability evidence for assessment tools.

3.1 MEASUREMENT THEORY

While we are accustomed to using measures in the physical world to describe concepts such as height, time and temperature within psycho-social contexts, the measures used are unlikely to generate the same universal understanding. Within the field of psychometrics, the measure of psycho-social aspects is far more abstract, as many of the attributes being measured are concepts and therefore lack a clear universal definition (Wu & Adams, 2007). These attributes of interest are generally referred to as latent traits or constructs.

Early measurement definitions such as Stevens' (1946, p. 677) "assignment of numerals to objects or events according to a rule", were significant in shaping measurement theory. However, other researchers have proposed more stringent conditions can be applied that would include measurement of a linear nature, with equal units, enabling measurement data to be manipulated mathematically (Bond & Fox, 2015; Wright, 1999). IRT offers a set of methods that focus on these more stringent measurement definitions (Baylor et al., 2011).

When a variable is abstract rather than concrete, we speak of it as being a construct, since it is literally a construct or something 'put together' from the researcher's own imagination. A trait is defined as latent because it is unable to be directly observed. For example, we may wish to measure the latent trait of achievement but we cannot perceive it in the same manner that we might read a thermometer to gauge temperature. It is only possible to infer academic prowess through examining indicator variables, such as the performance of a task. Therefore, a critical first step in developing psycho-social measures is clarifying what will be measured.

Within IRT, notions related to constructs are significant as they are closely linked to inferences made in relation to possession of latent traits. The model in Figure 3.1 shows the operation of the latent trait model within the IRT approach. As the latent trait cannot be directly observed, a range of manifest variables that highlight observable behaviours are developed for inclusion in the instrument. These indicators are representative of the 'little ideas' that reflect the 'big idea' of the latent variable.

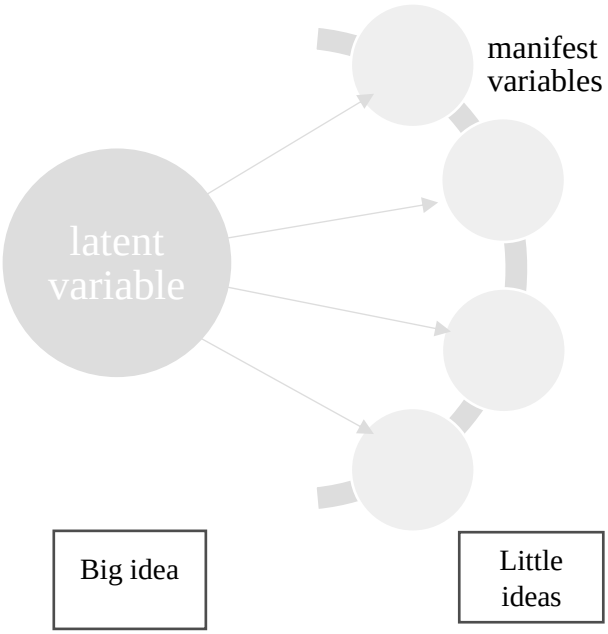


Figure 3-1: Relationship between latent and manifest variables

(Adapted from Wu, Adams, Wilson & Haldane, 1998)

3.2 MEASUREMENT SCALES

Having established the content, it is important to consider the rigour with which to measure the latent trait. Scientific measurement requires that numerical allocations be carried out according to a rule set that, at a minimum, produces a resultant scale and unit value that can be maintained along the entire scale. Numerical allocations applied by 'any' rule may produce useful indicators, only some of which qualify as 'measurement' thus defined. So, while both nominal and ordinal classifications are a required prerequisite in the development of systems of measures, they are not, in isolation, sufficient for actual measurement (Bond & Fox, 2015).

The scales associated with psychological measurement are: nominal, ordinal, interval and ratio, discussed in the sub-sections below.

3.2.1 Nominal scales

Within the nominal scale, numbers are associated with a named attribute (e.g. numbers given as student identification codes, such as 0125, 0126; or coding of gender when gathering data, such as male=1, female =2). Essentially, the numeral functions as a label for the identified trait that it relates to, which then allows for classification by an attribute. However, it does not provide a measure of 'more' or 'less' for an attribute (Mitchell, 2003; Wu & Adams, 2007).

3.2.2 Ordinal scales

In ordinal scales, numbers order objects or persons with respect to variation of a selected attribute (e.g. 1st, 2nd, 3rd specify the position in which runners complete a marathon; or identify levels of agreement can be used on a Likert scale: strongly disagree=2, disagree=1, neither agree nor disagree= 0, etc.). However, at the ordinal level it is only possible to perceive ranking and not a measure of actual difference between the numbers (i.e. the distance between runners who are awarded 1st and 3rd is not assumed to have same interval that exists between the athletes being awarded 3rd and 5th places). Ordinal placement is not indicative of an equal interval value (Bond & Fox, 2015; Stevens, 1946).

3.2.3 Interval scales

In this scale, numerical values indicate the amount of an attribute. For example, temperature and time are representative of interval measures. We can interpret the 'amount' in the numbers, which provides the opportunity for more information than a simple ranking. For example, the difference between one o'clock and three o'clock provides an interval measure of two hours, which is the same interval that exists between three o'clock and five o'clock. Interval measures allow this type of meaningful comparison between numbers (Wright & Linacre, 1989; Wu & Adams, 2007).

3.2.4 Ratio scales

Numerical values that indicate the amount of an attribute and have an absolute zero are ratio scales (e.g. height or count of votes in an election). As ratio measures contain a zero measure, it is possible to talk about 'how many times more' when comparing and contrasting in relation to the measure (e.g. twice the temperature, half the number of votes). Iterated units of measurement must be standardised across all measurement contexts so that they can be measured against a common linear scale. Measurement at the ratio level provides opportunities for comparisons between both numbers and ratios that are meaningful (Wright & Linacre, 1989; Bond & Fox, 2015).

These four levels of measurement provide varying capacity to discriminate in their measures. Evidently, the development of a scale for measuring latent traits that represents the highest possible level of measurement is most desirable. However, for the most part, latent traits do not support a ratio measure, as it is unlikely that an absolute zero measure point can be defined at which there is 'no' latent trait. Therefore, the development of an interval scale to measure a latent trait is likely to have the greatest capacity for measurement, over and above the ranking system possible within an ordinal scale (Wu & Adams, 2007).

3.3 CLASSICAL TEST THEORY

A fundamental tenet of CTT is that scores on a test consist of two components: a true score and a component of error (Lord, Novick, & Birnbaum, 1968). A true score is representative of the score that might be achieved if several tests of equivalent difficulty are undertaken by a student and an average score computed. Variability in test outcomes on similar tests is attributed to the 'error component' of the individual test, where 'error' refers to the difference between the observed score on the test and a student's true score (long-term average). As a result, the degree of variability in test scoring is indicative of the degree of confidence the test warrants, in cases where results are generally reproducible and reliable. The notion of reliability in CTT is a key concept that is expressed as an error component. Tests with a small error component indicate the likelihood that a student's score will vary within a small range on similar tests. If a student's score differs widely on similar tests, then those tests are perceived as having low reliability because of the high degree of variability. The notion of reliability is a key element of CTT (Lord, 2012).

3.4 ITEM RESPONSE THEORY

IRT or latent trait theory, encompasses a family of psychometric models based on the assumption that an underlying trait or ability underpins individual performance and that this can be measured on an instrument that has been designed to assess possession of a specified ability or trait. Individuals with greater possession of this ability are more likely to score highly on this test than persons who possess less of the same trait (Bond & Fox, 2015; Mitchell, 2003).

IRT was developed in the 1950s and 1960s by Fred Lord and Alan Birnbaum (Lord, Novick & Birnbaum., 1968), while in a similar timeline, George Rasch worked independently (Rasch, 1960/1982) to develop his model. While the two models share a mathematical basis, Lord and his colleagues' endeavours were focussed on the development of complex models to better describe empirical data and thus can be conceptualised as a data driven model. In contrast, Rasch's work may be characterised as model-driven, as the primary aim was to develop a more restrictive model to satisfy scientific measurement requirements.

A Rasch analysis offers a range of potential advantages over other psychometric approaches traditional to CTT. Foremost of these is the capacity of the model to provide an interval measure of student ability and item difficulty that are theoretically independent of the sample (Hula, Doyle, McNeil, & Mikolic, 2006). Interval measures possess the property that the distance between ability scores on a scale has a clear meaning, in a similar manner that the difference between two temperature measurements on the Centigrade scale have a clearly defined and consistent meaning.

3.5 THE RASCH MODEL AND CLASSICAL TEST THEORY

The output of a Rasch Analysis is presented as a set of both person ability and item difficulty values located on a single interval scale. The Rasch model stipulates that the success probability is dependent on the difference between the item's difficulty and the person's ability. It is this property that identifies the strength of the Rasch model in relation to other methods of measurement. The model's method orders persons in accordance with their ability and orders individual test items in relation to their difficulty (Bond & Fox, 2015). To better understand the strengths and limitations of the model, it is beneficial to consider the tenets of CTT in order to provide opportunities to compare and contrast IRT with CTT.

Where CTT makes no explicit assumption about person-attribute postulation determining test performance, IRT proposes a single variable for proficiency, θ, identified as latent ability. This is postulated as the underlier of person performance. θ, is identified as a distinct ability, which cannot be directly observed but can be used as a predictor of a person's test performance on a test designed to measure this trait. Additionally, IRT proposes a probabilistic model that predicts item responses for a person. In relation to the Rasch model, the probability of a 'correct' response is represented as a function of the

item difficulty δ and person ability θ. As a result, item responses under IRT function as units of analysis, unlike CTT where the overall test scores are the identified unit of analysis. While people are often tempted to make inferences about a student's overall proficiency within a defined discipline based on a test outcome, under CTT it is not assumed that a student's single test score is reflective of ability beyond the confined scope of that particular test.

The IRT person separation reliability can be viewed as equivalent to CTT's measurement error. The person separation reliability computation identifies the accuracy of individual ability measures and the potential variation of measures of ability across the student cohort taking part in the test. Indices of CTT coefficient alpha, while derived by a different formula provide an equivalent measure (Wu & Adams, 2007).

Within IRT the item difficulty measure is the ability at which a person has a 50:50 chance of a correct answer. This type of model is referred to as probabilistic as it identifies the likelihood, as a percentage, that a person has in getting the 'correct' answer. This is quite different to a deterministic model, which assumes a correct response every time. As item difficulty is defined on the ability scale, this becomes key to using IRT results in a range of applications. As the probability of success is expressed as a mathematical function, it is also possible to calculate the probability of success for items that are less or more difficult given the ability of the person. Figure 3.2 shows the intersection of predicted item difficulty and person ability curves.

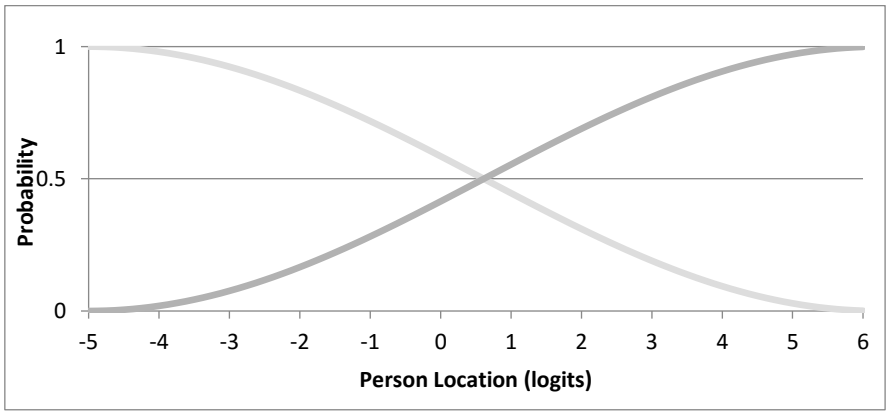


Figure 3-2: Item characteristic curve and probability of 0/1 responses

(Adapted from Dunne, Long, Craig & Venter, 2012)

The probability of response for any person *n*, engaged in attempting an item i, is expressed as a function *f* of the difference at play between person ability β_n and item

difficulty D_i. These types of probability statements cannot be made within CTT, as test and item scores form the basis of the computed statistics.

The Rasch model, also referred to as the simple logistic item response model, is used exclusively for dichotomously-scored instrument items that contain only two potential responses. In many assessments, the potential responses can be categorised as correct/incorrect. However, within this study, the response categories are best characterised as 'item attained' or 'item not yet attained', consistent with the developmental nature of the assessment's purpose and administration.

The simple logistic model provides an estimate of a person's probability of providing a correct response to a specific item as a function of both δ, item difficulty, and θ, person ability. This Rasch model equation for a dichotomously-scored test item is expressed as:

$$p=P(X=1)=\frac{\exp(\theta-\delta)}{1+\exp(\theta-\delta)}$$

where X is the student's score on an item. X=1 when the student has attained the item and X=0 when the student has not attained the item (Rasch, 1960/1982).

Data analysed using the Rasch dichotomous model is coded by two values, usually 0 and 1. It is important to note that this level of data is not nominal. In this usage, the value of 1 has greater meaning than the 0 value. In a nominal coding scheme, if a code of 0 is allocated to boys and a code of 1 is allocated to girls this is done to reflect that one group of respondents differs from the other. In contrast, when 'not yet attained' item responses are coded as 0 and 'attained' responses are coded as 1, the value affixed is much more significant than difference. An assignation of 1, in this instance, is superior to 0 as we identify a student who attains the item as having more ability than one who does not (Bond & Fox, 2015).

3.6 KEY ASSUMPTIONS OF THE RASCH MODEL

There are a number of explicit assumptions associated with the Rasch model. These are discussed in the following sub-sections.

3.6.1 Uni-dimensionality and the logit scale

All items within a test must have the capacity to measure the same uni-dimensional latent trait of interest. The analysis undertaken provides an estimate of ability, as the natural

logarithm of odds of success for a person given that the item difficulty is zero. On the other hand, item difficulty is defined as the ability at which the probability of success on the item is 0.5. Measures on this log scale are known as logit scores. Both ability measures and item difficulty measures are on the logit scale. Typically, these estimates are scaled so that the mean of the item difficulties is set to zero. When analysing dichotomous items, both the item difficulty and person ability are defined in such a manner that when they are equal, there is a 50:50 chance that a person will provide a correct response to an assessment item.

Logit scales can be conceptualised as a 'ruler' for latent traits, with the units of measure being logits instead of centimetres (Baylor et al., 2011). Logit scale units represent the increased likelihood of a correct response, as the value of the logit increases. Higher logit values for person ability are associated with a higher probability of a correct response and possession of the latent trait being measured. The mean of item difficulty is set by default at 0 logit.

3.6.2 Capacity to provide a linear measure

A key advantage associated with the model's use of a logit scale is that it approximates an equal interval scale. For example, with the ruler analogy, the centimetre is always a uniform unit and a logit is representative of a specific difference in the odds of item success. Equal interval scales have stable properties that can determine the extent to which an individual may have progressed over time through subsequent testing (Wright & Linacre, 1989).

Within the Rasch model, all individuals can be placed along an ordered continuum, from lesser to greater ability in relation to the latent trait being measured. Additionally, all items related to the construct can also be positioned along the ordered continuum from less to more difficult. Persons of high ability have a greater likelihood of answering items correctly while those with lower ability are less likely to do so (Rasch, 1960/1982; Bond & Fox, 2015). An increase from 1.0 to 2.0 logits (one unit) relates to increased odds in favour of the correct response. An increase of one unit increases odds by a factor of 2.718. Similarly, difficult items have a decreased likelihood of being answered correctly and items of low difficulty are more likely to be answered correctly (Hula et al., 2006).

3.6.3 Local independence

The assumption of local or conditional independence, also identified as specific objectivity or parameter separation, is a feature of the Rasch model. In theory, this mathematical property ensures that item difficulty values are independent of the sample of persons used to develop the original estimate and that individual items do not influence each other (Bond & Fox, 2015). For example, if a reading test asked individuals to read a passage then answer two questions about the text on a test, those two items may be locally dependant on each other. This is because both questions relate to the one passage of text and the responses provided to the two questions are dependent on an individual's capacity to understand the one section of text.

3.6.4 Item discrimination parameters

Within the Rasch model it is specified that the slope of the item characteristic curve (ICC) is equal for all items (Bond & Fox, 2015). Items with a MNSQ fit of 1, when viewed as a characteristic curve output, will run parallel to the expected slope. The expected curve for all Rasch items can be seen in Figure 4.3. The solid curve is the model's expected probability of success as a function of ability, and the dotted curve indicates the observed probability of success. The horizontal axis measures the ability level and the vertical axis shows the expected score on the item given an ability measure.

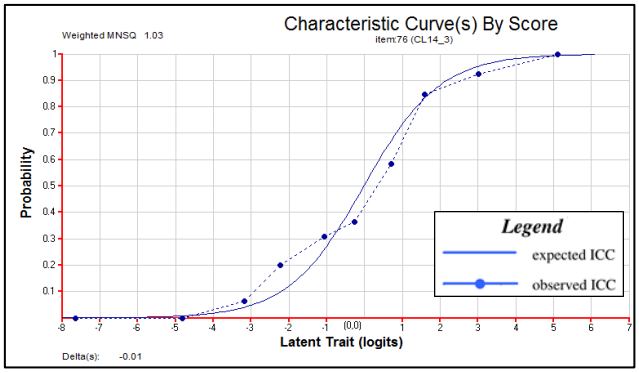


Figure 3-3: ICC for item CL_14, focus- pronoun use, within communication- vocabulary

(Note: Observed ICC is consistent with expected ICC (fit) (infit MNSQ = 1.03)

The congruence of expected and observed ICC in Figure 3.3 indicates a strong relationship between item performance and the Rasch model prediction for the item.

3.7 ITEM-PERSON MAPS

IRT provides an analysis that enables mapping between student abilities and item difficulties not readily available through CTT. ConQuest software produces item-person maps, also referred to as variable maps (see figure 3.4), which represent a range of key information.

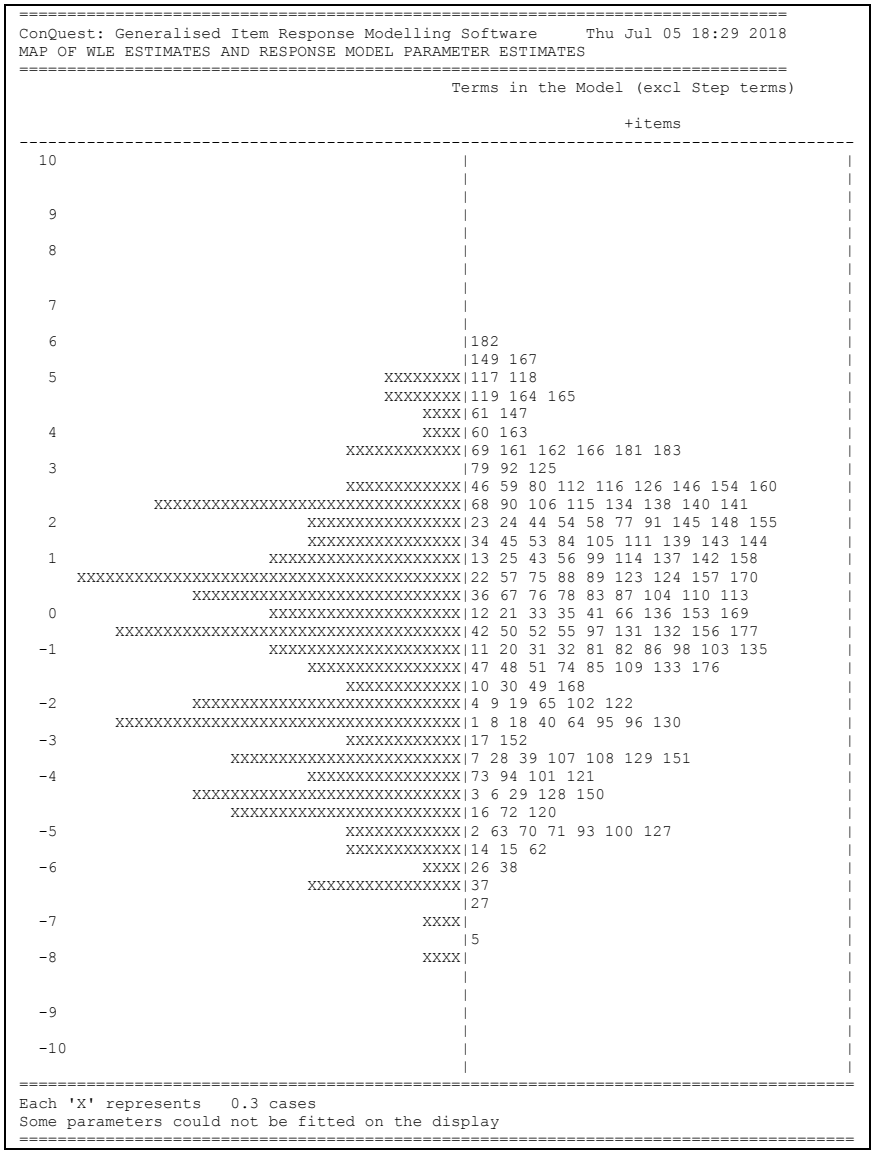


Figure 3-4: An item-person map of the instrument's functions and reading items generated by ConQuest

The logit scale, or measurement unit used to measure both item difficulty and person ability is located along the left edge of figure 3.4. The variable map shows the match between person ability and item difficulty calibrated on a common logit scale. 0 is set as

the mean of item and person difficulty and commences at the base between -7 and -8 logits (on this measure). Logits increase in ability/difficulty towards 6 logits for the selected items. Spread of person(s) ability is indicated by Xs in the area left of centre in the figure, with each X representing 0.3 students in this sample.
Distribution of item numbers (ie.1,2,3) right of centre represent the variance in item difficulty along the logit scale. Placement of item numbers towards the right bottom of the map reflects that these are easier items while those placed towards the top right of the map are estimated as possessing higher difficulty. For example, Item 182 is the most difficult of the communication items on the instrument and as a result is positioned at the top of all items. The easiest item, 5 is located at the bottom of the map with an item difficulty estimate between -7 to -8 logits.

3.7.1 Mapping student abilities to item difficulties

As item difficulty is defined on the student ability scale, it is possible for both to be placed on the same scale. This property makes it possible to identify the likelihood of a correct response for individual items, relative to the ability of the student. For example, a student who was located around logit -2 in figure 3.4, will have a 50% chance of providing a correct response to questions clustered at that logit (items 4, 9, 19, 65, 102 and 122). Additionally, they will have difficulty in providing an answer for questions clustered at logit -1 but will answer questions around logit -3 (items 17 and 152) with relative ease. These types of probabilistic statements can be utilised to develop descriptions in relation to the skill sets of students in addition to any test result assigned (Bond & Fox, 2015).

Within CTT, an item's facility (the percentage of correct responses) is used to measure the difficulty of the item. CTT item facility and IRT item difficulty perform alike in ranking items according to their order of difficulty. However, there is a clear variance when considered from a linear perspective. Figure 3.5 below provides an example.

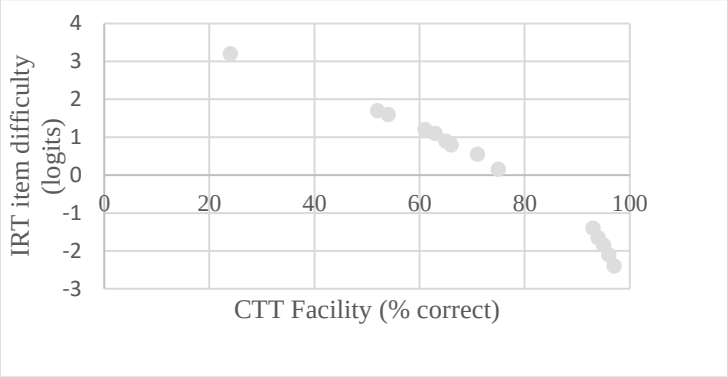


Figure 3-5: Linear perspective comparison of CTT facility and IRT item difficulty

(Adapted form Wu, 2009)

At both ends of the item difficulty scale (low and high), IRT item difficulties appear further apart than items situated in the mid-range. However mid-range facility items (20-80%) show a linear relationship between CTT and IRT items.

Typically, IRT programs provide a range of outputs that can be utilised to assess the functioning of an instrument. ConQuest (Adams & Wu, 2008) provides tables of both estimated item and person parameters, in addition to fit information related to the data (Wu & Adams, 2007).

3.7.2 Item discrimination statistics in classical test theory

The CTT discrimination index identifies the correlation between an individual's score on an item and the overall score. In cases where the item performs well, then a high correlation between item and overall test will be recorded. The discrimination value of 0 indicates that there is no correlating relationship between item and total score. The higher degree of positive relationship, the higher the discrimination score. Wu and Adams (2007) suggested that it is preferable to select items with a discrimination value above .4 and that items below .2 are unlikely to be acceptable but should be checked to ensure that scoring has occurred correctly.

In contrast, items with low discrimination would not demonstrate this positive relationship. Item discrimination has a key role, particularly in relation to assessments that seek to separate students by ability levels. Low discrimination items reflect a lack of relationship between the items and indicate that it is testing content that is unrelated to the underlying construct. In cases where many items have low discrimination, this will result

in a low reliability score, indicating a lack of relationship between the items and the underlying construct.

As the discrimination index correlates two score sets, it is sensitive to the variability present in both scores. Items that have very low or very high difficulty would not demonstrate significant variation in student score sets (i.e. there will be a bulk of either correct or incorrect responses for the item) and therefore correlation will be reduced. The CTT discrimination index tends towards the lower range for both very easy and very complex items. Therefore, a low discrimination index is not always a reflection that the item is of poor quality; it may be evidence of a lack of variation in correct/incorrect answers to the item (Adams & Wu, 2008).

3.7.3 Item discrimination within item response theory

While item difficulty identifies how many people correctly identified the same answer, item discrimination makes clear who obtained correct selections (e.g. mixed, low or high ability students). Item difficulty, by itself, does not indicate the quality of an item. A difficult item may be good if the small number of students who make the correct response are students of high ability. In this case, item discrimination will be high.

IRT offers two avenues to check for item discrimination: fit statistics and ICCs (Adams & Wu, 2008).

3.8 ITEM FIT TO MODEL

3.8.1 Residual-based fit statistics

Fit indices provide a measure of the extent to which items fit the item response model. A fit index that is close to 1 identifies an item that fits well to the model. Index scores further away from 1 indicate a poor fit to the item response model. Cases where the fit index is higher than 1 reflect an item that is less able to discriminate than predicted by the model. On the other hand, a fit index lower than 1 reflects that an item discriminates between low-high ability students better than the model predicted.

Wu and Adams (2007) suggested that fit statistics are best utilised in detecting misfit rather than as explicit cut-offs for acceptance or rejection of test items. Fit statistics for individual items highlight potential issues, but items should be carefully examined and improved where possible if the source of the misfit can be identified. Simply rejecting misfitting items, particularly overfitting items, may result in very strong items being

removed and unnecessarily weakening the test overall. Additionally, while residual-based fit statistics will show that items are a fit for the Rasch model, this is not the sole factor in identifying the strongest test. Test reliability indices relating to item discrimination are also key considerations in measuring a test's value in addition to testing item fit.

Researchers in the field offer general guidance around fit measures based on the proposed purpose of the assessment. Linacre and Wright (1994), recommended a range of .8-1.2 for high stakes testing items, .6-1.4 for rating scales and a range of .5-1.7 for clinically-based observations. Wu and Adams (2007) suggested that given the influence of sample size on the amount of variation that might be predicted as reasonable, researchers could calculate the degree of variation based on sample size. Linacre and Wright (1994) identified a more generous variation based on informal simulations of mean fit square (MNSQ) statistics. The overall values are presented in the table 3.1 below.

Table 3-1: MNSQ fit value ranges of informal simulations. Adapted from Linacre & Wright (1994)

MNSQ fit statistic	
Value	**Impact on measure**
2>	Distorts/degrades measurement system
1.5-2	Unproductive but not degrading
.5-1.5	Productive for measurement
<.5	Less productive but not degrading

In the case of this study, fit indices were explored to ascertain the level of congruence between predictions made by the Rasch model and teacher observations of students' skills in communication and literacy. Evidence of good fit in this case would be that there was a high correlation between teacher perceptions of their students' competency in relation to literacy and communication and their scoring of items i.e. More skilled students had more correct responses than less skilled students. In cases where this evidence is strained or tenuous, fit statistics may indicate the extent to which the relationship has been affected.

3.8.2 Observation of fit using item characteristic curves

In cases where items exhibit misfit, Wilson (2005) recommended using a visual comparison of cumulative item curves to determine expected and actual curves. This would assist in interpreting potential causes of misfit.

Observed ICCs with an extremely flat profile indicate that low ability students are as likely as high ability students to achieve a correct response (e.g. perhaps the item was confusing and generated a high degree of guesswork). Therefore, the item is not effective

in reflecting student ability. It follows that observed ICCs with steep curves identify items that are more powerful in separating students across the range of ability levels.

Figures 3.7 and 3.8 each show two curves. The solid line represents the theoretical ICC and the dotted line represents the observed ICC (with a flat curve that is indicative of a lack of relationship between the actual performance of an item and the predictions of the Rasch model), based on data collected for the item.

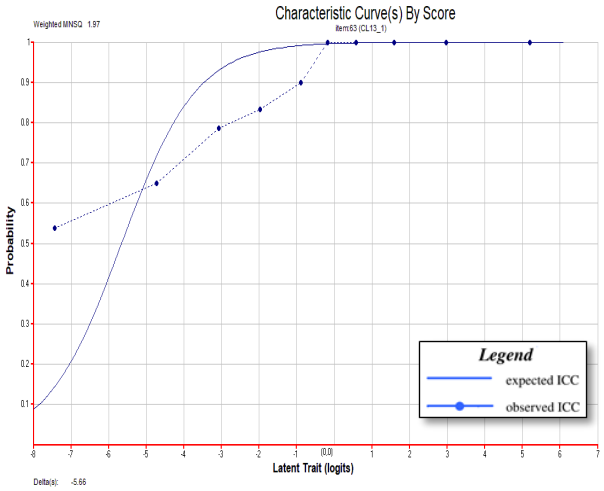


Figure 3-6: Observed ICC is 'flatter' than expected ICC (under-fit) (infit MNSQ = 1.97)

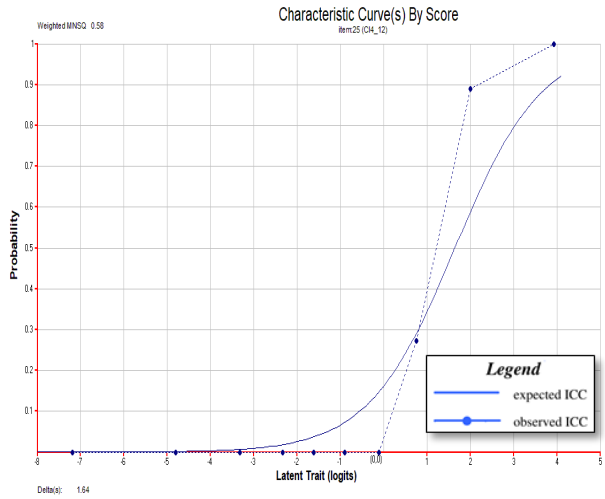


Figure 3-7: Observed ICC is 'steeper' than expected ICC (over-fit) (infit MNSQ = 0.58)

Items with high ICC slopes (and correlating high discrimination) are more likely to separate responses from individuals at differing ability levels. Items with low ICC slopes are less likely to do so. In cases where ICC slopes for sets of items differ substantially, it

is likely that the test items are providing a poor match to the underlying latent trait (Wright & Stone, 1999). Items with a fit mean score less than 1 indicate a more discriminating item than anticipated by the model. Fit mean scores more than 1 indicate less discrimination.

3.9 VALIDITY

Standards for educational measurement developed jointly by American Educational Research Association (AERA), American Psychological Association (APA), & the National Council on Measurement in Education (NCME) (2014) identify validity in reference to "the concept or characteristic that a test is designed to measure" (p.246). Mislevy, Almond & Lukas (2003) suggest that validity claims should be formally represented through structured reasoning and argument and Messick (1994) identifies construct centered views of validity as:

> An integrated evaluative judgement of the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of inferences and actions based on test scores" (p.13, 1989).

A great deal of the literature on assessment validity has focused on large scale and often high stakes assessments (Pellegrino et al., 2016). Most of these tests demonstrate limited links to contemporary models of cognition and the development of learner competence. Increasingly, there is a need for assessments that are designed and validated for both formative and summative assessment within teaching and learning contexts.

Pellegrino et al. (2016) outlined a framework that conceptualised the components of validity most applicable for assessments that are designed to support learning and teaching in classroom environments. While acknowledging the aforementioned forms of validity typically utilised in large scale assessments the intent underlying the framework was to;

> … build on current thinking that an assessment is not valid or invalid per se (i.e. validity is not a property of the instrument), but rather that validity has to be judged relative to the intended interpretative use of results. Furthermore, for a given intended interpretive use, multiple aspects of validity can be evaluated, each of which deserve attention in its own right" (Pellegrino et al., 2016, p3).

The framework identifies content, criterion, construct and consequential validity as multiple aspects worthy of individual attention, consistent with traditional standards for

psychometric testing (AERA/APA/NCME, 1999; 2014; Pellegrino et al., 2016). The framework builds upon and reflects multiple aspects of validity identified within the standards to provide a focus and organisational structure to develop, interpret and evaluate classroom instruments.

When focusing on evaluating the validity of assessments developed to support learning and teaching, Pellegrino et al. (2016) highlight the components of cognitive, instructional and inferential validity.

3.9.1 Cognitive validity

Cognitive validity focusses on the extent to which an assessment highlights significant domain knowledge and competence in a manner that is not compromised by other aspects unrelated to the construct being measured. It reflects the nature of student cognition, likely student development in response to instruction and the growth of competence (Kilpatrick, Swafford & Findell, 2001; Pellegrino et al., 2016).

> We are focused on those aspects of knowledge and skill that are the targets of assessment within instructional settings and the quality and value of the information about those constructs relative to the support of ongoing classroom teaching and learning" (p.4).

The cognitive model is reflective of procedural and conceptual knowledge related to the construct being measured. All assessments are based on assumptions about the type of tasks that will cue a student to say, do, or create in a manner that reflects the learning model related to the assessment. Therefore, selected tasks must be designed in a manner that reflects the learning model and allows for inferences and decisions to be made on the basis of assessment results (Pellegrino et al., 2016). This approach links assessments of cognitive validity to both instructional and inferential validity.

3.9.2 Instructional validity

The instructional component of validity identifies alignment with learning opportunities curriculum and teaching and the capacity of an instrument to provide timely and valid information that supports instruction. Evidence of instructional validity is based on the alignment of an assessment with knowledge and curriculum and its capacity to guide both instruction and learning (William, 2007; Pellegrino et al., 2016).

3.9.3 Inferential validity

The component of inferential validity addresses the degree to which an assessment can be considered to reliably provide information that yields a base model for student

performance, particularly in relation to diagnostic purposes. It connects closely with validity arguments for both cognitive and instructional component. Evidence is provided through analytic methods and statistical inference which determines the reliability of task performance with the underlying construct being measured (Pellegrino et al., 2016).

The three validity components prioritised reflect a repurposing of standard validity components and identifies these as the most influential sources of validity for assessments developed for classroom that inform instruction. Elements of Messick's construct centred view of validity are evident within cognitive validity. Traditional content and consequential validity are incorporated within instructional validity while inferential and criterion validity are also strongly aligned.

3.10 CHAPTER SUMMARY

This chapter presented an overview of key similarities and differences between CTT and IRT posited within the broader field of measurement theory. The data analysis techniques that have been explored provide the context for claims of evidence of validity and reliability within which an instrument's technical quality might be evaluated. Chapter 4 will explore a construct centred approach to designing and developing psychometric assessments.

4 INSTRUMENT DESIGN

There is a tendency within educational assessment to target test content based on a loose description of what a student should know, such as an aspect of a curricular domain or standards. The test writer then develops the items without attributing value to the types of evidence required. However, this diffuse process is unlikely to result in a high-quality assessment, reflective of an underlying construct. It may also not have the capacity to cover all relevant content with a high degree of certainty in relation to the scope of inferences that can be made about student performance (Pellegrino et al., 2016).

4.1 CONSTRUCT CENTERED APPROACH TO TEST DESIGN

Established guidelines for assessment design emphasise that the process should commence with a statement of the instrument's purpose, and a definition of the content to be measured (Millman & Greene, 1993; Wolfe & Smith, 2007a). Construct centred approaches to assessment development provide a clear framework for addressing these essential test attributes. Messick (1994) succinctly identified the priorities of construct-centred assessment design, as follows:

> A construct centered approach would begin by asking what complex of knowledge, skills or other attributes should be assessed … Next, what behaviours or performances should reveal those constructs, and what tasks or situations should elicit those behaviours? Thus, the nature of the construct guides the selection or construction of relevant tasks as well as the rational development of construct-based scoring criteria and rubrics. Focusing on constructs also alerts one to the possibility of construct-irrelevant variance that might distort the task performance, its scoring, or both. (p. 16)

Other researchers (Mislevy et al., 2003; Wilson, 2005) provide a contemporary yet consistent view and a number of models explicitly linking measurement models and construct maps have been further expounded from seminal approaches developed by Wright & Stone (1979) Wright & Masters (1982). These and other researchers exemplify the evidentiary reasoning logic of Pellegrino et al.'s (2001) assessment triangle, utilising a construct-centred approach in their development of assessment tasks (Mislevy & Haertel, 2006; Wilson, 2005).

Identifying an instrument's use and the types of inferences that may be drawn from assessment results is a factor that requires early consideration because of the potential

impact on test design, content and structure. As the instrument and assessment results may be utilised in different ways, it is essential that the design process takes future use into account so it can be planned for accordingly.

4.2 REASONING FROM EVIDENCE

The publication *Knowing What Students Know: The Science and Design of Educational Assessment* (Pellegrino, Chudosky & Glaser, 2001) identified an ambitious direction for the development of valid assessment instruments, balanced within a synthesis of learning theory and measurement research. Drawing on Mislevy's (1996) premise of assessment as a "process of reasoning from evidence" (p. 39) and a National Research Council synthesis of human learning (Bransford, Brown & Cocking, 2000), Pellegrino et al.'s (2001) articulation of the assessment triangle model makes explicit the relationship between models of learning, methods of assessment and the types of inferences that can be made from test scores.

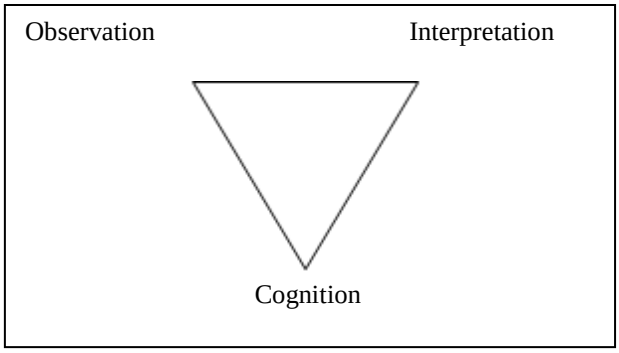


Figure 4-1: The Assessment triangle model, reproduced from Pellegrino et al. (2001)

In the assessment triangle model (Figure 4.1), the three elements of observation, interpretation and cognition are represented as corners of a triangle to emphasise their requirement for synchrony (Pellegrino et al., 2001). In order for an assessment to produce meaningful results each corner must make sense in relation to the other two elements.

4.2.1 Cognition

The cognition element references the requirement of a learning theory specific to the subject matter domain, representing credible understanding of knowledge, skills and competencies that develop and are important to measure. The test designer's identification of a model of learning that explicitly conceptualises cognition for their

learning domain, should ideally reflect a broad rather than a narrow research perspective. Assessment design based on a learning model enables the assessor to identify competencies that will allow appropriately targeted inferences in relation to student progress, whether that be a summative judgement of attainment or a formative assessment utilised to guide future instruction and learning.

A model of learning, describing how individuals demonstrate competence within a domain, is most likely to highlight those aspects of a domain that would underpin student achievement and progress. As Pellegrino et al. (2001) argued:

> Given a developmental description of learning, assessments can be designed to identify current student thinking, likely antecedent understandings, and next steps to move the student to more sophisticated understandings. Developmental models are also the starting point for designing assessment systems that can capture growth in competence. (p. 182)

Utilising a developmental perspective in assessment ensures that student learning and skills can be assessed over time, rather than as the single measurement of an instructional end point. Such an approach implies that an individual's performance in relation to a selected construct is of value to monitor over time.

In order for this developmental perspective to be enabled, a model of how students develop skills and understandings as a result of teaching interventions is required (Wilson, 2009). Masters (2013) stated:

> If curriculum requirements are not organised with respect to developmental outcomes that clarify clearly expected pathways, then teaching programs are unlikely to yield evidence of depth of learning. The consequences of such an approach to assessment is a renegotiating of the process of curriculum, teaching and assessment towards a holistic emphasis on how growth occurs and on what evidence should be gathered to show that is occurring. (p.iv)

4.2.2 Observation

The observation element of the assessment triangle model reinforces the requirement that assessments are designed thoughtfully and based on tasks that will allow students to do, say, make or act in a manner that showcases their skills and knowledge, enabling references to be made consistent with the learning theory outlined (Pellegrino et al., 2001). This approach allows the test designer to focus their observations in a manner that maximises the value of the data collected, as tasks are carefully selected to reflect the underlying developmental framework.

A fundamental purpose of educational assessment is to establish where each learner is positioned in relation to the specific domain of knowledge being measured. Therefore, the most significant frame of reference for interpretation of assessment results is the articulation of the domain itself across developmental zones. Most learning domain or construct maps utilise both horizontal and vertical structures. Learning content areas comprise the horizontal structure of the learning domain and the vertical structure identifies the development and increasing proficiency of skills and knowledge (Masters, 2013; 2014; Thomson, De Bortoli & Buckley, 2013).

It is critical that any assessment process be based on a rich understanding of the domain that students will progress through (Masters, 2014). Domain mapping utilises empirical evidence of how learning progresses within an identified domain, inclusive of typical sequences of development. Ideally, professional judgements provided by subject matter experts identify tasks and performances that represent low to high levels of competence. This input is informed by research into domain content and how students learn (Pellegrino et al., 2001).

Linking assessment tasks to teaching models emphasises the selection of tasks that are relevant to the construct and minimises less relevant features (Wilson, 2009; Messick, 1993). Task difficulty is then explicable in relation to the knowledge and cognition requirements of the task, rather than solely represented by item difficulty statistics. It is important to utilise the underpinning learning theories to select tasks requiring varying degrees of competence or knowledge in order to address the breadth of the learning continuum for students with ASD.

4.2.3 Interpretation

The interpretation element of the triangle model reflects how observations arising from the assessment tasks provide evidence of the knowledge being tested. Interpretations within large scale assessments are usually presented as a statistical model that provides an overview of patterns in the variations of student achievement. It is central to this process that the assessment has at its basis, an articulated theory of student learning and a clear understanding of the competencies students are likely to demonstrate as they progress within a learning domain.

In order to construct a set of standards, an assessment is administered and scored. A statistical analysis of students' performance on individual items allows test items to be

ordered from those least to most observed. Descriptions for each proposed level can then be developed with reference to the items clustered at different levels of difficulty. When these standards are considered, they provide an empirical map of increasing competency within each mode of the domain being assessed.

Masters (2013) suggests that:

> Individuals develop along idiosyncratic learning paths. Some may never show evidence of a particular way of thinking. Others may appear to regress in their understanding before developing higher levels of conceptual understanding. But the fact that individuals may not follow identical learning paths does not invalidate generalised pictures of increasingly sophisticated understandings of an aspect of learning. Research-based learning progressions (or 'progress variables') provide valuable frames of reference for thinking about student learning and for establishing where individuals are at any given time in their progress towards deeper understandings. (pp. 20-21)

Learning competence develops incrementally over time and not as a series of discrete steps between levels. However, an empirically derived continuum view of learning progress, discretely segmented and identified with a numerical scale, can create a useful proficiency band for describing student skill sets, grouping for instruction and reporting progress over time (Masters, 2013). Most importantly, descriptions of each level are derived empirically and therefore are based on analysis of actual student performance and not on a lone educator's beliefs about how learning might progress.

Glaser (1963) identified the desirability of a shift to criterion-referenced testing to enable performance reporting in absolute terms of what an individual can and cannot demonstrate, stating:

> … the specific behaviors implied at each level of proficiency can be identified and used to describe the specific tasks a student must be capable of performing before he achieves one of these knowledge levels … Measures which assess student achievement in terms of a criterion standard thus provide information as to the degree of competence attained by a particular student which is independent of reference to the performance of others. (pp. 519-520)

As such, these research-based snapshots of increased competency can be utilised as a basis for identifying where students are in relation to their learning and also as a monitor for the progress of individuals and cohorts. Utilised as a proficiency scale, this approach can also be used to set targets for students learning or identify a required level of proficiency for different purposes (Pellegrino et al., 2001). The assessment triangle

heuristic reflects the nature of assessment but requires further elaboration in order to construct assessment measures. A number of researchers have developed approaches to constructing evidentiary based educational assessments. These include but are not limited to education centred assessment design (Mislevy, Steinberg & Almond., 2002a; 2002b; Mislevy et al, 2003), Masters & Forster's (1996) assessment resource kit and Wilson's (2005) four building blocks approach.

Wilson's (2005) construct modelling approach provides comprehensive guidance in relation to the instrument design process. The processes required for the development of the assessment provide flexibility with regard to the identified context of the assessment and emphasise an iterative process rather than a rigid sequence for development.

4.3 'FOUR BUILDING BLOCKS' APPROACH

Wilson's (2005) 'four building blocks approach' to assessment development incorporates four key design foundations; construct map, item design, outcome space and measurement model. The design approach is outlined in the following subsections and readily aligned with the assessment triangle model (Pellegrino et al, 2001) as can be seen in Figure 4.2.

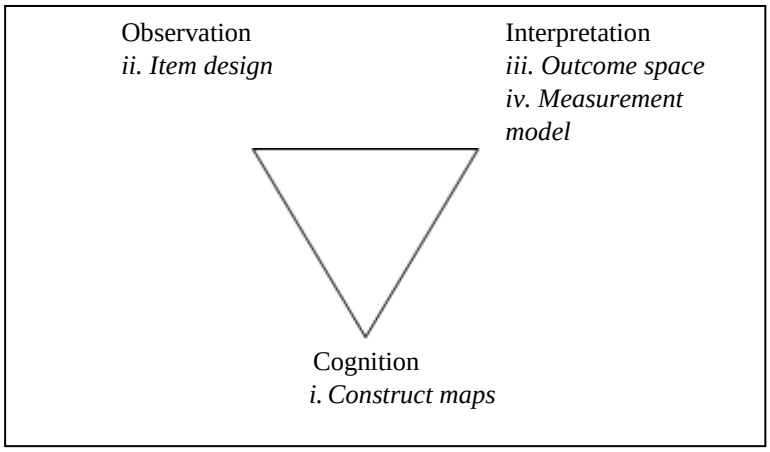


Figure 4-2: Assessment building blocks, reproduced from National Research Council (2006).

4.3.1 Construct map

Clear articulation of the construct that is to be measured is the priority at this stage of the design process. While a targeted construct may be broad or quite specific it is essential that it is defined in a manner that has the capacity to capture important aspects that are

reflective of the learning theory selected and the manner in which students develop competence in a domain (NRC, 2001).

4.3.2 Item design

Articulating a theory of learning early in the design process ensures that the assessment remains centred on measuring what is most valued. This has a significant impact on the developmental descriptors identified as an end product. In addition, the identified learning theories contextualise observations of the targeted construct, which can be seen in the observable shifts of behaviours as students develop in proficiency. It is important to ensure that test developers are able to draw on a deep understanding of how students learn in order to contribute rich conceptual knowledge of the construct to provide evidence of claims (Hendrickson, Ewing & Kaliski, 2013).

Item design requires the test developer to identify real world situations in which the theoretical construct might be manifested. Many approaches to test design imply unidirectional activity that commences with identifying the construct before proceeding to designing items and other subsequent actions. However, Wilson suggested that in the early stages of development, items and construct are likely to share an intuitive rather than explicit relationship that is likely to refine as it is further explored. Therefore, planning for an iterative process is likely to result in the most developed outcomes (Wilson, 2009).

4.3.3 Defining the outcome space based on results analysis

In order to make inferences based on item responses, test developers must select those aspects of the construct that will be the focus. While in some assessments responses might be assigned fixed scores, at this point in the framework development process it is the respondent's responses to items that will distinguish between easy and hard items and whether they are reflective of the construct targeted. Outcomes will then be defined into ordered categories that are reflective of an underlying continuum reflective of the latent trait being measured.

Rather than an overall score, students' current learning can be aligned with a developmental description or standard of the learning dimension. In the early stages of development this will be reflective of limited knowledge, increasing through stages to greater possession of a skill or trait. In order that learning progressions have validity they should be informed by research about learning development over time, reflect essential

knowledge and skills identified by subject matter experts and be informative in relation to assessment and instruction (Hess, 2008).

4.3.4 Measurement model

A psychometric model allows the developer to further relate the scored inferences to the construct. The interpretation element of the assessment triangle model reflects how observations arising from the assessment tasks provide evidence of the knowledge being tested (Pellegrino et al, 2001). It is central to this process that the assessment has at its basis an articulated theory of student learning and a clear understanding of the competencies students are likely to demonstrate as they progress within a learning domain. The measurement model informs the translation of item responses to location on the construct map. Both classical test theory (CTT) and item response theory (IRT) were used in the research model.

4.4 CHAPTER SUMMARY

This chapter outlines a framework for designing and validating a construct centred approach to assessment. It highlights the role of an evidentiary base linking learning theory to measurement models and provided an overview of the design approach used in the research study. The following chapter outlines the application of the design principles outlined in this chapter and the iterative development of the construct framework and research instrument for learners with ASD.

5. INSTRUMENT DEVELOPMENT

The purpose underpinning the current research was to develop an instrument, within the domains of communication and literacy that would reflect the underlying continuum of learning that occurs in the development of young learners with ASD. For educators, this assessment tool would provide opportunities to focus their observations in order to identify students' communication and literacy skills, enabling teachers to appropriately target interventions to progress student learning, measure progress over time, and monitor the effectiveness of teaching interventions in relation to the learning framework identified. This chapter outlines the development of the construct map and items for this study consistent with the first two stages of Wilson's (2005) 'four building blocks approach' to assessment design.

5.1. CONSTRUCT MODELLING FRAMEWORK

The construct map played a key role in the development of the assessment as it served as the framework for the conceptual and research-based ordering of qualitatively increasing levels of performance linked to the specified construct. The diagram in Figure 5.1 outlines the structure of the construct framework. At the top of the diagram, the domain (construct) being measured was further defined by subdomains: communication-functions, communication-vocabulary, reading and writing. Subdomains were further developed with strand content consistent with the range of key capabilities reflected in the research literature. Items developed for the observational assessment are identified as indicators in the framework outline below.

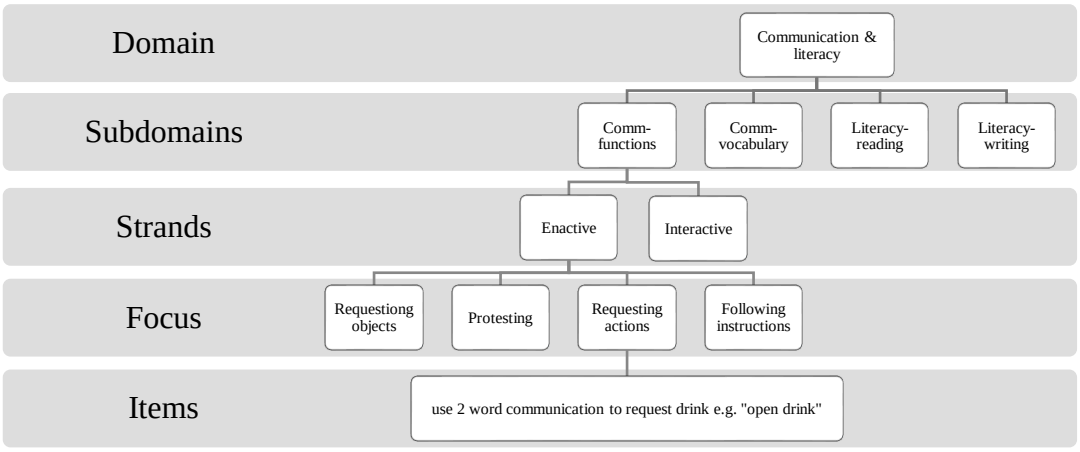


Figure 5-1: The construct framework

The framework defining communication and literacy for learners with ASD was developed through wide reference to a range of theoretical research within the domains of communication and literacy, for both typically developing and autistic children.

5.2. DEVELOPMENT OF THE CONSTRUCT FRAMEWORK AND DEFINITIONS

The literature review undertaken focussed on informing the construct, identifying developmental pathways and potential competencies that might be utilised to inform assessment items. Construct maps for the domains and subdomains within communication and literacy, were created to reflect the range of knowledge and skills required for students with ASD to participate actively and function optimally in a range of learning domains.

The approach utilised during the development of the domain map, construct scales and subsequent calibration of items combined both theoretical and psychometric approaches. The theoretical approach was utilised in the development of the construct and appropriate items for each subdomain. The psychometric approach was addressed in detail in the chapter 3.

The following sections detail the early theoretical framework developed to underpin the draft instrument. Further refinements were later made to the framework as part of the iterative process of instrument design, development and results analysis which contributed to the framework underpinning the final version. Strong consistencies exist between the initial and final frameworks as can be seen in Table 5.4 and explored in section 5.5 of this chapter.

5.3. DEFINING AND MAPPING COMMUNICATION AND LITERACY MODES

In developing the construct framework, communication and literacy were further separated into subdomains. This was seen as a logical reference to the manner in which each aspect of the construct was expressed. As the framework was intended for teacher use, it was important that it enabled teachers to plan for future content learning for their students with ASD within these clearly articulated modes.

5.3.1. Establishing the mode of communication

The definition of communication was articulated as the act of affecting another in such a way that a receiving communicative partner is able to infer the intent of the initiator and was inclusive of both verbal and augmentative forms. The framework design (Table 5.1) supported the development of a range of indicators for students who were pre-intentional through to those who possessed relatively intact communication skills. This ensured the instrument was both relevant and inclusive of students with ASD utilising a range of augmentative and verbal expressive modes.

Table 5-1 Communication mode- organised by strand and focus

Mode - Communication	
Strand	Focus
Functions	Requesting objects
-enactive	Protesting
This strand encompasses communication functions pertaining to regulating the behaviour of others.	Requesting assistance/actions
	Following Instructions
-interactive	Gaining attention
This strand relates to the interactive and transactional elements of communication.	Greetings
	Answering questions
	Asking questions
	Commenting
	Conversation
Strand	Focus
Vocabulary	Attributes - size, general, colour
Foci within this strand encapsulate a range of simple vocabulary utilised by learners moving from concrete to more abstract forms of language.	Concepts - spatial, sequencing, time
	Quantity concepts - numeric, relative
	Pronouns
	Affirmation/negation
	Plurals
	Verb use

5.3.2. Establishing the mode of reading

Reading was defined as the process of inferring shared meaning from symbols and words. As identified in the literature review reading and writing were broadly explored to be inclusive of the continuum of learners with ASD and encompassing of a range of emergent literacy behaviours.

Table 5-2: Reading mode- organised by strand and focus

Mode - Reading	
Strand	Focus
Text level knowledge	Attending to texts
Foci within this strand explore engagement with texts and the development of reading behaviours.	Engaging with texts
	Book knowledge
	Reading behaviours

Strand	Focus
Text comprehension *This strand relates to the recognition of symbols and words as representations of vocabulary concepts and structures.*	Reading picture texts
	Early text recognition
	Understanding word meanings
	Comprehending simple texts
Strand	Focus
Reflecting on reading *This strand relates to the development of metacognition in relation to reading texts*	Interacting with texts
	Understanding text types
	Reflecting on texts
	Reading fluency
Strand	Focus
Alphabetic & phonological knowledge *Foci within this strand encapsulate alphabetic knowledge, early phonemic understandings and the development of phonological knowledge.*	Letter recognition
	Letter knowledge
	Phonemic awareness
	Phonological knowledge

5.3.3. Establishing the mode of writing

Writing was defined as the process of conveying shared meaning via symbols, images and words (Table 5.3).

Table 5-3: Writing mode– organised by strand and focus

Mode-Writing	
Strand	Focus
Communicating ideas *This strand identifies the development of indicators that demonstrate that drawing and writing can be utilised to express ideas that share meaning between people.*	Assign meaning to texts
	Communicate ideas
Strand	Focus
Conventions of writing *Foci within this strand reflect writing conventions utilised by learners moving from early to more developed forms*	Writing conventions
	Plan writing
Strand	Focus
Conventions of spelling *Foci within this strand reflect spelling conventions evident in early stages of spelling development*	Understand spelling conventions
Strand	Focus
Writing strategy *This strand identifies indicators of progress in relation to fine motor skills, writing tool use and the development of planning and refining use of writing symbols.*	Early motor planning
	Develop control and grip
	Letter formation
	Develop mouse and keyboard skills

5.4. REFINEMENT OF THE CONSTRUCT FRAMEWORK

The framework structure for each domain is comprised of modes, strands, foci and indicators. Strand and focus elements highlight the theoretical capabilities identified through the literature review and researcher's development of the instrument. Indicators are presented as behavioural observations from which an individual's capability might be inferred. These indicators articulate a range of actions that a student might engage in, that

enable inferences of competence to be made by an observer and are inclusive of performance criteria.

The indicators were developed by the researcher and reviewed by subject matter experts in the draft assessment instrument. Feedback and reflection throughout the development, testing and analysis of the draft instrument was ongoing and led to refinements in the framework structure for each mode of the instrument. Wilson (2005) identified the iterative nature of construct development.

> The relationship between the items and the construct is not necessarily one way as it has just been described. Often the items will be thought of first and the construct will be elucidated only later - this is simply an example of how complex a creative act such as instrument construction can be. The important thing is that the construct and items should be distinguished and that eventually the items are seen as realisations of the construct. (p.10)

Tables 5.4, 5.5, 5.6 and 5.7 provide a comparison of the construct frameworks at the final and early iteration stages of the development process for each mode of the instrument.

Table 5-4: Comparison of communication-functions focus areas after iterative review

Final iteration			***Early iteration***	
Mode: Communication-functions			**Mode:** Communication-functions	
Strand	**Focus**		**Strand**	**Focus**
Enactive functions	Requesting objects Requesting assistance/actions Protest		Understanding and using language	Understanding names and pronouns Requesting objects Requesting assistance/actions Affirmation/negation Following Instructions Answering questions Asking questions
Interactive functions	Following instructions Joint attention Gaining attention Greetings Answering questions Asking questions		Engagement with others and the environment	Gaining attention Greetings Attending skills - task orientation Attending skills- group work Commenting Conversation

Table 5-5: Comparison of communication-vocabulary focus areas after iterative review

Final iteration			***Early iteration***	
Mode: Communication-vocabulary			**Mode:** Communication-vocabulary	
Strand	**Focus**		**Strand**	**Focus**
Vocabulary	Attributes - general size, colour Concepts - spatial, sequencing, time Quantity concepts - numeric, relative Pronouns Negation/Affirmation Plurals Verb use		Vocabulary	Attributes - size Size attributes - long/tall/short General attributes Colour attributes Spatial concepts Quantity concepts - numeric Quantity concepts - relative Sequencing concepts Time concepts Plurals

Table 5-6: Comparison of literacy-reading focus areas after iterative review

Final iteration			***Early iteration***	
Mode: *Reading*			***Mode:*** *Reading*	
Strand	**Focus**		**Strand**	**Focus**
Text knowledge	Attending to texts Engaging with texts Book knowledge		*Text level knowledge*	Interact with texts Attend to texts Book knowledge Reading behaviours Reading fluency Reading picture texts Logo and early text recognition
Text comprehension	Early text recognition Reading picture texts Understanding word meanings Comprehending simple texts		*Word level knowledge*	Understand word meanings Read simple texts
Reflecting on reading	Reading behaviours Interacting with texts Reflecting on texts		*Self-management and direction*	Self-management and engagement Respond to texts Understand text types
Alphabetic & phonological knowledge	Letter knowledge Phonemic awareness Phonological knowledge		*Letter & name knowledge*	Letter recognition Develop letter knowledge and understandings
			Phonological knowledge	Phonological knowledge

Table 5-7: Comparison of literacy-writing focus areas after iterative review

Final iteration			***Early iteration***	
Mode: *Writing*			***Mode:*** *Writing*	
Strand	**Focus**		***Strand***	**Focus**
Communicating ideas	Assign meaning to texts Communicate ideas		*Communicating ideas*	Developing expression of Ideas Assign meaning to picture texts Assign meaning to written texts Communicate ideas
Conventions of writing	Writing conventions Plan writing		*Conventions of writing*	Understand letter forms Understand writing conventions
Conventions of spelling	Understand spelling conventions		*Writing strategy*	Fine motor and planning Developing control and planning Utilise control and planning Developing mouse and keyboard skills
Writing strategy	Early motor planning Develop control and grip Letter formation Mouse and keyboard skills		*Conventions of spelling*	Understand spelling conventions Letter and sound understandings

A review of the content demonstrates the types of adjustments that were made to the communication construct framework during the iterative development process. The final iteration outline reveals a compact framework with clearer links to the research base underpinning the focus areas and item selection. Some focus areas in the vocabulary strand were conflated and focus areas realigned with the identified strands. Indicators were also edited, expanded, relocated and deleted as an outcome of multiple reviews both pre and post IRT results analysis.

5.5. INSTRUMENT DEVELOPMENT

This section provides an overview of the development of the instrument used within the study. The process of developing instruments involves the construction of an item bank that is reflective of the construct being measured. Item banks for the most part contain a multitude of items all specifically selected to target the latent trait being measured. Wilson (2005) stated:

> Every new instrument (or even the redevelopment or adaptation of an old instrument) must start with an idea - the kernel of the instrument, the "what" of "what does it measure?", and the "how" of "how will the measure be used?" when this is first being considered, it makes a great deal of sense to look broadly to establish a dense background of content and uses of the instrument. (p. 19)

5.5.1. The 'kernel of the instrument'

The initial impetus for this research project related to the researcher's intent to validate an existing, locally developed item bank for young learners with ASD. In 2006-2007, a team of six teachers and two assistant principals (led by the researcher) engaged in a collaborative action learning project to develop a school-based curriculum goal bank and assessment tools for students with ASD. The action research cycle employed resulted in the development of goal banks across the domains of English-speaking and listening (verbal and augmentative strands), reading, writing, interpersonal development and personal learning, health and physical education, mathematics, the arts and play.

The researcher and colleagues in the project worked collaboratively to develop learning rubrics, incorporating a review of theoretical literature and developmental progressions to establish a domain map and develop behavioural indicators encompassing increasing levels of proficiency. In panelling activities, these subject matter experts utilised paired comparison processes to determine skill progressions. This involved individuals and small groups looking at sets of behavioural indicators to estimate and rank their relative performance complexity.

The resulting rubric content was organised vertically into six progress levels that required students to demonstrate greater knowledge and skill at each successive level that would enable measurement of learning growth over time. The horizontal organisation of the rubric identified the breadth of each domain and was inclusive of content knowledge and skills.

Given the researcher's involvement in the development of these item banks, this was initially identified as a logical source of potential indicators for the research instrument. However, to ensure the validity of inferences drawn from test items, it is essential to first engage in a development process that closely links the latent trait, items and causality (Wilson, 2005).

The test design process developed by Wilson (2005) for this purpose is outlined earlier in this chapter. As a result of the application of this process, the researcher's initial intent to validate an existing item bank was dismissed. The majority of items in the research instruments are novel, some original goal bank items were redeveloped and a substantial number omitted, so that items reflected the theoretical identification of the constructs. In the interests of transparency and acknowledgment, Table 5.8 show some examples of items that were completely or substantially duplicated from the original item bank previously discussed, as well as examples of similar items. A full comparison of original and novel items is included in Appendix B.

Table 5-8: Comparison of research instrument and goal bank items

	Instrument item	***Original goal bank item***
The item is completely or substantially duplicated from the item bank	Use a single word communication to request familiar objects/activities in the classroom	Request a motivating object or activity using a single word
	Use 2 word communication to request objects/activities	Use 2 words to request objects/activities
	Use 3 word communication to request action e.g. zip my coat	Use 3 words to request an action
	Look briefly at play object when adult is engaged in shared play activity with him/her.	Look at object that an adult is playing with when adult is engaged in shared play activity with him/her.
The item is similar to another in the item bank	Help turn pages of book story when sharing with an adult	Turn pages of photo book with teacher assistance
	Link some visual aids to objects and people e.g. photo represents a familiar person	Request a motivating object using a symbolic representation (e.g. photo or pictograph),
	Point to individual words in text moving left to right	Read from left to right with return sweep, and from top to bottom
	Read 10-25 noun labels linked to known items	Reads an increasing range of functional nouns, e.g. clothes, body parts, food, utensils, classroom material.

In addition, a significant number of indicators were drawn from VCAA and Victorian Education Department resources for learners for whom English was an Additional Language (EAL) (VCAA, 2009: DEECD, 2007). These resources were selected in

preference to generic curriculum guidance as expectations of and strategies to support students with EAL identify the importance of contextualised language, supported by objects and visual materials to enable concepts to be linked with vocabulary (Clarke, 2006). These more targeted resources also highlighted the importance of understanding and using language in social and structured context and was reflective of typical phases of development for ESL learners (Clarke, 2009: Tabor, 1997).

These teaching resources included developmental continuums reflected typical progressions for EAL learners in speaking and listening, reading and writing. Items included behavioural indicators related to communication and literacy that could be observed and used to infer competency of learners with ASD, moving from less to more developed understanding in communication and literacy. As such they were deemed to provide a well conceptualised resource from which to draw items for inclusion in the communication and literacy instruments. The indicators that were selected for inclusion in the research instrument are detailed in Appendix C.

5.5.2. Development of instrument indicators

Rubrics were used in the development of items to ensure that both vertical and horizontal structures of the construct were articulated. Vertically, the structure of the rubric reflected the nature of increasing proficiency, typical developmental sequences and behavioural indicators reflecting varying levels of expertise. Horizontally, rubrics reflected aspects of the construct that came together to form the domain and were encompassing of content knowledge and skills.

Curriculum development based on models with a horizontal structure have been described as “little more than a catalogue of desirable outcomes” (Wilson, 2009 p.6). Whereas, the inclusion of vertical structures demonstrates an investment in developmental learning over time, involving deeper understanding of content.

Indicators were developed to reflect the range of capability that might be expected across a continuum of ability for students with ASD. This ranged from behaviours that are typically seen amongst students with a profound impairment, to those of students who demonstrate high levels of capability and minimal impairment. The researcher developed and selected indicators that were designed to provide a series of snapshots of developing proficiency that could be directly observed by teachers. The number of indicators

developed for each focus area varied. For some areas of focus this was as low as five but could range up to 27 indicators.

While high numbers of indicators potentially represent a challenge in terms of the use of all items in an assessment instrument, such a broad spread of indicators is more likely to enrich a developmental framework. It is worth noting that the construct being measured related to typical presentation of children with ASD between the ages of four and ten years. The diverse cognitive functioning of the intended sample (taking into account the potential impact of profound ID at one end of a continuum and savant skills at the other) means that the cognitive range encompasses significant breadth.

While a degree of ordering occurred during the development of indicators, this also comprised a discrete stage in the development of the scale. This process involved the researcher examining behavioural indicators to estimate and rank their relative performance complexity. Indicators were then clustered in each focus area, as identified in the evidence framework overview, relevant to the levels of performance required. These ordered clusters were further analysed in relation to the performance criteria they contained and labelled in a numerical sequence by the researcher.

Within each focus area, indicators were ranked in order of increasing task complexity, from least to most difficult. A sample of draft indicators from the writing framework can be seen in the table below.

Table 5-8: Sample draft items for writing

Strand: Conventions of spelling	
Focus: Understanding spelling conventions	*Indicators*
	1. match some simple shapes 2. match some letters and numbers 3. imitate initial word sounds modelled by a teacher 4. identify some letters and numbers named by another e.g. "give me B" 5. may mix shapes, letters and numbers when writing 6. write a few letters of the alphabet 7. copy or write some familiar letters with beginning accuracy 8. approximate use of letters for some letter–sound relationships and common words

The numbering of indicators in the table reflect the hypothesised increasing performance standard required to demonstrate competence within the designated focus area. For example, it was anticipated that the act of *1. match some simple shapes* required less

competency than *2. match some letters and numbers*, or *7. approximate use of letters for some letter–sound relationships and common words.*

It was evident that all indicators, coded as 1, would not be equivalent in their requirement for competency. Indeed, it was judged more likely that if all items, coded as 1, were referenced across all sets of indicators, this would highlight significant variation in proficiency levels. Table 5.9 shows a sample of draft communication items, with the proficiency levels required to demonstrate each indicator varying in sophistication.

Table 5-9: Draft communication-function items with diverse levels of proficiency required for items coded as 1

	Strand: Enactive
Focus: ***Protest***	*Indicators*
	1. begin to respond through 'accept' or 'reject' gestures or actions e.g. extend hand to receive, push unwanted item away 2. demonstrate an understanding through behaviour of no/not allowed to have e.g. protests 3. react when cross is placed over preference to indicate it is unavailable 4. reject an action/activity by using "no", "bye", "finish" e.g. say "bye", place item in finish box 5. use "yes/no" responses to consistently indicate likes and dislikes 6. use "I don't want…" with an appropriate tone to reject or refuse 7. use prohibiting language to control the behaviours of others e.g. "don't do that", "stop pushing me
Focus: ***Asking questions***	*Indicators*
	1. ask "what" questions 2. ask "who" questions 3. ask "where" questions 4. ask questions of another student about items in the immediate environment 5. ask questions using "why" and "how" to teacher to request an explanation. e.g. "why is there no library?" 6. ask questions of another student about items not in view 7. link questions and comments to a peer's comments rather than own interests

5.5.3. Numerical coding

No assumptions were made that the first indicator in each set of criteria, coded as 1, was equivalent to another indicator with the same numerical code. For example, *1. begin to respond through 'accept' or 'reject' gestures or actions e.g. extend hand to receive, push unwanted item away,* does not present with the same item difficulty as *1. ask "what" questions*, which also forms part of the communication-functions mode.

The system of organising sets and indicators using numeric coding is not indicative of the measured amount of proficiency required to demonstrate each indicator. The second

indicator did not demand twice the skill level required for mastery of the first indicator. Therefore, numeric codes were utilised to link indicators to descriptors rather than as an expression of the relative skill each indicator demanded.

Numerical coding was selected to assist with ease of transfer for analysis within the IRT software. It was anticipated that teachers would be unable to identify indicators as attained in some focus areas when assessing students with significant challenges. As a result, the category of *'student does not typically demonstrate this skill'* was included for each set of items and coded as '0' for input.

5.5.4. Subject matter expert (SME) workshop

In order to test the draft instrument, the researcher organised a workshop of subject matter experts to provide feedback. Hendrickson et al (2013) identify that partnerships with learning and cognition specialists alongside assessment experts have the capacity to enhance assessment tool development. Six experts with special education qualifications or significant practical experience were asked to attend. Four of these experts had significant experience in teaching students with ASD and two had considerable expertise in the development and delivery of literacy interventions. Two speech pathologists with expertise in ASD also provided feedback in relation to refining indicators for the project. While they were unable to participate in the workshop day, their feedback on the rubrics was provided in writing and in discussion with the researcher.

The first part of the workshop introduced the constructs of communication, reading and writing for learners with ASD. The group received an introduction to auditing the appropriateness of the rubrics using the rules of evidence identified by Griffin, Gillis and Calvitto (2007). Experts then sat in pairs to audit and review the ordering of clustered indicators and to review the content to ensure that they reflected key aspects of the construct being measured (i.e. content validity).

Other activities included a review of the indicators to ensure that the language used to describe behavioural indicators was clear, observable and descriptive of the performance level required. These specialists also scrutinised for gender bias, racial bias, role stereotyping, language issues, mechanics (spelling abbreviations, acronyms, punctuation, capitalisation), grammar (sentence structure, pronouns, verb forms, uses and tenses) and clarity (conciseness and consistency) of the items (i.e., to enhance the construct validity).

After working to review content in the subdomains of communication, reading and writing, each pair presented their results verbally, identifying and discussing their suggested edits to the printed rubrics of indicators they were working with. All participants engaged in discussion and debate with colleagues in relation to identified and additional indicators.

After review, the most common feedback provided by the SME group related to the use of examples. Within the instrument many indicators already included examples however, it was felt example use could be expanded to ensure that teachers using the tool had a clear notion of the types of actions or responses they might expect to observe. To a lesser degree a few examples were altered to more closely reflect the complexity level of response that was the target of the item.

In several instances wording choices for items were fine tuned to more effectively describe the action that might be observed to infer competence. Similarly, some items which incorporated multiple actions were simplified to single action observations in cases where the multiple actions might be reflective of different levels of competency, relative to the targeted focus. A sample of recommendations provided by the workshop group is included in Table 5.10

Table 5-10: Sample of workshop group recommendations

Nature of feedback	***Original indicator***	***Indicator after feedback***
Provide more examples	begin to respond through 'accept' or 'reject' gestures or actions	begin to respond through 'accept' or 'reject' gestures or actions *e.g. extend hand to receive, push unwanted item away*
	use attention gaining words such as "look" in 2-3 word sentences	use attention gaining words such as "look", "hey", in 2-3 word sentences e.g. "look, blue flower", "hey, it goes"
Change examples to clarify the complexity level of the response sought	answer questions about factual knowledge e.g. "what does mum buy at the shops?	answer questions about factual knowledge e.g. "what sound does a cow make?
Remove multiple actions which might require different levels of competency in relation to the targeted focus	respond to greeting/ farewell and question "what's your name?" when meeting an unfamiliar person	respond to greeting/ farewell when meeting an unfamiliar person
	seek out partner and make comments about missing and/or incorrect items in a familiar setting with familiar people	make comments about missing and/or incorrect items in a familiar setting with familiar people
Fine tune wording choices to more effectively describe the targeted observation	react to environmental stimulus	react to sounds in the environment
	copy the teacher reading aloud words that describe a picture	read aloud words that have been modelled by a teacher to describe a picture

Vary the hypothesised sequence of indicators &/or suggest additional items	listen and respond to familiar rhymes and stories with teacher support *then* collect a preferred text and approach an adult	listen and respond to familiar rhymes and stories with teacher support *add* sit, listen to and respond to interactive picture books *then* collect a preferred text and approach an adult

5.6. INTENDED ASSESSMENT POPULATION

As referenced in Chapter 1, the Department of Education and Training (DET), in the state of Victoria, provide funding support for learners with disabilities, through the Program for Students with Disabilities (PSD). Disability is broadly defined within legislation to be inclusive of all students with a disability, regardless of eligibility under the PSD. As a result, schools have an obligation to implement reasonable adjustment for a very broad range of students.

Within the state school system a range of options exist for learners with ASD, with deference to specific criteria. These include: mainstream school, autism specialist school, or three specialist schooling options that cater for students with disabilities; special, special developmental and specialist.

Eligibility for PSD-ASD funding support is dependent on an ASD diagnosis and evidence of significant deficits of two standard deviations in both adaptive behaviour and language skills domains (DET, 2016a). Many students with ASD also present with an intellectual disability (ID) and can be considered for eligibility to attend a specialist school under PSD-ID funding arrangements.

Students with IQ scores below 55 are eligible for entry to special developmental schools, which accommodate learners with moderate to profound IDs. Students whose IQ scores are between 55 and 70 are eligible to attend special schools, which aim to accommodate learners with a mild ID. The third option available for PSD-ID funded students is specialist schools that enrol students with IDs ranging from profound to mild, catering for the full spectrum of student ability (DET, 2016b).

The intended student population for the development of the assessment instrument in this study are students diagnosed with ASD who were deemed eligible for ASD or ID funding, as assessed by the PSD program. The targeted age range of students was between four and ten years. This age range aligned with typical early years groupings for

students used in specialist settings that routinely separate students by years of schooling into early, middle and later years' cohorts.

Given the paucity of educational assessments for students with ASD within specialist schools, it was hypothesised that there was an increased likelihood of school and teacher recruitment for this study within specialist schools, because of the high number of students with ASD enrolled and the perceived value of the proposed assessment.

In addition, teachers from specialist settings who consented to join the study were considered more likely to complete multiple assessments due to the potential of having an entire class or a large number of students with ASD in their class. They were also likely to have increased opportunities to observe their students because of smaller class sizes and higher teacher to student ratios. In comparison, teachers in mainstream schools were less likely to have multiple students with PSD-ASD funding in their classroom and would therefore be less likely to perceive the applicability of the assessment to their students.

5.7. POTENTIAL CONSTRAINTS

Teacher capacity to deliver accurate predictions of language and literacy performance based on observation of their students with disabilities has been commended by a number of researchers (Gresham, Reschly, & Carey, 1987). In order that judgements about student capability could be made by teachers, it was important that several key criteria be met in the instrument, as follows:

1. The language employed in the instrument was descriptive of behaviours that teachers might typically observe in the classroom.
2. Teachers needed to be highly familiar with the student being assessed.
3. The instrument should be concise and accessible for teachers to utilise whilst providing enough detail that teachers could identify a range of proficiency amongst their students.
4. Any constraints related to the delivery medium (in this case as a document only) and the amount of time expended to complete the instrument, should be reviewed to evaluate the instrument's validity for real-world application for continued use in schools (Wolfe & Smith, 2006b).

5.7.1. Teacher constraints

Given the decision to rely on teacher observations of students, rather than direct test administration to students, it was necessary to consider potential constraints that might impact on teachers during the collection process. These were identified as the time required to observe and record responses, familiarity with students being assessed and the capacity to understand and utilise the assessment tools.

In order to address these constraints, consideration was given to the timing of the assessment period so that it did not conflict with busy accountability periods for teachers, such as reporting and assessment periods. The beginning of the school year was also avoided, as a period in which teachers were unlikely to have developed familiarity with their students.

5.7.2. Accessibility constraints

In relation to the assessment tool, care was taken to ensure that plain language was used, to ensure easy interpretation by teachers, regardless of their degree of expertise or specialist knowledge of the domains of communication and literacy for learners with ASD.

As already indicated, it was also decided to target teachers within specialist settings exclusively, as they were more likely to demonstrate expertise in observing and assessing students with ASD, and would have greater opportunities to do so than their colleagues in mainstream schools because of smaller class sizes.

5.7.3. Student constraints

A broad range of approaches exist to assess student development, including tests of performance, multiple choice tests, essay writing, self-assessment and observation. These and other forms of assessment can be used to gather information related to student competence. For the cohort of students to which this assessment is addressed, tasks relying on validation techniques, such as protocol analysis or analysis of reasons would typically provide limited feedback. Students with ASD, at early stages in their communication and literacy skills development, would be unlikely to respond to cues to think aloud, or be able to provide a rationale for their responses given their challenges with language and metacognition.

Additionally, 30% of individuals with ASD are considered nonverbal and this percentage tends to be higher in young children (Rose et al., 2016; Iacono et al., 2016). As a result,

items need to be carefully written to ensure that they are inclusive of students who may utilise AAC to augment their communication.

It is evident that some methods provide a better match than others, given the construct being measured and the presentation of the individual learner. It is therefore important to consider likely constraints on students and teachers, so that they might be addressed during the planning and development of the instrument to maximise its accessibility. Pellegrino et al. (2001) suggested that:

> Traditional testing presents abstract situations, removed from the actual contexts in which people typically use the knowledge being tested. From a situative perspective, there is no reason to expect that people's performance in the abstract testing situation adequately reflects how well they would participate in organised, cumulative activities that may hold greater meaning for them. (p. 64)

Many young children with ASD would be challenged by tasks that require them to articulate their knowledge in unfamiliar contexts and test conditions as learners with disabilities possess well documented difficulties in generalising understandings and applying acquired knowledge in novel situations (Westling & Fox, 2004; Kleinert et al., 2009).

However, the inclusion of a broad developmental range of performance tasks that can be observed by a familiar teacher ensure that inferences about student knowledge and learning can be made. It was therefore determined that assessment tasks for this student cohort should be based on teacher knowledge and observation of students engaging in simple authentic actions within a familiar educational environment. These tasks, increasing in demand in small increments, would enable the greatest scope for the measurement of progress, if effectively captured and utilised within the assessment.

5.8. CHAPTER SUMMARY

This chapter outlined the approach utilised in the development of the construct framework and subsequent instrument development. It highlighted the iterative nature of the development process and how expert feedback, ongoing researcher review and reflection informed the refinement of the construct framework and subsequent instrument. Chapter 6 provides an overview of participant recruitment and collection of the data, in addition to the process of calibration for the draft instrument.

6. DATA COLLECTION AND ANALYSIS

This chapter reports on the recruitment process for teachers invited, who chose to participate in the study, and the demographic profiles of the school, teachers and students. It details the process employed for data collection, reports the data analysis undertaken and the calibration of indicators within each subdomain of the draft assessment instrument.

6.1. THE SAMPLING FRAMEWORK

A sample of schools were selected to provide a representative mixture of age, gender, experience in conducting assessment and access to locations for conducting assessments. The target population were defined as teachers working with children with ASD in Victorian special, specialist, special developmental and autism specific schools. Research participants were invited from schools that employed teachers working in special education settings with students with a diagnosis of ASD between 4 and 10 years of age. .

6.2. DATA COLLECTION PROCEDURE

6.2.1. Schools

Permission to undertake research in a Victorian government school was sought and granted by DEECD (later known as DET) and letters of invitation (Appendix D) sent to principals of specialist and autism specific schools in Western and Northern Metropolitan Regions of Victoria, providing information about the study and inviting an expression of interest (Appendix E). Two school principals emailed the researcher to express interest in the project and were contacted by phone. They were provided further details about the project and how teachers might participate. Of these schools, only one that specialised exclusively in enrolments for students with ASD indicated willingness for their staff to be further informed about the research. A time was identified for an information session for teachers and information packages given to prospective participants who elected to participate in the project.

6.2.2. Teachers

The collection of data from the instrument provided to participants necessitated teachers working their way through the draft instrument whilst considering the proficiency of a student. Participants were asked to provide demographic information in relation to their

gender, number of years of teaching experience, years of experience teaching children with ASD, possession of special education qualifications and access to ongoing professional development teaching students with ASD. In relation to the student/s selected as the focus of their observation teachers were asked to provide demographic information relating to: gender, age, years of schooling and possession of learning or medical needs that may have been additional to a diagnosis of ASD.

6.2.3. Students

Students were between four and ten years of age. Student confidentiality was protected because only the teacher who selected students for observation knew who they had considered. This information was not recorded or submitted for research purposes.

6.3. INSTRUMENT ADMINISTRATION

The following materials were provided to each participant:

- Four copies of the draft instrument (Appendix F)
- A plain language statement for participants explaining the study (Appendix G)
- Consent forms for the school and participants explaining the voluntary nature of participation (Appendix H and Appendix I)
- A self-addressed prepaid envelope for return of the consent form and instruments to the researcher.

The instrument developed for this study aimed to provide an avenue for the coherent organisation of teacher's existing observations of students. This approach was deemed the most pragmatic, as many of the students to whom the instrument content was directed presented with a disability that was likely to compromise their capacity to engage in standardised testing that might create a disruption to familiar learning contexts.

Behavioural indicators were presented in the instrument as a series of ordered statements however, it was made explicit in the instructions that the ordering of indicators might not be representative of all students. As stated in the preamble of the instrument:

> There are no right or wrong responses. Items tend to be presented in order of increasing difficulty within each section but a student may demonstrate some skills at a higher level and others at a lower level within the same area. (Appendix F)

Teachers completing the assessment were asked to tick a box to nominate skills that they felt their student/s could typically demonstrate. In cases where teachers elected to

complete multiple assessments, they were encouraged to include students whose skills represented a broad continuum of abilities and challenges. It was anticipated that this approach would enhance the probability that the students chosen would be representative of a broad range of capabilities and learner abilities in relation to communication and literacy measures.

6.4. TRIAL OF THE DRAFT INSTRUMENT

Prior to the administration of the draft instrument, a small trial was conducted. Eleven teachers of the defined target population completed three to four instruments each, providing a total of 35 completed instruments. All teachers worked at the same school from which subsequent participants were drawn. The aim of the trial was to provide an opportunity for initial analysis of the instrument, and to identify whether any items included should be eliminated prior to its use with the larger sample group. Based on the initial analysis it was decided to retain all the items in the draft instrument. As no change was made to the draft instrument after the trial these 35 responses were also included in the subsequent analysis of the instrument.

6.5. PARTICIPANT DEMOGRAPHICS FOR DRAFT INSTRUMENT CALIBRATION

6.5.1. Teachers

Sixty-one teachers took part in the study. Of these, 35.42 % filled out surveys reflecting their observations of three students and 64.58% returned surveys related to one or two students. Demographic information indicates a range of teaching experience from one year to 15+ years, with an average of 6.29 years' experience for all teacher participants completing the instrument.

Special education qualifications were held by 46% of the teaching staff and in response to questions about access to professional learning, 100% of teachers identified they had access to specialist training.

6.5.2. Schools

Of the 264 instruments distributed, 96 responses were received. The total number of instruments included in the analysis was 131, including the addition of 35 instruments completed as part of the aforementioned trial. Invitations to participate were extended to

ten schools. One school, focussed exclusively on the education of students with ASD, elected to participate in the study.

6.5.3. Students

The distribution of students across ages five to ten, can be seen below in Figure 6.1. The average age of students observed was 6.5 years.

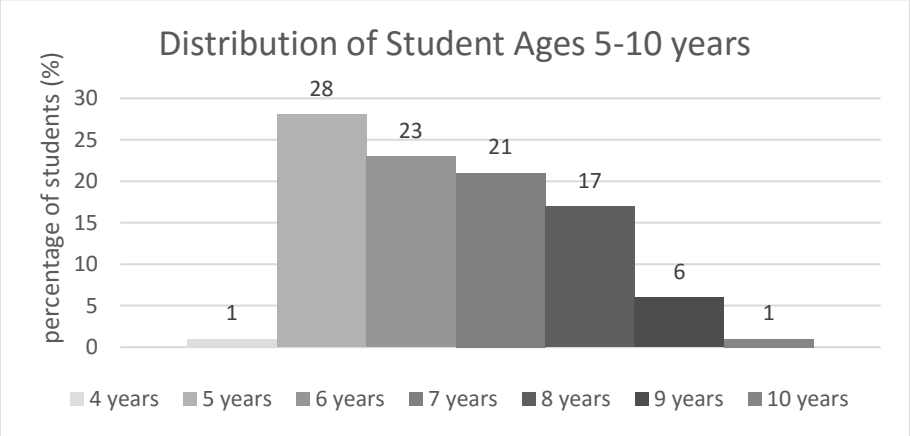


Figure 6-1: Distribution of student ages

The ratio of male to female students included in teacher observations was 3:1. While it was anticipated that there would be a higher proportion of males, consistent with distributed incidence of ASD in male subjects (Australian Bureau of Statistics, 2015), it was surprising that the sample yielded that particular male: female ratio. Based on queries made of the school, it became evident that the student distribution at the time roughly equated to a 7:1 male to female ratio. It would appear that teachers had applied some bias to selecting students in order to equalise the representation of both genders.

6.6. DATA ANALYSIS

As detailed in Chapter 5, indicators drafted for the instrument were representative of a range of observable behaviours, 1in relation to students' engagement in learning within the domains of communication, reading and writing. The selected indicators were representative of a continuum of ability, encompassing student behaviours reflective of minimal skill, up to and including observable actions that were indicative of high ability.

6.6.1. Item scoring

As the draft instrument contained approximately 600 indicators care had been taken to minimise teacher's administration time. Teachers were only expected to tick indicators if the student typically demonstrated a skill when presented with a task that required its performance. The absence of a tick against an indicator would be interpreted as evidence that the student did not demonstrate that indicator in a focus area.

Teachers' responses for items were scored dichotomously. Indicators attained received a score of 1 and indicators not yet attained were scored as 0. Responses to the indicators were coded as '1' present, where a tick had been entered, '0', not present, to reflect a student's performance in relation to individual items, or '3' to represent missing responses.

Data was then analysed utilising a simple logistic item response model, used exclusively for dichotomous items to assess their functioning against the underlying construct of communication and literacy for students with ASD. As this was a small-scale survey, data was prepared using MS Excel to capture the raw data. Files were further prepared using SPSS software for development and export to data file format for use within ConQuest. The data was analysed using an IRT model for dichotomous scoring in order to calibrate individual items against the constructs of communication, reading and writing.

6.6.2. Initial review of present and missed responses

The initial review revealed extremely low levels of missed responses. A breakdown of missed responses for each mode and domain can be seen in Table 6.1. Within the domain of communication-functions, the 0.04 percentage of missing data reflected single instances of missed responses in the focus areas of understanding name, following instructions and greetings, and within communication-vocabulary there was no missing data. Within the domain of reading, the 0.02 percent data identified as absent related to single missed responses within the focus areas of fine motor and planning, understanding spelling and developing expression. Similarly, within the domain of writing the 0.02 percent missed responses reflected missed responses within the focus areas of logo and early text recognition

Table 6-1: Percentage of missing data

Mode	*Percentage of missing data*
Communication	
Functions	0.04%
Vocabulary	0.00%
Literacy	
Reading	0.02%
Writing	0.02%

This could indicate that the instrument was reflective of the range of abilities students demonstrated and that the selected indicators were well matched to behaviours observable by teachers. However, during the data entry process, a number of potential anomalies in anticipated scoring patterns were noted by the researcher and on further review of the raw data the following hypothesis was developed.

Some teacher's responses showed unexpected relationships between indicators selected as not acquired and student ability. These teachers appeared to bypass low ability items on the instrument, instead targeting mid-zone ability items as the point at which they began their assessment. This occurred in cases where the student being assessed had moved beyond early indicators of progress within that strand area.

It appeared that these teachers commenced their marking of indicators as achieved from the point at which the student was currently operating and did not mark as achieved lower ability skills preceding these indicators. To illustrate this, Table 6.2 shows a sample of how a teacher marked items within the strand of commenting.

Table 6-2: Sample of teacher marking within the draft communication-functions instrument

	Commenting	
1.	show an object/photo to a small class group and make a comment with teacher support	
2.	contribute to small group discussions by using some key words in response to cues provided by the teacher e.g. "I see...."	
3.	make simple comments during familiar activities, e.g. 'look, red car"	
4.	show an item to a small class group and make a simple comment e.g. "my book"	
5.	make 1-2 related comments within an activity e.g. "car is going", "fast red car"	
6.	comment on immediate concrete item/activity produced in class in a structured small group situation using a complete sentence e.g. "I like Pokémon cards"	√
7.	show an item to a small class group and makes 2 – 3 comments.	√
8.	describe a 3 -4 step procedure with visual support, step by step	√
9.	describe a series of events or actions	

Items 1-5 and 9 were not marked, items 6-8 were marked as achieved. A review of items in this strand of the communication instrument shows that indicators had been ordered in

accordance with a hypothetical sequence, from less to more difficult. A comparison of early missed responses (items 1-5) in this sequence to latter items (items 6-9) would indicate that a student would be highly likely to demonstrate some, many or all of the prior listed indicators if they were able to demonstrate mastery of the more sophisticated behavioural indicators (items 6-8) that had been selected. An assumption was made by the researcher that for the most part students of high ability would be likely to score 1s for easier items with scores of 1 and 0 for moderate to high ability items dependant on the students' relative strengths.

As a result of this unexpected observation and subsequent hypothesis, a further coding of responses took place so that instruments that appeared to commence marking of items in a mid-zone of student ability were re-scored. As part of the data analysis process utilising ConQuest IRT software (Adams & Wu, 2008), the missed responses were coded with an alternate numeral as '3' to identify them as missing data. This was instead of the items receiving a score of '0', which would indicate that the student was typically unable to demonstrate the skill. This solution was applied as it was not possible to know exactly why the response had been missed or that the missed response was equivalent to '0'.

This decision was further supported by analysis of the items. Table 6.3 shows excerpts from a communication file where items are ranked relative to the number of analysed responses (low to high). By referencing the total number of respondents against the difficulty estimate of the item, it is evident that the items that attracted the lowest response rates were all below mean, ranging from -4.12 to -1.31. Items from the mid-range (3.92 to -1.30) of respondents were less impacted by the reduction in respondents, whilst items shown in the higher response range were linked to higher ability items (1.943 to 5.04). To illustrate this the sample of results presented in the table 6.3 supports the researcher's hypothesis that less difficult items had been excluded by some participants, who commenced their assessment at the student's perceived level of ability, bypassing 'easier' items.

Table 6-3: Comparison of relationship between difficulty estimates and missed items

Relative ranking based on missed responses	Item label	Difficulty estimate	Total of respondents	Missed items	
1	CL3_1	-4.12	110/131	21	Highest number of missed responses
2	CL3_2	-3.99	110	21	
3	CL3_3	-3.29	110	21	
4	CL3_4	-1.86	110	21	

5	CL3_5	-1.31	110	21	
66	CL7_3	2.59	123/131	8	Moderate number of missed responses
67	CE6_8	1.13	123	8	
68	CE6_9	0.96	123	8	
69	CL5_4	-2.23	124	7	
71	CL5_7	-1.30	124	7	
152	CL2_15	5.04	130/131	1	Lowest number of missed respondents
153	CL4_12	1.78	130	1	
154	CL5_14	4.17	130	1	
155	CE2_14	3.81	130	1	
156	CE1_12	3.92	131	1	

6.6.3. Analysis of missed responses across all domains after recoding

Each instrument was checked to identify any missing responses to items that might be indicative that they were unclear or confusing for teachers. It is worth noting that the majority of missing items were the result of recoding, based on the researcher's hypothesis (discussed above) that a proportion of participants had skipped low ability items and commenced marking items for higher functioning students in a mid-zone of item difficulty. Therefore, the conservative approach of identifying responses as missed was applied.

Table 6.4 shows the frequency, as percentages, of teachers' missed responses in each strand of the instrument and the estimate range of item difficulty within each focus area of the communication modes. In this analysis 6.16% of the overall data for communication-functions and 3.63% of the data for communication-vocabulary was coded as missing after recoding.

Table 6-4: Percentage of missed responses for each focus area of the draft communication subscales

Mode	*Focus*	*Percentage of missing data*	*Estimate range*
Communication-Functions	Requesting objects	9.92%	-6.19 to 2.75
	Requesting assistance/actions	10.53%	-4.12 to 5.04
	Protest	8.51%	-5.23 to 1.78
	Following instructions	4.84%	-5.06 to 4.17
	Joint attention	6.03%	-6.55 to 3.49
	Gaining attention	2.90%	-3.92 to 5.37
	Greetings	6.34%	-4.05 to 4.65
	Commenting/giving information	5.17%	0.2 to 4.86
	Conversation	4.33%	1.51 to 3.61
	Asking questions	4.35%	0.95 to 6.25
	Answering questions	3.82%	-1.51 to 3.61
Mode	*Focus*	*Percentage of missing data*	*Estimate range*

Communication-Vocabulary	Attributes - size	4.94%	-2.49 to 3.93
	Attributes -general	3.24%	-2.73 to 4.45
	Attributes - colour	3.82%	-6.1 to 3.00
	Concepts-spatial	2.24%	-5.52 to 4.88
	Concepts-quantity- numeric	4.24%	-5.74 to 0.94
	Concepts-quantity- relative	3.44%	-2.68 to 4.88
	Concepts-sequencing	3.38%	-6.76 to 2.55
	Concepts-time	3.73%	-1.04 to 5.12
	Negation/affirmation	4.96%	-2.13 to 2.00
	Pronouns	2.47%	-2.21 to 3.20
	Plurals	7.79%	0.86 to 4.65
	Verb use	3.30%	-6.82 to 2.01

Table 6.5 shows the frequency, as percentages, of teachers' missed responses in the literacy domain reading and writing modes of the instrument. In this analysis, 5.62% of the overall data for reading and 4.41% of the overall data for writing are missing after recoding.

Table 6-5: Percentage of missed responses for each focus area of the draft literacy subscales

Mode	Focus	*Percentage of missing data*	*Estimate range*
Literacy-Reading	Attending to texts	7.43%	-5.57 to -0.23
	Engaging with texts	3.75%	-5.27 to 1.03
	Conventions of print	12.98%	-4.25 to 5.77
	Reading picture texts	5.64%	-6.72 to 2.73
	Early text recognition	4.76%	-4.12 to 2.45
	Comprehending simple texts	5.31%	0.61 to 5.49
	Interacting with texts	1.37%	-1.54 to 2.44
	Reflecting on texts	4.73%	-0.86 to 4.46
	Reading fluency	9.92%	0.44 to 5.04
	Letter knowledge	5.53%	-2.62 to 3.55
	Phonemic awareness	5.17%	-5.35 to -0.51
	Phonological knowledge	4.44%	0.01 to 5.86
Mode	Focus	*Percentage of missing data*	*Estimate range*
Literacy-Writing	Assign meaning to texts	7.20%	-2.367 to 7.438
	Communicate ideas	4.34%	-1.94 to 7.556
	Writing conventions	5.48%	-0.617 to 7.556
	Plan writing	2.00%	3.778 to 7.557
	Understand spelling conventions	4.73%	-1.34 to 7.556
	Early motor planning	6.07%	-8.15 to 0.24
	Develop control and grip	6.79%	-6.182 to -0.84
	Letter formation	4.63%	-4.672 to 5.948
	Mouse and keyboard skills	4.37%	-3.891 to 3.345

Overall, the number of missed responses was moderate. This could indicate that teachers found the indicators made sense and reflected the range of abilities that students with ASD demonstrated in relation to the domains of communication and literacy.

6.6.4. Review of the hypothesised ranking of instrument items

Under the Rasch model, it is assumed that students of higher ability have an increased likelihood of achieving more difficult items than students of lower ability. For ease of use by teacher participants, individual items were presented in a hierarchical order as a series of statements within the instrument

In analysing the statistical output for some items, it became clear that the original rankings of items were mainly preserved in the order presented. Within some strands there was evidence of multiple items reflecting similar levels of difficulty and within other strands the original order was disordered (Table 6.6).

Table 6-6: Comparison of preserved and disordered ranking of items relative to original hypothesised ordering

Preserved Order				**Disordered ranking**			
Mode- Communication-vocabulary Focus – Attributes-colour				**Mode- Communication-vocabulary Focus - Pronoun use**			
Hypothesised order	Calibrated order	Estimate	Item label	Hypothesised order	Calibrated order	Estimate	Item label
1	1	-6.10	CL11_1	1	1	-0.44	CL1_9
2	2	-4.25	CL11_2	2	3	1.11	CL1_10
3	3	-3.40	CL11_3	3	2	0.31	CL1_11
4	4	-3.31	CL11_4	4	6	2.36	CL1_12
5	5	-3.21	CL11_5	5	9	3.20	CL1_13
6	6	-3.03	CL11_6	6	7	2.48	CL1_14
7	7	-1.68	CL11_7	7	4	1.61	CL1_15
8	8	0.76	CL11_8	8	5	1.71	CL1_16
9	9	3.00	CL11_9	9	8	2.83	CL1_17

6.6.5. Exploration of fit statistics

In this study, residual based fit statistics were reported by ConQuest (Wu, Adams, Wilson & Haldane, 1998a) and examination of fit to the Rasch model focussed on highlighting the difference between actual and expected scoring of persons and items, through an exploration of these statistics. Misfitting items were reviewed by the researcher through a detailed examination of their fit statistics, wording and potential interpretation. Feedback was also sought from other researchers with expertise in educational assessment.

As discussed in Chapter 3, the expectation of a derived fit MNSQ statistic is close to 1 but this will vary in relation to the size of the data sample. A test given to a small number

of students would be expected to generate fit values that fluctuate quite widely around 1, even in cases where the items provided a good fit to the Rasch model (Wu & Adams (2013). It is important to assess the difference from 1 before concluding that an item is misfitting and consider both over fit (mean square value below 1) and under fit (mean square value above 1). Given the small sample size it was therefore anticipated that fit values might vary widely for this study. CTT discrimination values and MNSQ indices were utilised as evidence of fit and identification of misfit. As a starting point, the researcher identified items with discrimination values below .20, consistent with guidance from Wu and Adams (2007) and MNSQ values of .5-1.5 identified by Linacre and Wright (1994) as productive for measurement.

Additionally, while residual based fit statistics will show that items are fitting the Rasch model that is not the sole factor in identifying the strongest test. Test reliability indices relating to item discrimination are also key considerations in measuring a test's value.

The item discrimination index identifies the degree of correlation between an individual's score on an item in relation to their overall test score. Details relating to the exploration of fit are explained for each mode of the instrument in the following sections.

6.6.6. Calibration of draft communication and literacy indicators

This section identifies the calibration process applied to the items comprising the draft communication and literacy aspects of the instrument. Items developed to reflect students' communication abilities were organised across two modes: functions and vocabulary and each mode was analysed separately. Within the literacy section of the instrument, reading and writing modes were also analysed independently of each other. These indices were reviewed to assess the technical quality of the instrument.

6.6.6.1. Communication-functions

This section provides a summary of the calibration of items for the functions mode of the communication instrument. Of the 183 functions items, 97% showed clear evidence of fit within the anticipated range, indicating that, for the most part, items aligned with the degree of variation predicted by the Rasch model. A summary of the statistics generated by the analysis including indices of item difficulty and discrimination statistics, can be seen in Table 6.7. The full ConQuest output files for the communication-functions draft instrument are available in Appendix K.

Table 6-7: Calibration estimate for communication-functions

Communication-functions												
	Understanding names						Requesting objects					
Item number	1	2	3	4	5	6	7	8	9	10	11	12
Estimate	-2.318	-3.701	-2.863	-1.32	-0.907	-0.716	-6.276	-4.28	-3.098	-2.336	-1.796	-1.436
MNSQ	2.92	1.37	1.46	1.22	1.26	1.08	1.70	1.82	1.28	0.79	0.71	0.69
Discrimination	-0.02	0.32	0.44	0.61	0.64	0.69	0.19	0.24	0.46	0.63	0.72	0.75
Responses	122	130	122	123	115	110	129	129	116	129	119	119
	Requesting objects											
Item number	13	14	15	16	17	18	19	20	21	22	23	24
Estimate	-1.095	-0.941	-1.361	-0.292	0.313	1.557	2.896	2.896	5.205	-4.1	-3.965	-3.242
MNSQ	0.90	0.76	0.81	0.61	0.79	0.69	0.74	0.92	0.86	1.84	1.43	1.32
Discrimination	0.73	0.76	0.71	0.83	0.79	0.79	0.7	0.66	0.5	0.19	0.33	0.42
Responses	127	110	117	119	130	113	116	129	127	126	126	126
	Requesting assistance/actions/giving instruction											
Item number	25	26	27	28	29	30	31	32	33	34	35	36
Estimate	-1.768	-1.206	-1.017	-0.735	-0.556	-0.75	0.356	1.47	2.166	3.433	3.433	2.642
MNSQ	0.73	0.73	0.94	0.98	0.86	0.68	0.84	0.81	0.88	0.88	0.95	0.86
Discrimination	0.71	0.75	0.73	0.73	0.76	0.77	0.8	0.79	0.72	0.64	0.61	0.68
Responses	113	123	127	129	124	113	125	115	129	125	125	118
	Affirmation/negation											
Item number	37	38	39	40	41	42	43	44	45	46	47	48
Estimate	-4.406	-5.256	-2.012	-2.967	-0.575	0.421	1.551	0.302	1.409	3.091	1.565	1.943
MNSQ	1.80	1.08	1.42	1.16	0.54	0.78	1.17	0.60	0.61	0.97	0.53	0.78

Discrimination	0.06	0.35	0.49	0.52	0.8	0.79	0.7	0.82	0.82	0.66	0.82	0.77
Responses	129	127	120	110	113	130	129	113	119	130	119	120
	Following instructions											
Item number	49	50	51	52	53	54	55	56	57	58	59	60
Estimate	-5.077	-4.733	-4.445	-2.141	-2.49	-2.055	-1.178	1.255	0.886	2.589	3.757	3.002
MNSQ	0.85	0.90	1.16	0.80	0.80	0.64	0.63	1.27	1.26	1.12	0.96	1.27
Discrimination	0.39	0.41	0.37	0.67	0.61	0.69	0.75	0.69	0.68	0.65	0.58	0.54
Responses	128	122	114	128	128	110	114	120	125	113	127	114
			Answering questions									
Item number	61	62	63	64	65	66	67	68	69	70	71	72
Estimate	4.128	4.321	-0.053	-0.144	-0.318	1.071	0.174	0.908	1.07	2.494	2.996	1.389
MNSQ	1.38	1.30	1.25	0.70	0.80	0.68	0.68	0.73	0.72	0.89	0.89	0.93
Discrimination	0.49	0.48	0.72	0.78	0.75	0.8	0.81	0.82	0.81	0.72	0.68	0.77
Responses	126	126	118	120	129	114	119	131	110	113	125	127
		Asking questions										
Item number	73	74	75	76	77	78	79	80	81	82	83	84
Estimate	3.63	1.122	2.897	2.717	2.166	3.537	4.313	5.746	5.547	5.746	6.456	-6.66
MNSQ	0.97	0.74	1.14	1.06	0.80	0.83	1.01	1.08	1.36	1.10	1.06	1.52
Discrimination	0.58	0.81	0.64	0.67	0.75	0.66	0.54	0.41	0.4	0.45	0.38	0.19
Responses	125	127	121	125	126	131	126	128	119	118	128	126
	Gaining attention											
Item number	85	86	87	88	89	90	91	92	93	94	95	96
Estimate	-3.766	-4.284	-3.888	-1.552	-0.967	1.495	1.588	1.642	2.264	3.091	4.071	5.547

MNSQ	1.68	1.45	1.52	0.96	0.98	1.48	1.10	1.07	1.26	1.02	1.10	1.47
Discrimination	0.17	0.27	0.27	0.63	0.7	0.63	0.71	0.73	0.66	0.63	0.54	0.38
Responses	123	125	118	128	129	126	128	127	124	127	129	119
	Greetings											
Item number	97	98	99	100	101	102	103	104	105	106	107	108
Estimate	-3.995	-3.995	-3.396	-2.541	-1.488	-0.115	0.189	1.641	2.107	3.09	4.817	4.128
MNSQ	1.10	1.33	1.00	0.92	0.83	0.90	0.86	1.20	1.38	1.00	0.93	1.13
Discrimination	0.45	0.36	0.52	0.59	0.71	0.78	0.77	0.69	0.65	0.64	0.5	0.51
Responses	117	122	123	128	129	129	129	124	121	129	123	126
			Attending skills - task orientation									
Item number	109	110	111	112	113	114	115	116	117	118	119	120
Estimate	4.817	3.956	-5.076	-5.967	-5.277	-4.589	-4.165	-2.756	-1.269	-1.139	1.07	-4.888
MNSQ	0.79	1.35	1.11	1.20	1.25	1.32	1.26	1.18	1.61	1.37	1.24	1.24
Discrimination	0.53	0.49	0.31	0.14	0.21	0.27	0.32	0.53	0.57	0.62	0.71	0.24
Responses	130	122	129	119	124	122	124	125	120	126	124	113
	Attending skills - group work											
Item number	121	122	123	124	125	126	127	128	129	130	131	132
Estimate	-3.178	-0.714	-1.026	-0.357	1.64	3.338	2.018	3.066	3.633	3.633	5.023	3.956
MNSQ	1.30	0.82	1.24	1.17	1.35	1.53	1.07	1.03	0.86	1.03	0.75	0.83
Discrimination	0.47	0.76	0.64	0.7	0.64	0.51	0.71	0.64	0.64	0.56	0.55	0.61
Responses	130	125	110	111	121	123	130	127	119	125	117	127
			Commenting									
Item number	133	134	135	136	137	138	139	140	141	142	143	144

Estimate	4.579	4.579	0.399	1.381	0.616	1.542	1.95	2.592	3.304	3.818	5.01	0.748
MNSQ	0.84	0.88	0.73	1.12	0.83	0.88	0.78	0.66	0.76	0.78	0.99	1.87
Discrimination	0.57	0.56	0.81	0.75	0.8	0.77	0.78	0.76	0.65	0.63	0.48	0.58
Responses	129	129	127	129	129	125	125	114	127	127	124	119
	Conversation											
Item number	145	146	147	148	149	150	151	152	153	154	155	156
Estimate	0.66	-0.048	0.296	0.559	1.254	1.695	1.334	1.167	2.392	2.272	2.516	3.935
MNSQ	0.77	1.14	0.91	0.76	0.93	0.79	0.67	0.83	0.73	0.84	0.82	0.88
Discrimination	0.82	0.74	0.76	0.81	0.79	0.78	0.8	0.81	0.74	0.76	0.73	0.62
Responses	116	125	129	121	128	113	118	129	117	129	128	125
Item number	157	158										
Estimate	3.712	5.01										
MNSQ	0.78	0.90										
Discrimination	0.63	0.52										
Responses	113	129										

6.6.6.2. Items subject to further review within communication-functions

Seven items were flagged for further review and are shown in Table 6.8. Items 9, 23 and 58 showed misfitting MNSQ indices ranging from 1.69 to 1.86. However, the discrimination values of these items were within an acceptable range at .24 and .20 for items 9 and 23 respectively, while the value for item 58 was quite robust at .58. Therefore, these items were retained for further consideration.

Item 79's MNSQ index was well within standard range although discrimination appeared compromised at .19. This was likely to have been influenced by low variation in responses for the item (i.e. the item was positioned with other low estimate items with only five not present scores recorded in contrast to 108 present observations). Wu and Adams (2007) suggested that restricted variation in scores for items is likely to generate a low discrimination index and is not necessarily reflective of an item being of poor quality. Overall, the mixed indices relating to fit and other causal factors were deemed unlikely to degrade the discrimination of the draft instrument so the item was retained for further consideration.

Items 3, 38 and 80 demonstrated varied misfit on both selected indices. While items 38 and 80, MNSQ were outside recommended parameters at 1.72 and 1.64, with discrimination at .05 and .16 respectively, item 3 demonstrated the most significant misfit with a discrimination index of .00 and MNSQ of 2.88. This item was one of a series relating to joint attention, specifically the behavioural indicator "Respond inconsistently to the sound of their own name in familiar environments" that was targeted towards students with low skill levels who may have just begun to recognise and respond intermittently to the sound of their own name. The low reliability score was indicative of the fact that students with a range of abilities, low to high, were assessed as not yet attained on this item and therefore the item was not providing a clear distinction between students' overall ability levels in relation to the construct. As the degree of misfit for this item was likely to distort the measure if retained the decision was made to remove item 3 from the draft instrument.

Table 6-8: Communication-functions summary of misfitting items

Item	*Item label*	*Focus*	*Estimate*	*MNSQ*	*Discrim*	*Responses*	*Indicator*
9	CL2_2	Requesting objects	-4.29	1.69	0.24	129	Place item in hard to open container in adult's hand to request e.g. packet of chips

23	CL3_1	Requesting actions/ assistance	-4.12	1.73	0..20	126	Pull adult's hand to object to request assistance e.g. pull teacher to door and place their hand on the handle to get door opened
38	CL4_1	Affirmation/ negation	-4.42	1.72	0.05	129	Begin to respond through 'accept' or 'reject' gestures or actions e.g. extend hand to receive, push unwanted item away
79	CE1_1	Gaining attention	-6.55	1. 2	0.19	126	Look briefly at play object when adult is engaged in shared play activity with him/her
85	CE1_2		-3.80	1.64	0.16	123	Lead a teacher towards an object to communicate a request
3	CL1_1	Joint attention	-2.39	2.88	0.00	122	Respond inconsistently to the sound of their name in familiar environments
58	CL6_1		0.56	1.86	0.58	119	Actively respond to communication from others by withdrawing attention

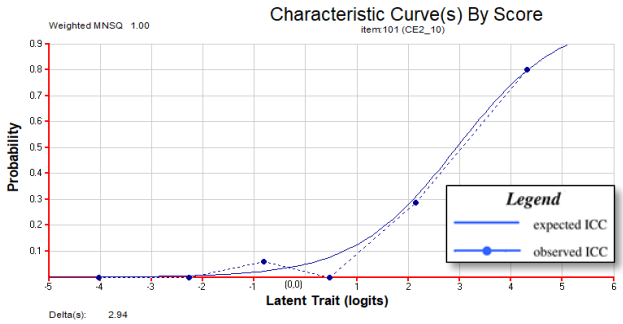
The draft questionnaire contained two focus areas that were removed at this stage of the draft instrument review, attending skills- task orientation and attending skills- group work. While the items included in these focus areas appeared to demonstrate fit to the communication instrument they typically reflected an emphasis on interactions with activities rather than communication partners. Items that reflected student capacity to engage with communication based classroom tasks and expectations were retained and included in other focus areas. However, the remaining items were perceived as not truly reflective of the underlying communication construct and as a result were removed from further consideration for inclusion in the final instrument.

The cycle of review, comparison and consideration of individual items throughout the process of item calibration provided valuable opportunities for further refinement of the instrument. As a result of the iterative process employed throughout the development of the instrument, the construct became more distinguished and the items definitive realisations of that construct (Wilson, 2005).

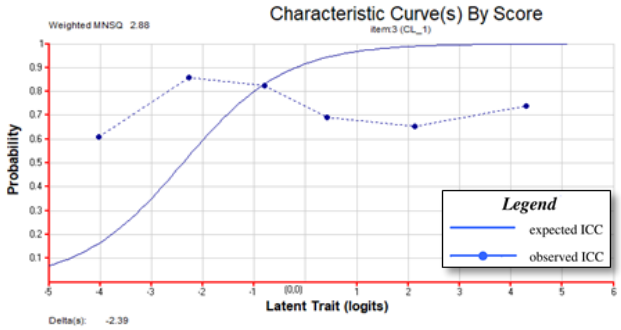
6.6.6.3. Using ICCs to analyse fit

MNSQ indices compare the variation between each item and the degree of variation predicted by the Rasch model. This can be seen most clearly when viewing ICCs generated by ConQuest in concert with a review of fit statistics. The Rasch model assumes that all items share the same discrimination parameter value or slope. Therefore, in cases where the ICC is steeper than predicted, the corresponding fit mean square value will be lower than 1. Conversely, where an observed ICC is flatter than expected then the

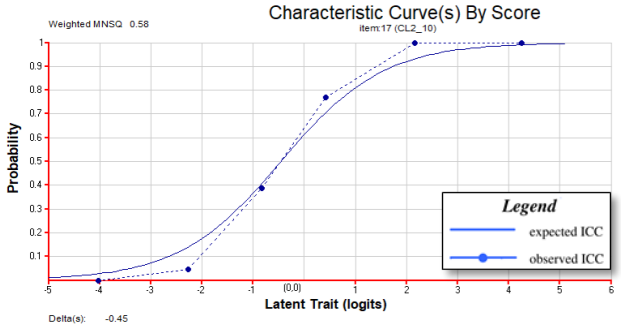
corresponding fit mean square will be greater than 1. A review of ICCs for individual items was undertaken when reviewing item fit and a small sample can be seen below in Figure 6.2 (expected, flat and steep curve sample).



Item CE2_10 (MNSQ-1.00) expected curve



Item CL1_1 (MNSQ-2.88) flat curve



Item C2_10 (MNSQ-.58) steep curve

Figure 6-2: sample of expected, flat and steep curves from reviewed communication-functions ICCS

Estimates of item difficulty and student ability were plotted on a variable map to illustrate the relationship, using the same axis, between student ability and item difficulty, expressed as logits. The variable maps in Figure 6.3 reflects the Communication-

functions mode. Distribution of Xs on the left side of the map are representative of the variance in student ability along the logit scale. Xs placed at the left bottom of the map identify students estimated as having low ability, while at the top left of the map Xs denote students of estimated high ability.

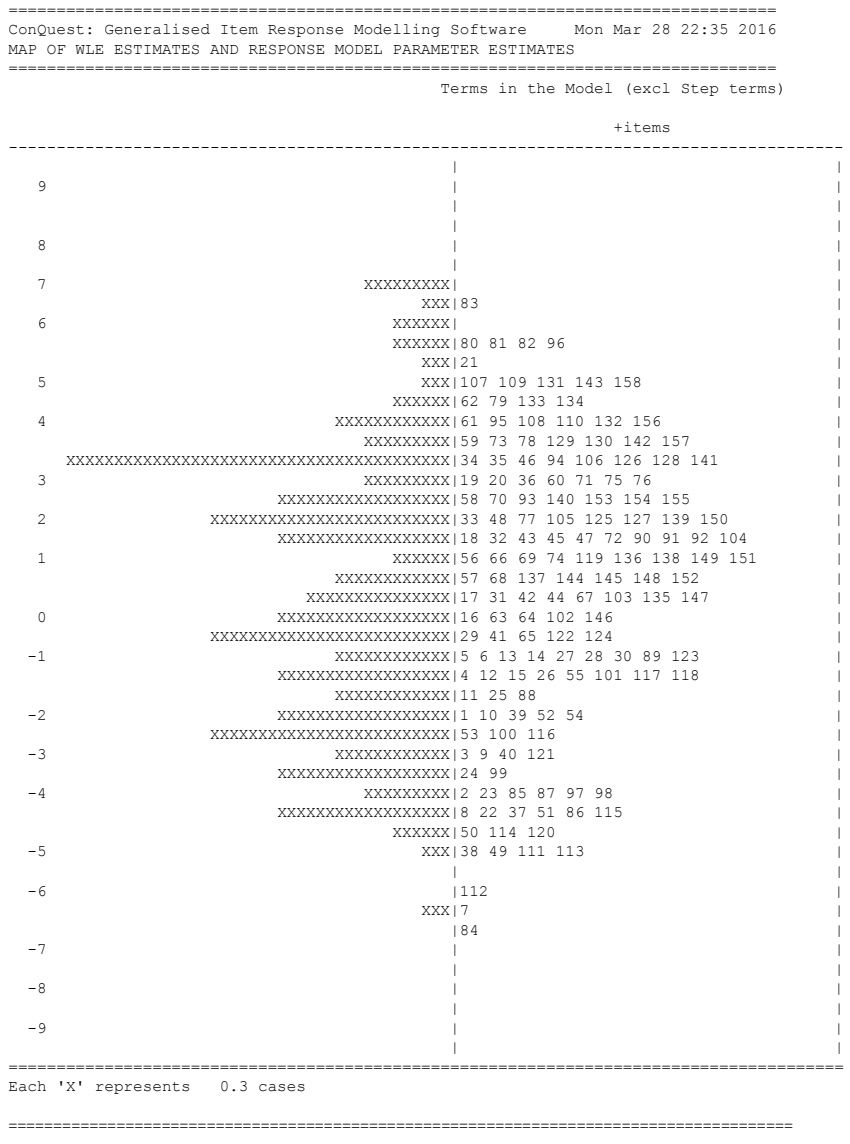


Figure 6-3: Variable map for draft communication-functions items

Distribution of item numbers (ie.1,2,3) on the right side of the map are representative of the variance in item difficulty along the logit scale. Placement of item numbers towards the right bottom of the map reflects that these are easier items, while those placed towards the top right of the map are estimated as possessing high difficulty. For example, in figure 6.3, Item 83 is the most difficult of the Communication-functions items on the

instrument and as a result is positioned at the top of the items, on the right side of the person/item division.

The variable map in Figure 6.3 illustrates a spread of item difficulties that provide a sound match to students with a range of abilities. The variable map, when considered in conjunction with high weighted likelihood estimation (WLE) person separation index noted as 0.989 and coefficient alpha at .99, indicate that performance quality criteria were well balanced across the variable and able to separate students in relation to their estimated ability.

6.6.6.4. Communication-vocabulary

This section provides a summary of the calibration of items for the vocabulary strand of the draft communication instrument. The statistics generated by the analysis include indices of item difficulty and discrimination statistics. These indices were reviewed to assess the technical quality of the instrument. The full ConQuest output files for the draft communication-vocabulary subdomain is available in Appendix L. Table 6.9 provides the calibration estimates for individual items from the communication-vocabulary. The initial review indicated that 97.3% of items exhibited evidence of fit, consistent with the established parameters.

Table 6-9: Calibration estimate for draft communication-vocabulary

Communication-vocabulary												
	Pronoun use											
Item number	1	2	3	4	5	6	7	8	9	10	11	12
Estimate	-2.945	-2.945	-0.497	1.024	0.239	2.293	3.157	2.41	1.519	1.624	2.773	-2.52
MNSQ	0.97	0.92	0.86	1.17	0.94	1.11	1.18	1.28	1.32	1.14	1.51	1.45
Discrimination	0.66	0.69	0.78	0.67	0.76	0.63	0.57	0.59	0.63	0.66	0.52	0.64
Responses	126	126	126	128	128	128	128	128	128	128	128	
	Size-big/little						Size-long/tall/short					
Item number	13	14	15	16	17	18	19	20	21	22	23	24
Estimate	-1.781	-1.046	-0.014	0.499	2.584	2.592	-1.69	-0.785	0.238	0.192	1.276	1.706
MNSQ	0.82	0.90	0.76	0.80	0.83	0.84	1.11	1.00	1.11	0.84	0.79	0.86
Discrimination	0.8	0.78	0.8	0.78	0.66	0.65	0.74	0.77	0.73	0.76	0.74	0.71
Responses	121	121	123	125	125	126	124	124	124	125	126	127
			General attributes									
Item number	25	26	27	28	29	30	31	32	33	34	35	36
Estimate	3.476	3.925	-2.569	-1.014	-2.749	-0.178	-1.594	-1.955	-0.887	-0.334	0.739	0.481
MNSQ	0.90	0.87	1.30	0.74	1.68	0.92	0.75	1.00	0.78	0.80	0.85	0.82
Discrimination	0.58	0.55	0.67	0.8	0.64	0.77	0.8	0.76	0.8	0.79	0.76	0.78
Responses	128	128	124	124	124	125	126	126	126	127	128	128
							Colour					
Item number	37	38	39	40	41	42	43	44	45	46	47	48
Estimate	-0.499	2.031	1.397	2.719	3.34	4.47	-6.103	-4.228	-3.402	-3.311	-3.217	-3.038
MNSQ	0.91	1.26	1.40	1.07	1.12	1.34	0.92	1.36	1.54	0.97	1.04	1.12
Discrimination	0.78	0.63	0.64	0.62	0.55	0.43	0.46	0.52	0.57	0.66	0.65	0.66

Responses	128	128	128	128	129	129	123	123	124	125	125	127
				Spatial concepts								
Item number	49	50	51	52	53	54	55	56	57	58	59	60
Estimate	-1.715	0.681	2.962	-5.515	-4.232	-3.221	-1.701	-1.539	-0.211	0.512	1.723	2.38
MNSQ	1.18	1.35	1.26	1.08	1.03	1.30	1.19	0.91	0.77	0.74	0.85	0.94
Discrimination	0.72	0.66	0.57	0.51	0.6	0.61	0.73	0.76	0.79	0.78	0.7	.66
Responses	129	129	129	127	127	127	127	128	128	128	128	129
					Quantity concepts							
Item number	61	62	63	64	65	66	67	68	69	70	71	72
Estimate	4.276	4.096	4.928	4.928	-5.74	-3.113	-2.75	-2.39	-1.489	-2.81	-1.137	-0.133
MNSQ	0.71	0.85	1.24	1.15	1.94	1.07	0.89	0.93	0.95	0.82	1.20	1.39
Discrimination	0.54	0.52	0.43	0.45	0.41	0.66	0.73	0.74	0.76	0.72	0.71	0.68
Responses	129	129	129	129	122	122	124	124	125	127	127	128
		Quantity-relative								Sequencing		
Item number	73	74	75	76	77	78	79	80	81	82	83	84
Estimate	0.857	-2.704	-2.163	-0.013	1.296	2.714	3.618	4.926	4.686	-6.778	-4.853	-3.353
MNSQ	1.28	1.18	1.22	1.03	0.78	0.74	0.81	0.69	0.88	0.88	0.88	0.94
Discrimination	0.65	0.69	0.71	0.73	0.75	0.67	0.61	0.51	0.45	0.41	0.56	0.61
Responses	130	123	124	125	128	128	128	128	128	120	123	127
					Time							
Item number	85	86	87	88	89	90	91	92	93	94	95	96
Estimate	-0.045	0.109	2.493	2.043	-1.084	0.714	1.932	0.993	-0.933	2.251	3.618	4.686
MNSQ	1.27	0.95	1.38	0.93	0.87	1.03	1.20	1.15	1.01	0.96	1.01	1.14

Discrimination	0.7	0.77	0.56	0.69	0.78	0.73	0.66	0.7	0.77	0.65	0.55	0.43
Responses	128	129	129	130	125	125	125	125	127	127	127	127
		Plurals					Verb use					
Item number	97	98	99	100	101	102	103	104	105	106	107	
Estimate	5.194	-0.918	1.435	2.334	3.463	4.68	-6.656	-6.839	-1.789	-0.449	1.933	
MNSQ	1.21	1.02	1.06	1.02	1.39	1.19	1.37	1.23	0.73	0.76	1.24	
Discrimination	0.39	0.76	0.67	0.63	0.52	0.43	0.36	0.33	0.79	0.8	0.63	
Responses	127	118	120	122	122	122	122	126	128	130	130	

Of the 112 vocabulary items, 97% demonstrated a cohesive fit within the ranges identified, consistent with recommendations within the measurement field.

6.6.6.5. Items subject to further review within communication-vocabulary

The three items identified for further review exhibited a very similar profile and can be seen in Table 6.10 below. All demonstrated strong discrimination with indices between .41-.64. The potential misfit identification was made on the basis of elevated MNSQ indices varying between 1.55-1.97. However, as the indices' range was considered unlikely to degrade the instrument and discrimination indices were within a strong range, all items were retained.

Table 6-10: Communication-vocabulary summary of misfitting items

Item	*Item label*	*Focus*	*Estimate*	*MNSQ*	*Discrim*	*Responses*	*Indicator*
29	CL10_3	Attribute-general	-2.73	1.74	0.64	124	Show understanding of clean/dirty/messy in context e.g. tries to wipe hands when sticky
45	CL11_3	Attribute-colour	-3.40	1.55	0.58	124	Sort and match a range of items into like colour groups
65	CL13_1	Quantity-numeric	-5.74	1.97	0.41	122	Coactively select 'one' item when supported

The variable map shown in Figure 6.4 illustrates that the indicators were well spread along the axis of the variable. This is confirmed by the coefficient alpha at .98 and a strong result for WLE person separation reliability at 0.983 identifying that indicators were well selected in their capacity to separate students based on their vocabulary use and knowledge.

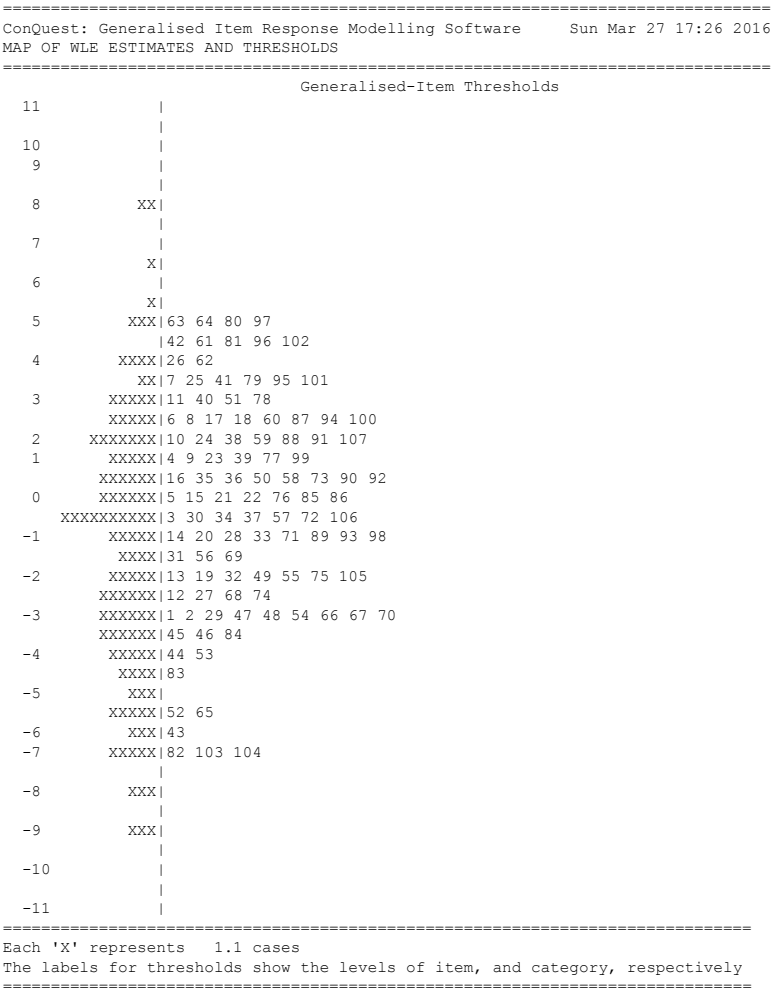


Figure 6-4: Variable map for draft Communication-vocabulary

6.6.6.6. Literacy-reading

This section provides a summary of the calibration of items for the literacy-reading draft instrument. The statistics generated by the analysis include estimates, item discrimination and response statistics. These indices were reviewed to assess the technical quality of the instrument. The ConQuest output files for the draft literacy-reading subdomain utilised in the analysis are available in Appendix M. Table 6.11 below, provides the calibration estimates for individual items from literacy-reading. Of the 183 reading items, 95.6% demonstrated a strong fit to the Rasch model, as reflected by fit indices.

Table 6-11: Calibration estimate for literacy -reading

Literacy- reading												
	Interacting with texts											
Item number	1	2	3	4	5	6	7	8	9	10	11	12
Estimate	-5.347	-4.291	-3.522	-2.863	-2.867	-1.204	-1.539	-0.374	0.213	0.447	-5.411	-4.934
MNSQ	1.19	1.27	1.10	1.07	1.02	1.22	0.88	0.75	0.86	1.00	0.68	1.00
Discrimination	0.33	0.37	0.49	0.56	0.6	0.64	0.71	0.77	0.73	0.69	0.46	0.44
Responses	125	125	125	128	130	130	131	131	131	131	121	121
	Attending to texts									Book knowledge		
Item number	13	14	15	16	17	18	19	20	21	22	23	24
Estimate	-4.227	-2.387	-1.446	-1.528	-0.297	-0.229	0.864	1.324	1.96	-5.568	-3.592	-3.661
MNSQ	1.07	0.93	0.82	0.82	0.89	0.72	1.19	1.24	1.28	1.16	1.09	1.26
Discrimination	0.48	0.66	0.73	0.73	0.72	0.76	0.64	0.6	0.56	0.37	0.59	0.53
Responses	122	124	124	126	127	128	129	130	130	114	113	114
										Reading behaviours		
Item number	25	26	27	28	29	30	31	32	33	34	35	36
Estimate	-4.252	-3.508	-3.036	-1.942	-2.877	-1.723	-0.389	1.016	2.442	-1.321	-0.871	-0.342
MNSQ	1.23	0.96	1.53	1.11	1.20	0.99	0.82	1.02	1.39	0.92	0.70	0.77
Discrimination	0.46	0.57	0.42	0.66	0.59	0.68	0.75	0.66	0.47	0.73	0.79	0.77
Responses	114	117	120	123	127	127	127	128	128	111	112	114
							Reading fluency					
Item number	37	38	39	40	41	42	43	44	45	46	47	48
Estimate	-0.058	0.129	1.013	0.55	3.062	3.879	0.435	1.929	0.815	2.425	5.042	5.042
MNSQ	0.75	0.66	1.03	0.94	1.34	1.09	0.86	0.91	0.86	1.05	1.07	1.07

Discrimination	0.77	0.8	0.69	0.71	0.48	0.41	0.73	0.65	0.72	0.6	0.31	0.31
Responses	117	121	121	121	121	122	115	116	119	119	119	119
		Reading picture texts										
Item number	49	50	51	52	53	54	55	56	57	58	59	60
Estimate	4.394	-6.716	-4.805	-4.805	-4.118	-2.764	-1.33	-0.47	-0.279	0.173	2.734	2.185
MNSQ	1.19	0.94	1.03	0.79	0.64	0.82	0.92	1.15	0.97	1.08	1.06	0.86
Discrimination	0.37	0.33	0.46	0.51	0.59	0.66	0.73	0.68	0.72	0.67	0.54	0.63
Responses	119	118	118	118	120	122	126	126	127	127	127	128
	Logo & early text recognition											
Item number	61	62	63	64	65	66	67	68	69	70	71	72
Estimate	-5.158	-4.31	-3.604	-2.988	-1.29	-1.064	-1.134	-1.752	-0.642	-1.82	-0.785	1.83
MNSQ	0.92	1.14	0.61	0.73	0.83	0.81	0.99	0.80	0.96	0.88	0.89	1.26
Discrimination	0.47	0.48	0.63	0.67	0.75	0.76	0.73	0.75	0.74	0.73	0.75	0.58
Responses	125	125	126	126	125	126	126	126	127	127	127	128
		Understanding words										
Item number	73	74	75	76	77	78	79	80	81	82	83	84
Estimate	1.83	-1.35	-0.06	-0.06	0.815	0.958	1.736	1.627	1.222	1.847	2.203	2.45
MNSQ	0.89	0.96	0.94	0.93	0.93	0.76	0.85	0.86	0.79	0.80	0.72	0.96
Discrimination	0.66	0.71	0.72	0.73	0.71	0.74	0.66	0.66	0.72	0.66	0.64	0.59
Responses	128	120	120	120	122	125	125	125	125	125	125	126
			Reading simple texts									
Item number	85	86	87	88	89	90	91	92	93	94	95	96
Estimate	1.956	1.731	0.608	0.884	1.202	2.237	1.86	1.982	2.099	1.737	2.362	3.696

MNSQ	0.57	0.88	0.85	0.80	0.78	0.55	0.61	0.49	0.73	0.89	0.87	0.96
Discrimination	0.73	0.67	0.72	0.71	0.71	0.7	0.71	0.74	0.67	0.67	0.6	0.5
Responses	126	126	122	122	123	123	123	123	124	124	124	124
Item number	97	98	99	100	101	102	103	104	105	106	107	108
Estimate	4.161	3.696	1.298	2.061	4.202	3.545	3.963	5.494	5.27	-4.493	-3.754	-2.532
MNSQ	1.00	1.34	0.63	0.64	0.87	0.55	0.86	1.43	1.04	0.85	0.85	0.96
Discrimination	0.46	0.35	0.73	0.71	0.46	0.57	0.49	0.28	0.42	0.53	0.59	0.67
Responses	124	124	126	126	126	126	126	126	119	120	126	126
	Self-management & direction											
Item number	109	110	111	112	113	114	115	116	117	118	119	120
Estimate	-3.287	-2.565	-0.785	-0.926	-0.499	0.251	1.609	2.441	1.718	1.609	-0.861	-0.297
MNSQ	1.12	1.27	0.82	0.70	0.98	1.11	1.30	1.11	1.02	1.03	0.95	0.62
Discrimination	0.57	0.61	0.76	0.79	0.71	0.68	0.59	0.57	0.64	0.62	0.72	0.81
Responses	127	127	127	128	128	128	128	128	128	128	124	125
	Responding to texts											
Item number	121	122	123	124	125	126	127	128	129	130	131	132
Estimate	1.424	1.026	0.825	1.826	2.864	3.019	3.019	3.745	4.464	4.464	2.918	5.221
MNSQ	0.94	0.84	0.93	1.00	1.15	0.94	0.77	1.24	1.26	1.02	1.34	1.31
Discrimination	0.69	0.72	0.71	0.66	0.53	0.54	0.59	0.43	0.35	0.42	0.47	0.12
Responses	124	124	125	125	125	125	125	125	125	125	112	112
	Understanding text types			Letter recognition								
Item number	133	134	135	136	137	138	139	140	141	142	143	144

Estimate	5.766	4.792	5.221	-4.121	-1.798	-2.623	-2.346	-2.005	-1.604	-0.902	-0.01	-0.391
MNSQ	1.09	1.35	1.18	1.43	1.13	0.91	0.68	0.62	0.72	0.83	1.21	0.82
Discrimination	0.13	0.21	0.23	0.48	0.65	0.67	0.73	0.75	0.74	0.75	0.65	0.76
Responses	112	112	112	121	121	122	122	122	124	124	124	124
								Developing letter knowledge & understanding				
Item number	145	146	147	148	149	150	151	152	153	154	155	156
Estimate	-0.019	0.576	0.096	0.252	1.723	0.922	1.83	0.271	0.357	1.104	-0.907	0.552
MNSQ	0.79	1.06	0.93	1.30	1.16	1.01	1.18	1.29	1.07	1.23	0.80	0.87
Discrimination	0.77	0.69	0.72	0.63	0.59	0.67	0.6	0.62	0.68	0.61	0.76	0.73
Responses	126	127	127	127	127	128	128	119	119	119	119	121
Item number	157	158	159	160	161	162	163	164	165	166	167	168
Estimate	1.009	1.719	2.067	2.318	1.033	2.081	3.55	-3.56	-3.564	-4.289	-2.249	-1.982
MNSQ	0.92	0.99	0.86	0.93	0.85	0.80	1.08	1.73	1.50	1.52	1.13	1.36
Discrimination	0.7	0.64	0.65	0.63	0.72	0.66	0.46	0.39	0.48	0.42	0.64	0.58
Responses	121	124	124	124	125	125	126	120	122	122	123	125
	Phonological knowledge											
Item number	169	170	171	172	173	174	175	176	177	178	179	180
Estimate	-1.432	-1.57	-1.222	-0.508	0.013	0.09	1.721	1.833	3.393	3.043	3.393	4.035
MNSQ	1.15	0.90	1.07	1.06	0.99	1.08	1.42	1.01	1.02	0.88	1.53	1.49
Discrimination	0.65	0.71	0.65	0.71	0.71	0.67	0.55	0.62	0.5	0.54	0.38	0.36
Responses	125	125	125	125	125	125	125	125	125	125	125	125

Item number	181	182	183	
Estimate	5.856	3.358	4.464	
MNSQ	1.01	1.32	1.23	
Discrimination	0.26	0.44	0.36	
Responses	125	126	126	

6.6.6.7. Items were identified for further review within literacy-reading

After an initial review of fit statistics, eight items were identified for further evaluation. Of these, five had MNSQ results between 1.5 and 1.73, one had an MNSQ result below .50 and two items demonstrated low discrimination indices below .20. All items can be seen in table 6-12.

Table 6-12: Literacy-reading items for review

Item	*Item label*	*Focus*	*Estimate*	*MNSQ*	*Discrim*	*Responses*	*Indicators*
27	RT3_6	Book knowledge	-3.04	1.53	0.42	120	Turn pages sometimes skipping pages
92	RT9_6	Comprehend simple texts	1.98	.49	.74	123	Read sentence (pronoun/ verb /noun) i.e. "she is climbing the slide" & show comprehension by matching to a picture
132	SM3_2	Conventions of print	5.22	1.31	0.12	112	Identify features of a range of text types, e.g. Recount, report, procedure, narrative
133	SM3_3		5.76	1.09	0.13	112	Talk about features of a story or poem that have personal appeal, e.g. Fantasy elements, favourite characters, interesting words/phrases
164	PK1_1	Phonemic awareness	-3.56	1.73	0.39	120	React to sounds associated with familiar activities and people
165	PK1_3		-4.29	1.52	0.42	122	Respond to a range of familiar environmental sounds
179	PK1_2		-3.56	1.52	.48	122	Respond to the sound of key words e.g. Lunch
166	PK1_16	Phonological knowledge	3.39	1.53	0.38	125	Relate most letters of the alphabet to sounds

Three of the indicators were generated as part of the phonemic awareness focus of the reading mode, with items 164, 165 and 166 describing low ability skills. Item 179 related to a higher level skill within the phonological knowledge focus. Items 27, 164, 165, 166 and 179 had robust discrimination indices varying between .38-.42 and MNSQ indices that were only marginally outside a standard range for four of the items (1.52-1.53) and 1.73 for item 164.

Item 92 was unusual in that it demonstrated an MNSQ result below .50. While this can technically be considered misfitting it is of note that a low MNSQ can also be considered as being more discriminating than predicted by the Rasch model and was therefore retained for further consideration. This can be seen visually in the generated ICC for item 92, captured in figure 6.5.

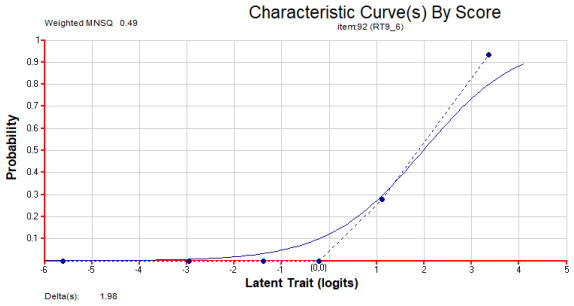


Figure 6-5: ICC for item 92- RT9_6

Items 132 and 133 were both drawn from the focus area conventions of print. Both had strong MNSQ indices of 1.09 and 1.31 but discrimination values below .13. Given that the estimates for these items were relatively high (+5.221 and +5.166) and targeted high ability students, it is likely that the lowered discrimination score was in part a reflection of the low number of students (item 132 – three students and item 133 - two students) who were able to demonstrate this skill. Overall, these items showed evidence of capacity to differentiate on the basis of discrimination or MNSQ indices and were all retained for potential inclusion in the final instrument.

The variable map in figure 6.6 reflects a comprehensive spread in the difficulty of items and ability of students. Items increase in number at higher ability levels with fewer items present at the lowest levels of ability. Person separation index (WLE) was recorded as .986 and coefficient alpha at .99 providing evidence of the instrument's capacity to separate students in relation to their ability and items on the basis of their difficulty.

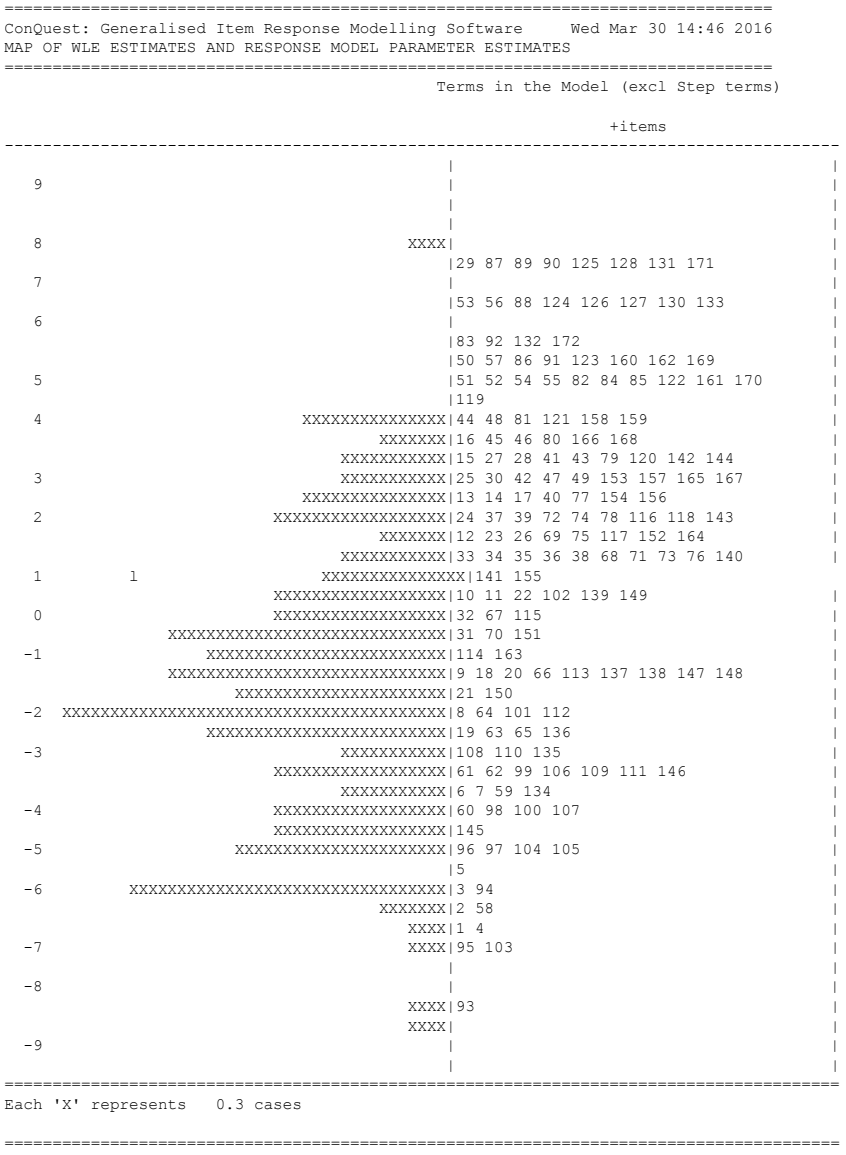


Figure 6-6: Variable map for literacy-reading

6.6.6.8. Literacy-writing

This section identifies the calibration process applied to the items comprising the literacy-writing strand of the draft instrument. The output files for writing utilised in the analysis are available in Appendix N. Of the 172 writing items, 93.6% demonstrate clear fit and can be seen in Table 6.13 below.

Table 6-13: Calibration estimate for literacy-writing

Literacy-writing												
	Develop expression of ideas											
Item number	1	2	3	4	5	6	7	8	9	10	11	12
Estimate	-6.684	-6.316	-6.007	-6.643	-5.485	-3.859	-3.859	-1.94	-1.369	0.554	0.202	1.431
MNSQ	1.40	1.30	0.89	1.32	0.97	1.07	1.07	1.02	1.04	1.12	0.98	1.02
Discrimination	0.19	0.22	0.32	0.25	0.39	0.53	0.51	0.64	0.66	0.66	0.71	0.66
Responses	116	116	117	122	122	122	122	124	126	126	126	127
						Assign meaning to pictures						
Item number	13	14	15	16	17	18	19	20	21	22	23	24
Estimate	2.544	2.405	3.34	3.577	2.341	-1.196	-2.367	-1.43	-1.501	0.22	1.557	1.978
MNSQ	0.95	0.76	1.10	1.07	0.99	1.42	1.05	1.27	1.17	1.16	0.79	1.05
Discrimination	0.63	0.67	0.54	0.51	0.64	0.58	0.62	0.6	0.62	0.66	0.71	0.63
Responses	127	127	127	128	128	120	120	122	125	125	125	126
		Assign meaning to written symbols										
Item number	25	26	27	28	29	30	31	32	33	34	35	36
Estimate	2.906	1.698	3.272	3.089	7.438	2.975	-0.374	-0.158	1.019	1.123	1.338	1.361
MNSQ	1.03	1.04	0.97	1.34	2.20	1.25	1.34	0.86	0.90	0.96	1.28	1.17
Discrimination	0.57	0.63	0.6	0.49	0.13	0.5	0.62	0.75	0.71	0.69	0.63	0.65
Responses	126	115	115	116	116	117	120	121	122	122	122	123
	Communicate ideas											
Item number	37	38	39	40	41	42	43	44	45	46	47	48
Estimate	1.899	1.007	1.974	2.479	3.395	3.059	3.222	4.229	3.58	3.778	2.904	4.229
MNSQ	1.08	0.85	1.26	0.92	0.65	0.59	0.83	0.80	0.90	1.05	1.03	0.96

Discrimination	0.67	0.72	0.57	0.64	0.59	0.66	0.6	0.53	0.54	0.55	0.62	0.53
Responses	124	125	125	125	125	125	125	125	125	125	125	125
Item number	49	50	51	52	53	54	55	56	57	58	59	60
Estimate	2.756	5.484	4.777	4.777	6.572	5.103	4.777	6.572	5.484	-6.182	-3.96	-4.212
MNSQ	1.25	0.97	1.22	1.38	1.03	1.22	1.12	1.00	1.89	1.46	0.91	0.69
Discrimination	0.57	0.47	0.45	0.4	0.36	0.42	0.49	0.36	0.33	0.3	0.59	0.59
Responses	125	125	125	125	125	125	125	125	125	115	117	115
	Understand letter forms											
Item number	61	62	63	64	65	66	67	68	69	70	71	72
Estimate	-3.536	-3.477	-2.403	-2.26	-2.475	-1.386	0.061	1.238	1.559	-0.617	1.207	2.192
MNSQ	0.62	0.54	0.66	0.91	0.69	0.89	1.08	0.82	0.86	0.94	0.97	0.99
Discrimination	0.65	0.66	0.71	0.67	0.72	0.68	0.69	0.72	0.71	0.72	0.7	0.63
Responses	118	120	124	124	125	125	127	127	127	121	124	121
	Understand writing conventions											
Item number	73	74	75	76	77	78	79	80	81	82	83	84
Estimate	1.288	2.208	1.726	1.185	2.606	2.208	3.389	3.774	3.99	4.774	5.948	5.101
MNSQ	0.98	1.03	0.88	1.15	1.02	0.91	0.91	1.25	1.11	1.09	1.16	1.04
Discrimination	0.67	0.6	0.7	0.65	0.59	0.64	0.6	0.47	0.46	0.47	0.4	0.47
Responses	122	124	124	124	124	124	124	124	124	124	124	124
Item number	85	86	87	88	89	90	91	92	93	94	95	96
Estimate	4.774	5.482	7.556	6.571	7.556	7.556	5.482	5.948	-8.145	-5.656	-6.928	-5.208

MNSQ	0.94	1.45	0.73	1.13	0.73	0.73	1.18	1.15	1.11	1.33	1.11	1.70
Discrimination	0.5	0.32	0.31	0.29	0.31	0.31	0.34	0.36	0.13	0.32	0.24	0.3
Responses	124	124	124	124	124	124	124	124	124	124	124	124
	Fine motor and planning											
Item number	97	98	99	100	101	102	103	104	105	106	107	108
Estimate	-5.005	-4.268	-3.465	-4.194	-2.166	0.24	-6.924	-5.092	-4.991	-3.42	-4.081	-2.837
MNSQ	1.52	1.14	0.98	0.94	1.65	1.55	1.27	1.34	1.13	1.09	0.94	1.13
Discrimination	0.32	0.48	0.55	0.52	0.45	0.55	0.17	0.38	0.41	0.56	0.54	0.6
Responses	125	126	127	127	127	127	122	122	122	123	123	124
	Develop control & planning											
Item number	109	110	111	112	113	114	115	116	117	118	119	120
Estimate	-3.364	-2.837	-3.234	-2.088	-1.293	-0.84	0.027	1.891	1.431	2.212	4.486	3.218
MNSQ	0.98	0.85	0.88	0.88	1.02	1.24	1.21	1.26	1.25	1.44	1.28	1.43
Discrimination	0.57	0.65	0.58	0.65	0.68	0.62	0.65	0.64	0.67	0.57	0.41	0.46
Responses	124	124	126	126	126	126	127	127	127	128	128	128
Item number	121	122	123	124	125	126	127	128	129	130	131	132
Estimate	4.227	4.778	5.485	6.573	7.557	6.573	6.573	7.557	n/a	6.573	7.557	5.95
MNSQ	1.38	0.98	1.17	1.05	0.73	1.13	1.13	0.73	1.13	0.73	1.33	1.13
Discrimination	0.4	0.51	0.36	0.35	0.31	0.3	0.3	0.31	n/a	0.3	0.31	0.33
Responses	128	129	129	129	129	129	129	129	129	129	129	129
		Develop mouse & keyboard skills										
Item number	133	134	135	136	137	138	139	140	141	142	143	144

Estimate	6.573	-3.891	-3.025	-2.398	-1.463	-1.388	0.311	1.037	1.343	3.345	2.027	3.224
MNSQ	1.43	1.26	1.04	1.18	1.30	0.96	0.79	0.74	1.28	1.13	1.28	0.70
Discrimination	0.3	0.48	0.56	0.65	0.65	0.62	0.71	0.72	0.76	0.53	0.62	0.47
Responses	129	119	120	124	126	126	127	127	127	127	127	128
	Understand spelling conventions											
Item number	145	146	147	148	149	150	151	152	153	154	155	156
Estimate	-4.672	-3.394	-1.337	-1.106	0.497	-1.202	-0.416	1.589	2.927	2.393	1.409	2.2
MNSQ	0.82	0.98	0.84	1.41	0.79	0.83	1.14	0.87	1.14	0.71	0.65	0.90
Discrimination	0.53	0.6	0.67	0.71	0.57	0.69	0.7	0.64	0.63	0.6	0.74	0.7
Responses	122	122	122	122	122	123	123	123	124	125	125	126
							Letter & sound understandings					
Item number	157	158	159	160	161	162	163	164	165	166	167	168
Estimate	2.899	3.991	3.991	5.483	4.775	5.483	-0.67	2.164	2.819	3.521	2.897	3.774
MNSQ	1.39	1.22	1.24	1.15	1.45	1.57	1.34	0.99	0.94	1.05	1.05	1.17
Discrimination	0.64	0.45	0.5	0.38	0.48	0.33	0.53	0.58	0.6	0.55	0.54	0.44
Responses	127	127	127	127	127	127	121	121	122	123	125	125
Item number	169	170	171	172								
Estimate	5.482	5.101	7.556	5.95								
MNSQ	1.11	1.99	1.25	1.11								
Discrimination	0.36	0.41	0.19	.36								
Responses	125	125	125	125								

6.6.6.9. Items subject to further review within the literacy-writing mode

Eleven items were identified for further review and have been included in Table 6.14. Items 57, 96, 97, 101, 102 and 163 showed reasonable to robust discrimination indices between .3-.55 but their listed MNSQ indices were reflective of a less productive range (1.52-1.89). In contrast, Items 1, 93 and 103 shared low discrimination indices ranging from .13-.19, which were offset by sound MNSQ indices ranging between 1.11-1.4.

Item 171's indices of 1.99 and .19 for MNSQ and discrimination respectively were reviewed within the context that the lowered discrimination scores were at least in part a reflection of the restricted number of students able to demonstrate this skill (i.e. only one student was able to demonstrate this skill in contrast to 124 students who did not). After review of this item, it was deemed unlikely that its continued inclusion would compromise the instrument as fit measures were likely to have been in part a reflection of the small sample size.

Item 29 showed poor discrimination with MNSQ of 2.2 and discrimination at .13. Linacre and Wright (1994) suggested that MNSQ values >2 are likely to distort the measure. Item 129 was unusual in that no estimate, MNSQ or discrimination values were generated as no student was able to demonstrate the skill. As a result of the item review, these two items were both identified for removal from the instrument, the first because it was likely to degrade the measure and the second because there was no evidence of its capacity to either enrich or distort the instrument.

Table 6-14: Literacy-writing items for review

Item	*Item label*	*Focus*	*Estimate*	*MNSQ*	*Discrim*	*Responses*	*Indicators*
29	CI3_4	Assign meaning to text	7.44	2.2	0.13	116	Reread own text to check meaning and content is clear
57	CI4_27	Communicate ideas	5.48	1.89	0.33	125	Use vocabulary, modelled writing or ideas from texts read or viewed in class in own writing or drawing
1	CI1_1	Early motor planning	-6.68	1.4	0.19	116	Experience moving sensory substance coactively e.g. hand movement through rice or water
93	WS1_1		-8.15	1.11	0.13	124	Hold small objects in hand
96	WS1_4		-5.21	1.7	0.3	124	Reach across the body to grasp and retrieve an object
97	WS1_5		-5.01	1.52	0.32	125	Remove and replace objects from and into a container
101	WS1_9		-2.17	1.65	0.45	127	Open and close a zip lock bag
102	WS1_10		0.24	1.55	0.55	127	Fold paper so that edges are close to meeting

103	WS2_1		-6.92	1.27	0.17	122	Reach purposefully for item in view
163	CS2_01		-0.67	1.57	0.53	121	Consistently write the same letters and numbers the same way
171	CS2_09	Understand spelling conventions	7.556	1.99	0.19	125	Use a range of resources to find words or phrases needed for own writing or to check spelling, e.g. Simple dictionaries, vocabulary lists, modelled texts, familiar books and environmental print

The variable map shown in Figure 6.7 illustrates that the indicators were well spread along the axis of the variable. This is reinforced by a coefficient alpha index of .98 and WLE person separation reliability of 0.987, confirming that indicators were well selected in their capacity to separate students within the literacy-writing strand.

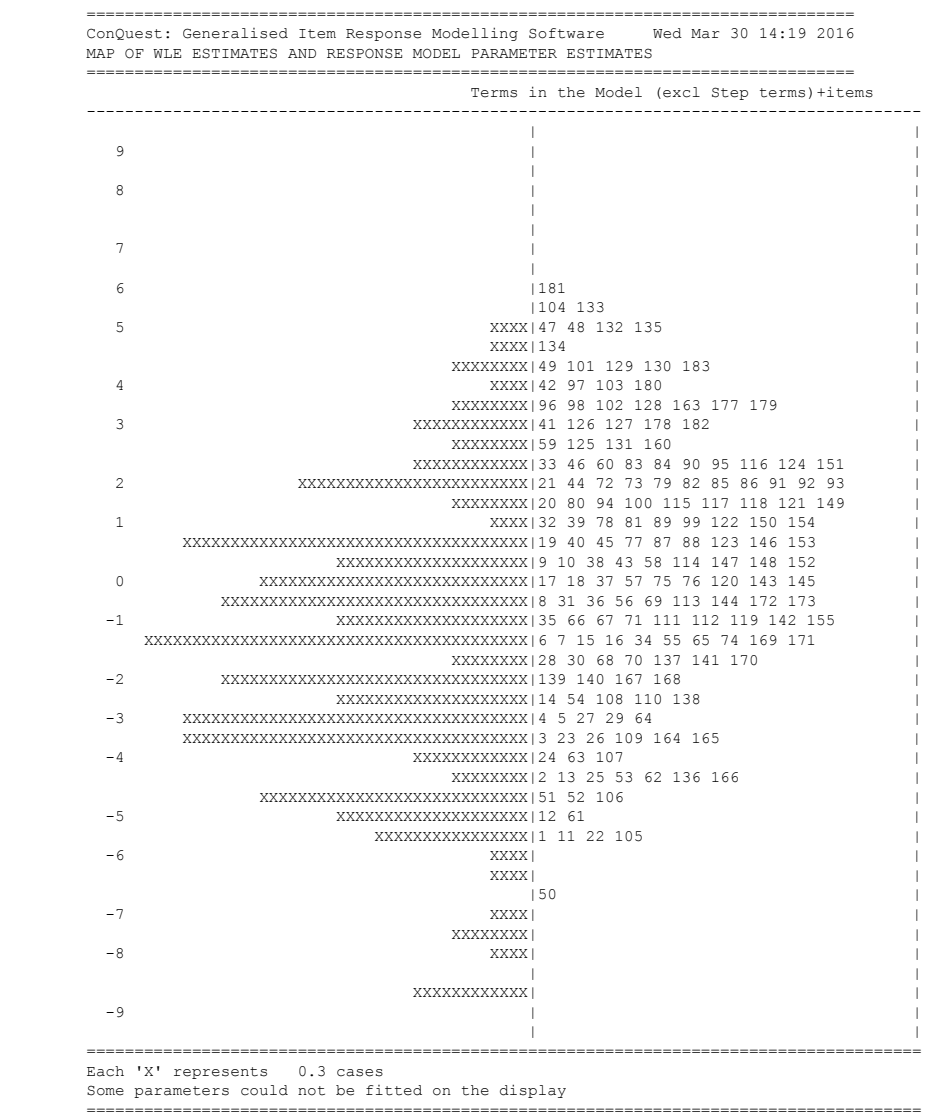


Figure 6-7: Variable map for literacy-writing

6.7. CHAPTER SUMMARY

This chapter provided a description of the recruitment process and demographic information related to students, teachers and schools in this study. It also detailed the calibration of items that were generated for the draft communication and literacy instrument. Review of the calibrated results demonstrated a sound spread of item difficulty and student ability that was well evidenced by high indices of reliability and discrimination. This calibration process identified some misfitting items that were subsequently reviewed and a small number excluded from further consideration. Chapter 7 reports on the refinement of the draft, calibration of the final instrument and development of standards reflecting increasing levels of student competence in communication and literacy.

7. CALIBRATION OF THE FINAL INSTRUMENT

This chapter reports on the data analysis, calibration and correlation of items for the final version of the instrument. It revisits the framework underpinning the construct and the process of refining the draft instrument to its final iteration. It concludes with the articulation of the levelled standards that have been empirically derived from data analysis of the instrument.

7.1. REFINEMENT OF THE DRAFT INSTRUMENT

As previously detailed, the indicators for the draft instrument were selected to represent a range of behaviours that could be observed by teachers in relation to students' developing competence within the domains of communication, reading and writing. Items were written to represent a continuum of ability, highlighting observable actions that reflected developing competence from minimal skill towards higher levels of knowledge and competency in the specified domains.

Refining the final version of the instrument and the development of performance standards necessitated an in-depth review of the entire draft instrument, leading to an overall reduction in the number of items for each mode, refinement of the construct framework and the development of draft levels. Each subdomain of the instrument was then recalibrated within ConQuest and items subsequently reviewed for their fit and correlation across subdomains. Performance standards were then developed for each section of the final instrument to reflect students' development along the continuum of proficiency for each subdomain.

7.1.1. Review of the instrument

ConQuest output files were generated for all sections of the draft instrument excluding those items that were identified for removal in chapter six. These output files were imported and reformatted within MS Excel spreadsheets, with indices relating to estimate, MNSQ and reliability presented with item numbers and labels for each item across the modes of communication-functions, communication-vocabulary, literacy-reading and literacy-writing.

Items within each section of the instrument were initially sorted by their focus area and estimate level. They were then organised into a rubric layout so that they could be easily reviewed and evaluated for both their horizontal and vertical alignment with other items.

Draft performance levels were identified and items separated into bands to reflect levels of increasing performance. Figure 7.1 illustrates this process using a sample section of the organisational structure for the communication-functions rubric. The columns define focus areas within the subdomains and rows horizontally progress from easy items at the top of the figure to increasingly difficult items at the base of the figure. The colours and spaces between rows represent draft performance levels.

Requesting Objects					Requesting assistance/actions			
114	CL2_1	-7.38	reach for preferred object to request item		129	CL3_1	-5.32	pull adult's hand to object to request assistance e.g. pull teacher to door and place their hand on the handle to get door opened
115	CL2_2	-5.47	place item in hard to open container in adult's hand to request e.g. packet of chips					
192	CE1_2	-4.98	lead a teacher towards an object to communicate a request		130	CL3_2	-5.2	give / offer play objects to an adult to initiate request for assistance
116	CL2_3	-4.3	attempt to point to a preferred object to request the item		131	CL3_3	-4.48	glance at adult for assistance when engaged in some familiar activities
117	CL2_4	-3.47	use a single word communication with teacher modelling to request object /activity		132	CL3_4	-2.88	use a single word communication with visual support to request assistance/action
118	CL2_5	-2.9	use a single word communication to request a preferred object/ activity					
119	CL2_6	-2.53	use a single word communication to request familiar objects/activities in the classroom		133	CL3_5	-2.28	use a single word communication to request assistance linked to a familiar activity
122	CL2_9	-2.45	use modelled phrase "I want" and 1 word communication to request objects/activities e.g. "I want chips"		134	CL3_6	-2.08	request a motivating action using a single word communication e.g. open, push, cut
120	CL2_7	-2.17	repeat some modelled 2 word communications to request objects/activities e.g. "want cup"		135	CL3_7	-1.79	use a single word communication to request action/assistance within familiar settings
121	CL2_8	-2.04	use 2 word communication to request objects/activities		137	CL3_9	-1.78	use 2 word communication to request action e.g. "open drink"
123	CL2_10	-1.36	use modelled phrase "I want" and 1-2 word communication to request an object/activity e.g. "I want blue texta"		136	CL3_8	-1.61	begin to repeat modelled 2 word communication to request assistance e.g. "help shoe"
124	CL2_11	-0.72	use 3-4 word communication to request a range of known objects and activities e.g." I want 2 cups"		138	CL3_10	-0.64	use 3 word modelled communication to request action e.g. "cut red paper"
125	CL2_12	0.6	request familiar objects and activities in 4-5 word sentences		139	CL3_11	0.52	use 3 word communication to request action e.g. "zip my coat"
					140	CL3_12	1.31	request assistance using a range of verbs in 4-5 word sentences
127	CL2_14	2.15	use complete sentences and correct grammar to appropriately request objects/activities e.g. "can I have the..."		143	CL3_15	1.86	request permission using appropriate phrases "can I go to....", "can I play with..."
					142	CL3_14	2.74	clearly identify issues and use appropriate phrases to request assistance e.g. "my shoelace is undone. can you help me?"

Figure 7-1: Sample section of the organisational structure for the communication-functions rubric

At this stage of the process the number of levels proposed for each mode varied from seven to eight. Following on from the establishment of the draft performance bands, the rubric for each mode was reviewed to identify items to be retained or removed.

7.1.2. Rationale for reducing number of assessment items

The main consideration in reducing the length of the instrument related to minimising the time taken for administration, as the four subdomains of the draft instrument combined included 609 items and was time-intensive to complete. The decision to remove an item was based on either single or multiple factors. While quantitatively equal distribution of items across each focus areas and estimate level was not expected, it was planned that there would be a reasonable spread of items for each mode. Decisions in relation to which items were retained were based primarily on their perceived validity in reflecting the construct and/or evidence of fit after a review of fit statistics.

In reviewing the calibrated items, it was evident that in some cases a better spread could be achieved in some areas of the subdomain rubrics. This would be accomplished by reducing the number of items in areas where there was a bulk in either a particular focus area, difficulty estimate range or both. The factors considered when identifying items to be retained or removed are detailed in the following sub-sections.

7.1.2.1. Multiple items within a foci with the same difficulty estimate

In some focus areas data analysis results indicated very little or no variation between the difficulty estimates of items that had been included to capture subtle variations. Table 7.1 provides an example of a dense cluster of items within a focus area that shared the same difficulty estimate. Shaded items were removed and the unshaded item retained. This pattern was most likely to occur for items reflective of higher level understandings.

Table 7-1: Dense cluster of same estimate items within the plan writing (PW) focus of the writing instrument

Item #	Label	Estimate	Item	Focus
124	WS2_22	6.57	create a simple plan using pictures before writing a simple text	PW
126	WS2_24	6.57	write, using a text type appropriate to the purpose, e.g. a story, a list, a procedure, a report	PW
127	WS2_25	6.57	describe the purpose of a text, e.g. to inform, to describe an event, to tell a story	PW
130	WS2_28	6.57	use size of writing, colour, layout and choice of media to help transmit messages, e.g. making a sign or a poster	PW
133	WS2_31	6.57	model writing on other texts, e.g. use words, phrases or sentence patterns from a teacher model or favourite story	PW

7.1.2.2. Item similarity

As indicators were written to capture very small shifts in development for students, some items reflected subtle variations that resulted in items generating a similar estimate level, leading to like items being clustered together in some focus areas. This is illustrated in Table 7.2 below, the shaded items were removed and unshaded items retained.

Table 7-2: Item similarity resulting in close clustering within the focus areas attributes (ATT-size) and concepts (CON) in the vocabulary section of the communication instrument

Item #	Label	Estimate	Item	Focus
20	CL9_4	0.26	point to/select an item based on its size when directed e.g. "show me short"	ATT
19	CL9_3	0.31	attempt to indicate an object to meet the criteria, for example long/short (choice not always correct)	ATT
61	CL12_12	4.88	identify 'left and right' sides of body in self consistently	CON
62	CL12_13	4.88	move self, left and right in response to a direction	CON

7.1.2.3. Fit analysis

As previously outlined, residual based fit statistics for this study were reported by ConQuest (Wu et al., 1998a) and examination of fit to the Rasch model focussed on examining differences between actual and expected scoring of persons and items. Consistent with the guidance outlined for the draft instrument, items with CTT discrimination values below .20 and MNSQ values below 2 were closely examined for evidence of fit and identification of misfit (Wu & Adams, 2007; Linacre & Wright, 1994). MNSQ values 2> are identified as likely to degrade a measurement system, while values between 1.5-2 may be unproductive but not degrading, and values <.5 are perceived as less productive but not degrading. Test reliability indices relating to item discrimination are also key considerations in measuring a test's value. Therefore, items with potentially misfitting CTT values below .20 were also a priority for review.

Fit statistics were also referenced in selecting which items to retain or discard when comparing like items within a similar ability estimate. Table 7.3 shows a sample of items, within the focus area of letter knowledge, at a similar difficulty range. Unshaded items were retained and shaded items were removed. Fit statistics for individual items were reviewed and those with the stronger result across both fit indices were generally retained.

Table 7-3: Fit statistics used to inform decisions relating to retention or removal of items

Item#	*Label*	*Estimate*	*MNSQ*	*Discrim*	*Item*
143	LK1_8	-0.01	1.21	0.65	recognise some letters of the alphabet by their distinct shape or association e.g. AFL
145	LK1_10	-0.02	0.79	0.77	recognise and label letter names in view
147	LK1_12	0.10	0.93	0.72	list the letters of the alphabet
148	LK1_13	0.25	1.3	0.63	recognise letters out of sequence
150	LK1_15	0.92	1.01	0.67	match upper to lower case letters
156	LK2_5	0.55	0.87	0.73	identify common letters in different words consistently, e.g. point to all the 't's in a sentence

7.1.2.4. Wording clarity

While all items were originally reviewed for clarity of expression, on final review some were considered less developed than others in their capacity to clearly pinpoint the observation required of teachers. Sometimes items combined multiple elements for observation that were likely to require differing skill levels to access. In one instance, there appeared to be a typing error or omission published in the test materials that impacted on item clarity. For example, in the writing instrument item WS2_03 'hold thick crayon or texta with whole' appeared to be missing the word 'fist' at the end of the item statement. This item and a few others perceived as lacking clarity were therefore excluded from the final instrument.

7.1.3. Reduction of items and impact on measures of separation reliability

A thorough review of items took place with the aim of reducing the overall number of items, to decrease the time required for its administration without degrading the instrument. The final version was reduced in length but still included a rich array of indicators for students across developmental levels.

Overall, the number of items was reduced from 609 to 348. A summary of the number of items retained and removed for each instrument is presented in Table 7.4 below.

Table 7-4: Summary of items removed from draft instrument

Domain		Total draft items	Items removed	Items retained

Communication	Functions	147	59	88
	Vocabulary	107	30	77
Literacy	Reading	183	92	91
	Writing	172	80	92
Full draft instrument		609	261	348

Table 7.5 identifies measures of separation reliability for each subdomain in both draft and final versions of the instruments. Results indicated that the variation between draft and final instruments for these indices was minimal for all subdomains.

Table 7-5: Comparison of WLE person separation reliability (WLE) and coefficient alpha (Alpha) indices of draft and final instrument subdomains.

	Functions		**Vocabulary**		**Reading**		**Writing**	
Version	***WLE***	***Alpha***	***WLE***	***Alpha***	***WLE***	***Alpha***	***WLE***	***Alpha***
Draft	.989	.99	.983	.99	.986	.99	.987	.98
Final	.982	.98	.978	.98	.977	.98	.980	.98

This can be viewed as evidence that although the number of included items had been reduced, those retained had been well selected in their capacity to separate students across the continuum of ability.

7.2. FINAL CALIBRATION OF COMMUNICATION AND LITERACY INDICATORS

This section outlines the final calibration processes applied to the communication and literacy instruments. As in the initial process, each mode was analysed separately. Communication was analysed in two sections, functions and vocabulary, and literacy in the sections, reading and writing. After the review of items, those retained in each mode were reanalysed within ConQuest, to calibrate individual items within the subdomains of communication, reading and writing, the same process as utilised with the draft instrument.

There was a substantial reduction in the number of items between the draft and the final instrument. This reduction occurred over multiple iterations and reanalyses, as any adjustment made within the instrument, had the potential to vary the estimate levels and fit of individual items because of the interrelated nature of these processes. Therefore, each section of the instrument was reviewed numerous times in response to single or

multiple items being removed. The analysis contained in the following sub-sections relates to the final version of each subsection of the instrument.

7.2.1. Analysis of missed responses across all domains

As noted in Chapter 6, it was hypothesised that a proportion of participants overlooked easier items and commenced marking items for more capable students in a mid-zone of item difficulty. Evidence was presented to support the researcher's hypothesis that items with the lowest response rates were all below the mean of difficulty for items within each subdomain. Items from a mid-range of difficulty demonstrated less missed responses, whilst items for the most difficult items were perceived as generating the most consistent teacher responses. As a result, the conservative approach of identifying responses as missed, rather than 'not present', was applied to patterns of skipped items, with the majority of missed item responses the result of the recoding.

Table 7.5 presents a summary of the frequency of teachers' missed responses in each mode of the instrument. In the final analysis, 6.36% of the data for communication-functions and 3.57% of the data for communication-vocabulary was coded as missing. Of the overall data for the literacy section, 5.22% for reading and 4.44% for writing were missing.

Table 7-5: Summary of missed responses across modes

Domain	***Focus***	***Percentage of missing data***
Communication	Functions	6.36%
	Vocabulary	3.57%
Literacy	Reading	5.22%
	Writing	4.44%
	Overall average	4.86%

The number of missed responses was relatively low for vocabulary and writing and moderate for functions and reading. As the overall percentage of missed data for the instrument prior to recoding was <.03 it was evident that this process was the cause of the increased percentage of missed responses.

7.2.2. Communication-functions

This section identifies the calibration process applied to the items comprising the communication-functions section of the instrument. The full output files for the communication-functions instrument are available in Appendix O. Estimates of student

ability and item difficulty were plotted on a variable map to illustrate the relationship, using the same axis, between student ability and item difficulty, expressed as logits.

The variable map in Figure 7.2 reflects only those items included in the final version of the communication-functions section of the instrument.

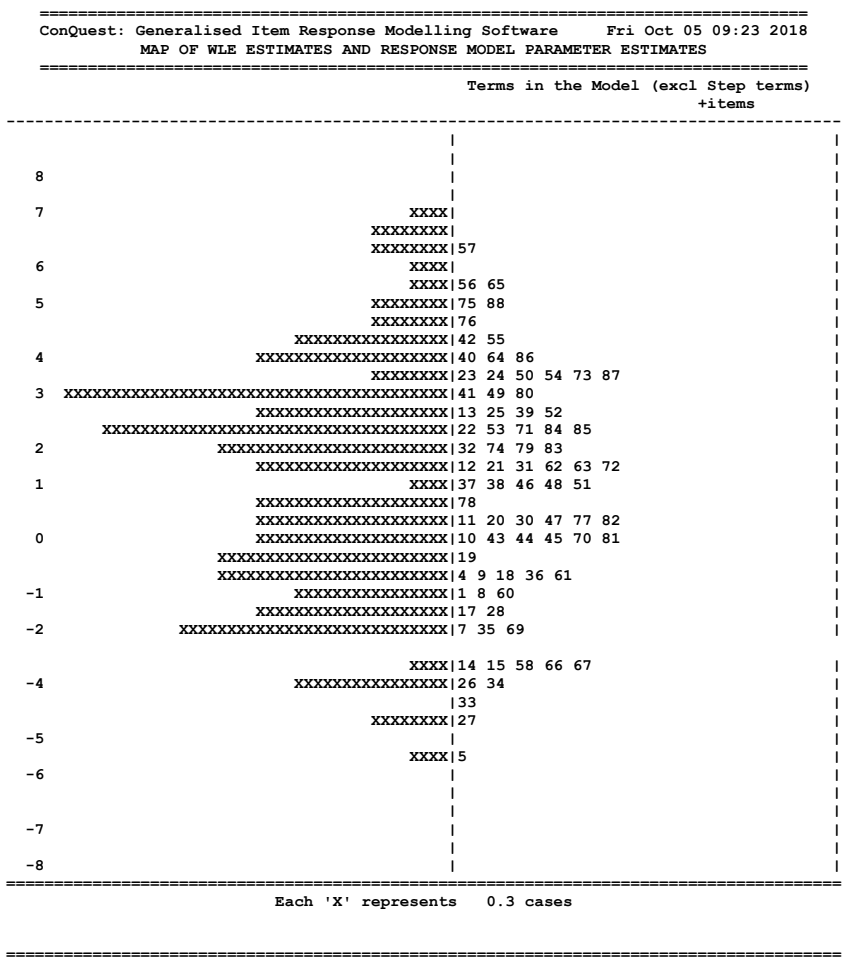


Figure 7-2: Variable map for communication-functions

The variable map in Figure 7.2 shows a broad spread of item difficulties, providing a strong match to students with diverse abilities. The communication-functions variable map, considered in conjunction with high item and WLE person separation indices of 0.982 for reliability and coefficient alpha at .98, indicate that performance quality criteria were well balanced across the variable, with a strong capacity to separate students based on their estimated ability.

7.2.2.1. Items subject to further review within communication-functions

The statistics generated by the analysis include indices of item difficulty and discrimination statistics that were reviewed to assess the technical quality of the instrument. The two items flagged for further review are shown in Table 7.6 below. The MNSQ indices for items 14 and 26 showed some misfit, with ranges of 1.65 and 1.68 respectively. Discrimination value for item 14 was .21 which was in an acceptable range, however item 26 had a poor discrimination value of .06.

Table 7-6: Summary of misfitting communication-functions items for review

Item #	*Label*	*Estimate*	*MNSQ*	*Discrim*	*Items*
14	CL3_1	-3.51	1.65	0.21	pull adult's hand to object to request assistance e.g. pull teacher to door and place their hand on the handle to get door opened
26	CL4_1	-3.79	1.68	0.06	begin to respond through 'accept' or 'reject' gestures or actions e.g. extend hand to receive, push unwanted item away

Further review identified that this was an easier item, targeted to students moving from pre-intentional to intentional communication. A low discrimination score could be interpreted as evidence that the item did not discriminate between low and high ability students as predicted by the statistical model. However, it is also possible that teachers had not marked these items as achieved because they were assessing students of higher ability who had moved towards more sophisticated communicative skills. If the student being assessed did utilise the identified action captured by the item it would be characterised as immature in contrast to their current level of functioning. Given limitations in the scoring options for teachers that did not allow teachers to mark skills as surpassed and the hypothesis that this had influenced teacher marking these items were retained on the basis of their perceived validity in capturing the competence of students at very early ability levels. MNSQ indices for the identified items were only marginally outside the recommended parameters, therefore these items would not degrade the measure.

7.2.3. Communication-vocabulary

This section provides a summary of the calibration of items for the vocabulary strand of the communication instrument. The ConQuest analysis included indices of item difficulty and discrimination statistics that were reviewed to assess the technical quality of the

instrument. The full output files for communication-vocabulary utilised in the analysis are available in Appendix P.

The communication-vocabulary variable map (Figure 7.3) illustrates that the indicators were well spread along the axis of the variable. This is confirmed by the separation reliability coefficient for the calibrated items noted as 0.985. Additionally, a strong result for WLE person separation reliability at .977 suggests that indicators were well selected in their capacity to separate students based on their knowledge of vocabulary.

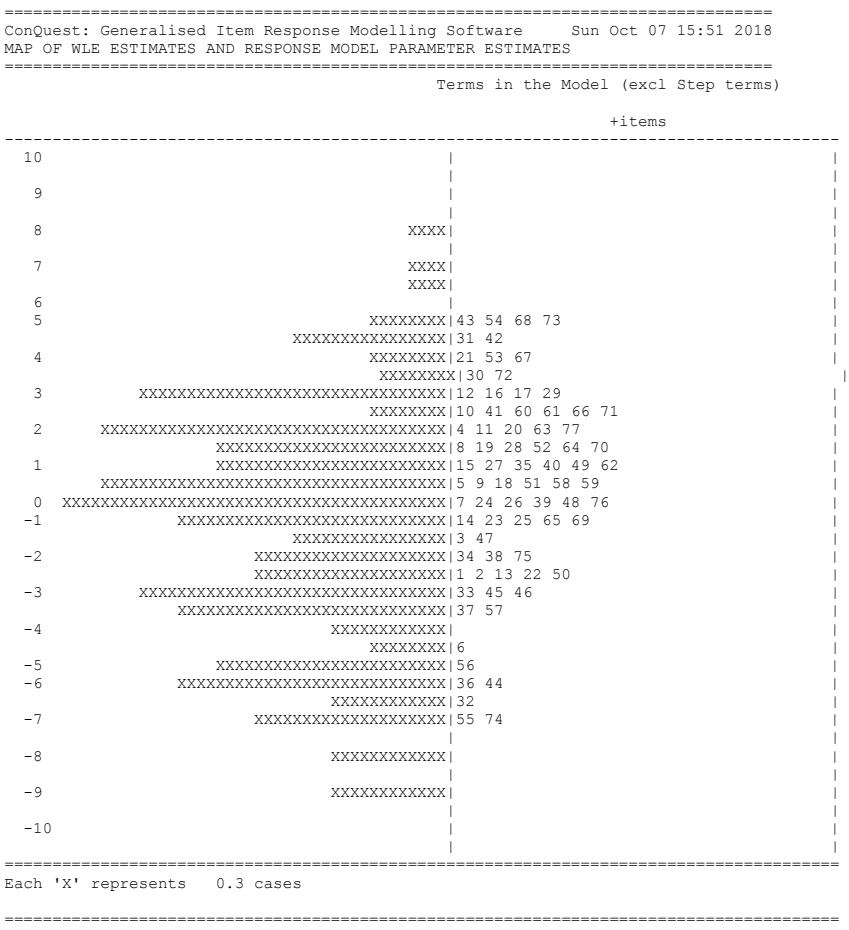


Figure 7-3: Variable map for communication-vocabulary

7.2.3.1. Items subject to further review within communication-vocabulary

Only one item within communication-vocabulary was further analysed on the basis of a MNSQ result that required review, as identified in table 7.7 below. Item 44 was intended as an easy item which was established with an identified difficulty estimate of -6.00. Review of the ICC for this item shows an upwardly trending ICC from low to mid ability ranges. As this item requires coactive support that had likely limited the absence of not

observed responses by teachers so the probability of a correct response was less than what might be typically predicted by the Rasch model. However, the ICC showed the item's capacity to discriminate between students of lowered ability within the -8 to 0 ability range, while students above this range were able to demonstrate the skill without variation.

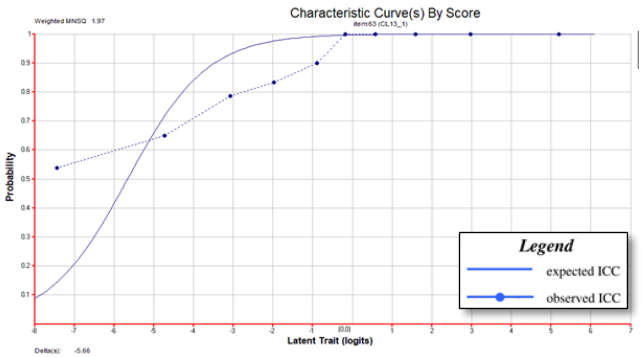


Figure 7-4: ICC for item CL13_1

After consideration of potential contributing factors, it was decided that the fit index for MNSQ would not degrade the measure and that the item would be retained. All other items within the subdomain of vocabulary demonstrated strong discrimination indices between .34-.81.

Table 7-7: Summary of misfitting communication-vocabulary items for review

Item #	*Label*	*Estimate*	*MNSQ*	*Discrim*	*Items*
38	CL13_1	-6.00	1.95	0.40	coactively select 'one' item when supported

7.2.4. Literacy-reading

This section provides an overview of the calibration of items for the literacy-reading instrument. The statistics generated by the analysis include estimates, item discrimination and response statistics that were reviewed to assess the instrument's technical quality. A summary of the full output files for literacy-reading utilised in the analysis are available in Appendix Q.

The literacy-reading variable map (Figure 7.5) illustrates that the indicators were well spread along the axis of the variable. This is confirmed by the separation reliability

coefficient for the calibrated items noted as 0.985. The WLE person separation reliability result of 0.977 suggests that indicators were well selected in their capacity to discriminate between students based on their competency within the reading strand.

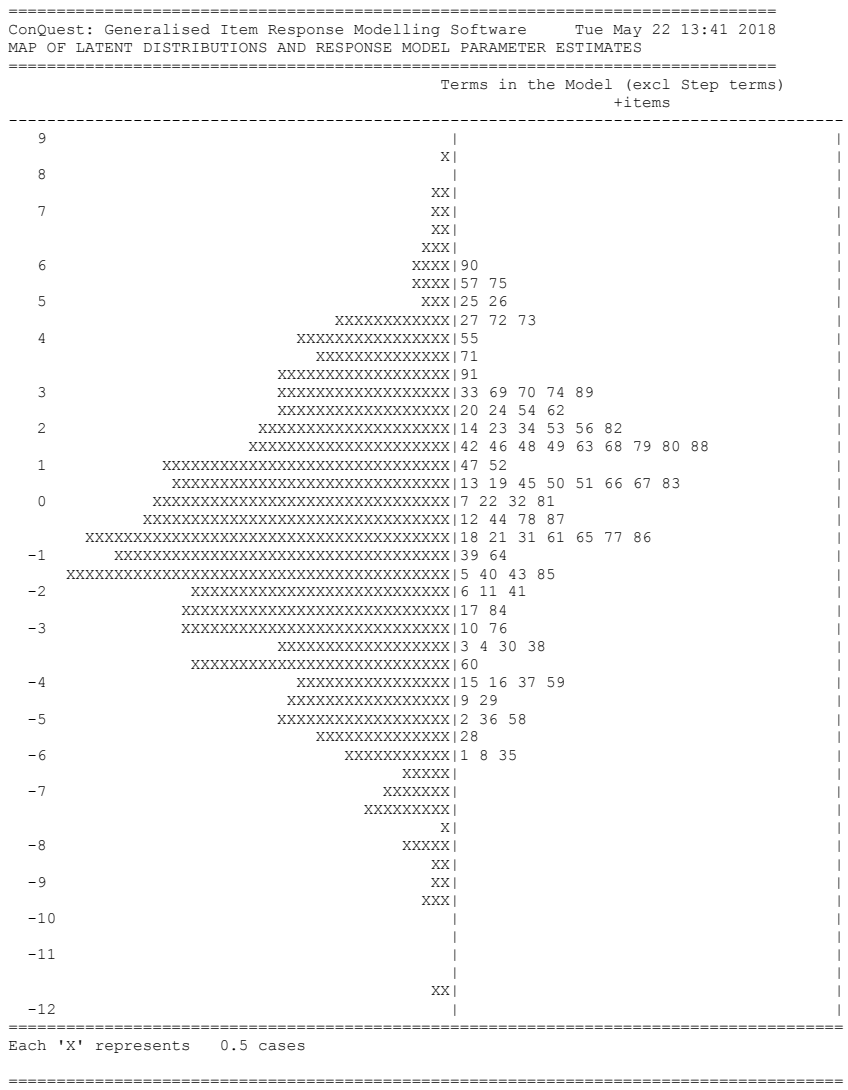


Figure 7-5: Variable map for literacy-reading

7.2.4.1. Items subject to further review within literacy-reading

No items were identified for further review of fit. There were no misfitting MNSQ results below .5 or above 1.5 and indices for all items varied between .53-1.48. Discrimination indices varied between .22-.80, which was indicative of a clear capacity to separate students on the basis of ability.

7.2.5. Literacy-writing

This section outlines the calibration process applied to the items comprising the literacy-writing strand of the instrument. The output files for literacy-writing utilised in the analysis are available in Appendix R. The literacy-writing variable map (Figure 7.6) illustrates that indicators were well spread along the axis of the variable. This is confirmed by the separation reliability coefficient for the calibrated items noted as 0.977. The result for WLE person separation reliability at 0.980 suggests that indicators were well selected in their capacity to separate students on the basis of their competency within the literacy-writing strand.

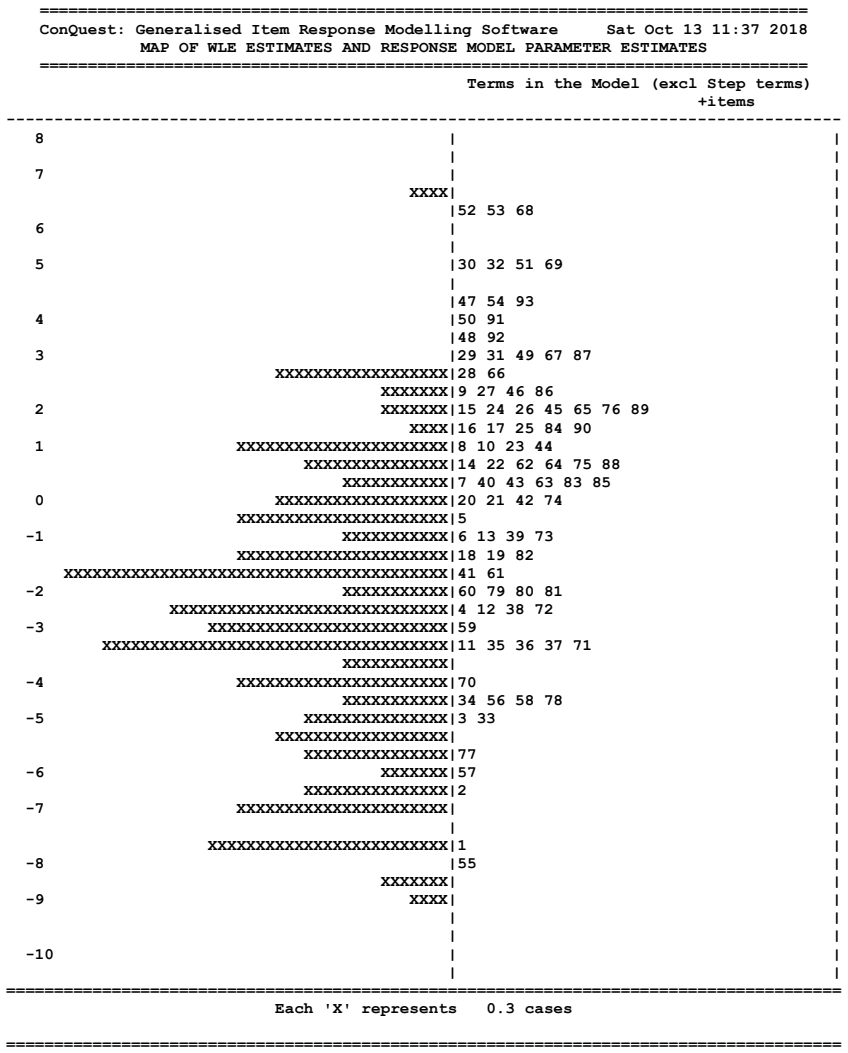


Figure 7-5: Variable map for literacy-writing

7.2.5.1. Items subject to further review within literacy-writing

Three items were identified for further discussion, as shown in Table 7.8.

Table 7-8: Literacy-writing items for review

Item	*Label*	*Estimate*	*MNSQ*	*Discrim*	*Item*
52	CW2_20	6.972	0.35	.29	link sentences using common conjunctions and connectives, e.g. but, after, when
53	CW2_21	6.972	0.35	.29	use some punctuation consistently, e.g. full stops, question marks, commas
68	WS2_23	6.29	0.35	.29	use a variety of simple text structures, e.g. a title, an opening, ending, caption

Items 52, 53 and 68 were reviewed within the context that lowered discrimination scores were likely to be a reflection of the restricted number of students able to demonstrate these high ability skills. Though technically misfitting, MNSQ below .5 can also be considered more discriminating than anticipated by the Rasch model and therefore worthy of retention (Wu & Adams, 2007). Figure 7.7 shows the ICC for items 53 which was the same for items 54 and 55 and reflects the MNSQ of .35.

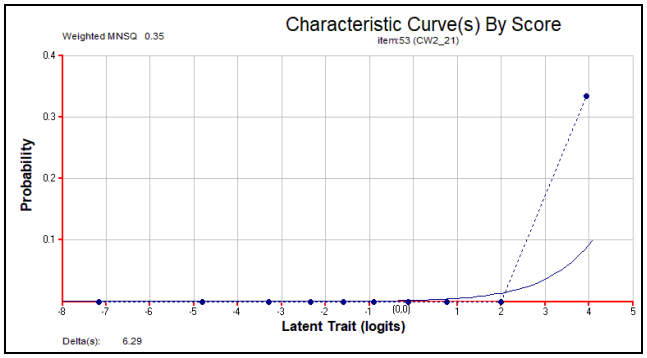


Figure 7-7: ICC reflecting MNSQ .34 for items 53

The observed curve was demonstrably steeper than the expected curve, reflecting that the items were more discriminating than anticipated. A review of responses for this item revealed that across these three items only one student for each item was marked as having mastered the item, indicating that it posed a high degree of difficulty for the cohort assessed. It was deemed likely that continued inclusion of the examined items would likely enhance rather than derogate the instrument, so all items were retained.

7.3. EXPLORATION OF CORRELATION BETWEEN COMMUNICATION AND LITERACY SUBDOMAINS

Review of fit data and content of individual items within each mode indicated that the sequencing of low to high ability items was sound. However, as the instrument was designed to measure the integrated construct of communication and literacy further exploration and articulation of the relationship between the modes was desirable. Initially, correlation analysis was conducted within MS Excel to identify the degree to which subdomains correlated with each other in their measurement of student ability. Student raw scores for paired subdomains were correlated in separate analyses covering all possible subdomain combinations. The results can be seen in table 7-9 below.

Table 7-9: correlation of instrument sections

	Functions	*Vocabulary*	*Reading*	*Writing*
Functions		0.94	0.89	0.84
Vocabulary	0.94		0.94	0.89
Reading	0.89	0.94		0.90
Writing	0.84	0.89	0.90	

An extremely high degree of correlation was evident between the communication subdomains of functions: vocabulary (0.94) and vocabulary: reading (0.94) subdomains. A very strong relationship was also demonstrated between functions: reading, vocabulary: writing and reading: writing (0.90, 0.89 and 0.90 respectively). The lowest correlation was between functions: writing however, this was still substantial at .84.

Vocabulary was selected as a benchmark for initially anchoring likely estimate ranges of derived standards across all the subdomains as it possessed the strongest overall correlation with functions and reading. In addition, the writing subdomain shared a similar degree of correlation with vocabulary as it did with reading.

The high correlation of students' raw scores across all modes is indicative that students are likely to perform at a similar levels across all test subdomains, with due adjustment to the relative difficulty of each test. While the correlation data suggests that this is the likely outcome there is also the potential that individual students will demonstrate relative

strengths in specific modes of the instrument, resulting in an uneven skill profile across the different modes.

7.3.1. Review of test difficulty and standard variation

Table 7-10 shows the average of students' raw scores, expressed as a percentage of the total number of test items scored correctly in each subdomain. When compared average scores indicate the relative difficulty of each mode of the instrument and revealed that subdomain tests varied in difficulty and to a modest degree in standard variation.

Table 7-10: Subdomain values for test difficulty and standard variation

	Functions	Vocabulary	Reading	Writing
Average raw score	47.30%	38.76%	34.64%	27.16%
Standard variation	0.27	0.29	0.25	0.21

When ordered from easiest to most difficult the subdomains were; functions, vocabulary, reading, writing. The ordering of the subdomains, relative to test difficulty was consistent with developmental expectations outlined in the literature review and construct framework. Given the likely developmental sequence experienced by children in relation to mastering a range of communication functions and vocabulary, as a foundation for reading and writing, the results provide a sound endorsement of the developmental continuum underlying the construct map design.

The average raw score for students on the 'easiest' subdomain test was functions at 47.30% whereas the average writing subdomain score on the 'hardest' test was substantially lower at 27.16%. Vocabulary and reading subdomains showed the smallest difference in test difficulty with average scores of 38.76% and 34.64% respectively.

Standard variations were relatively stable across the four subdomains of the instrument. The greatest variation existed between vocabulary and writing with the standard deviation expressed respectively as .29 and .21. The standard deviation for the subdomains of functions (.27) and reading (.25) fell between these two measures.

Further examination and comparison of items across subdomains was utilised to anchor ability estimates and standards across all modes of the instrument. Final items from the communication subdomains of functions and vocabulary, vocabulary functions with reading items, and reading with writing items were recalibrated as three separate analyses

for further comparison. Response data for the final items of the combined subdomains were calibrated and analysed for all modes consistent with IRT processes previously documented. The output files generated by ConQuest for these analyses can be reviewed in full in Appendix R and are explored in the following subsections.

7.3.2. Matching communication functions and vocabulary subdomain items

Communication-functions and vocabulary were calibrated on the same scale to ensure that the standards developed reflected the types of vocabulary items students might demonstrate attainment of when they achieved a similar ability level in communication-functions. Figure 7.8 shows a variable map of combined communication-functions and vocabulary items. Vocabulary items have been shaded in order to highlight their positioning amongst the estimate range of each subdomain.

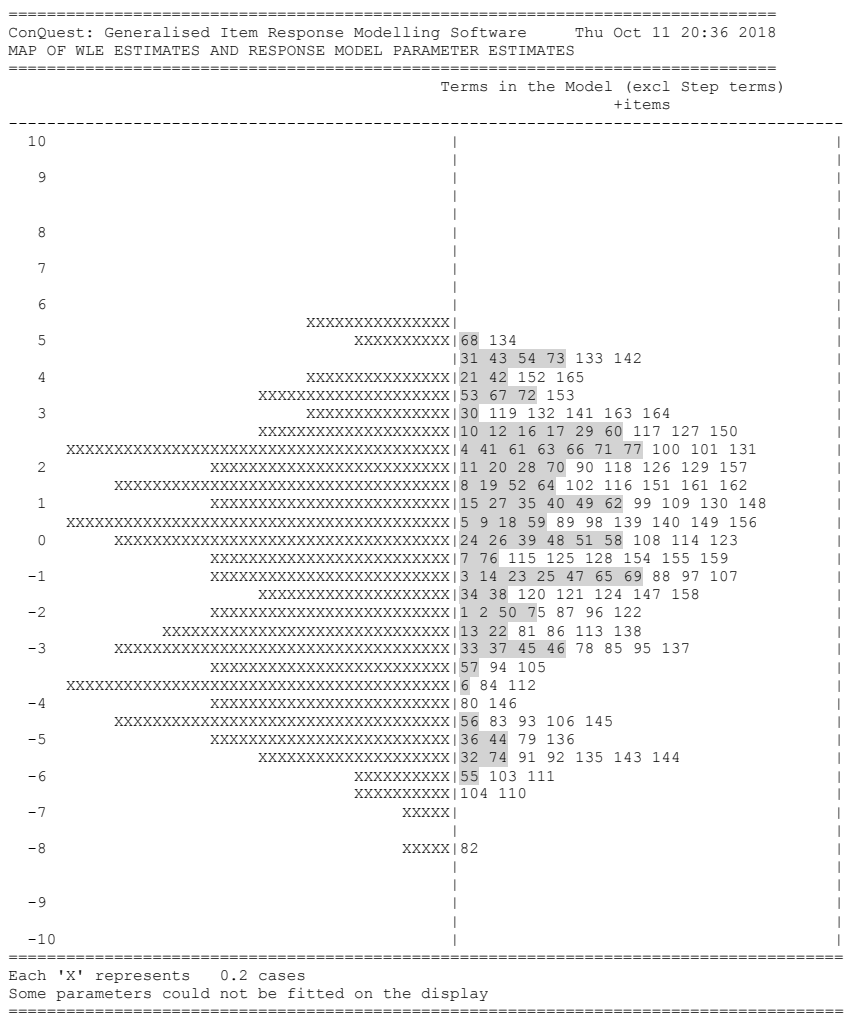


Figure 7-8: variable map of combined communication-functions and vocabulary items

When combined it was evident that functions items in the final instrument included significantly more low ability items than were present for vocabulary at a similar ability range. This was consistent with the premise highlighted in the literature review that communication can exist where language, or vocabulary, does not (Frith & Happé, 1994). At higher ability estimates there were a greater number of vocabulary items, indicating that while foundational communication functions may have been mainly mastered at this level there was significant breadth for vocabulary growth at higher ability ranges.

7.3.3. Matching vocabulary and reading subdomains

Vocabulary and reading were calibrated and analysed together to ensure the standards developed were reflective of the correlation between reading and vocabulary skill development. Figure 7.9 shows a variable map of both vocabulary and reading items with vocabulary items highlighted to distinguish the estimate range of each subdomain.

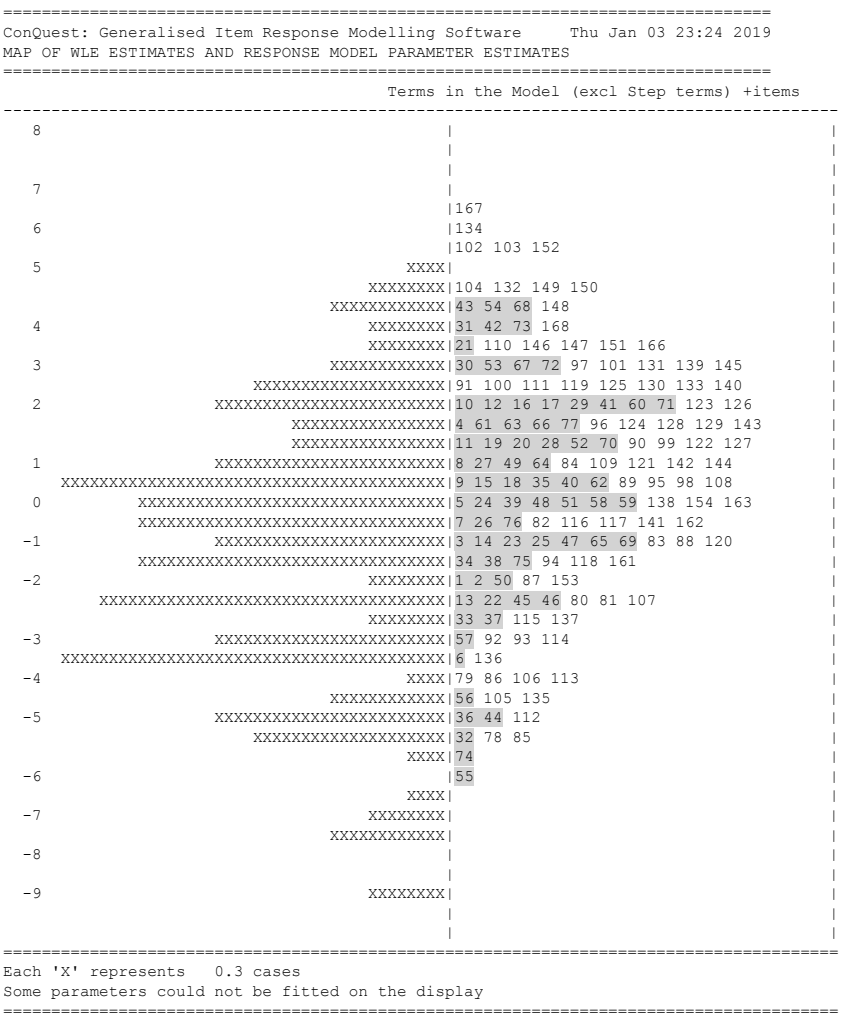


Figure 7-9: variable map of combined vocabulary and reading items

Exploration of the variable map reveals that the lowest ability items are all drawn from the vocabulary subdomain and the highest ability items are reading items. This indicates that performance standards created at the lowest and highest levels would be likely to be dominated by alternate subdomains. Given that an individual must develop their understanding of both language and symbolic representation in order to read with comprehension, the variable map is reflective of an anticipated developmental profile in which some vocabulary must be present before reading competence can progress. At higher levels the variable map displays many more reading than vocabulary items, potentially reflecting that a significant grasp of vocabulary must be achieved to underpin mastery of reading items at the higher ability estimate ranges.

7.3.4. Matching literacy reading and writing subdomains

The blended pool of reading and writing items was analysed to evaluate contribution to the standards development. Correlation of the instrument subdomains for reading: writing was estimated as .90 (table 7-9), a slightly reduced relationship than identified for functions: vocabulary at .93 and vocabulary: reading at .92. Ability allocation and sequencing of items across the variable map were reviewed carefully for evidence of capacity to support coherent links with ability estimates in other subdomains. The variable map in figure 7.10 shows both reading and writing items. Reading items have been shaded.

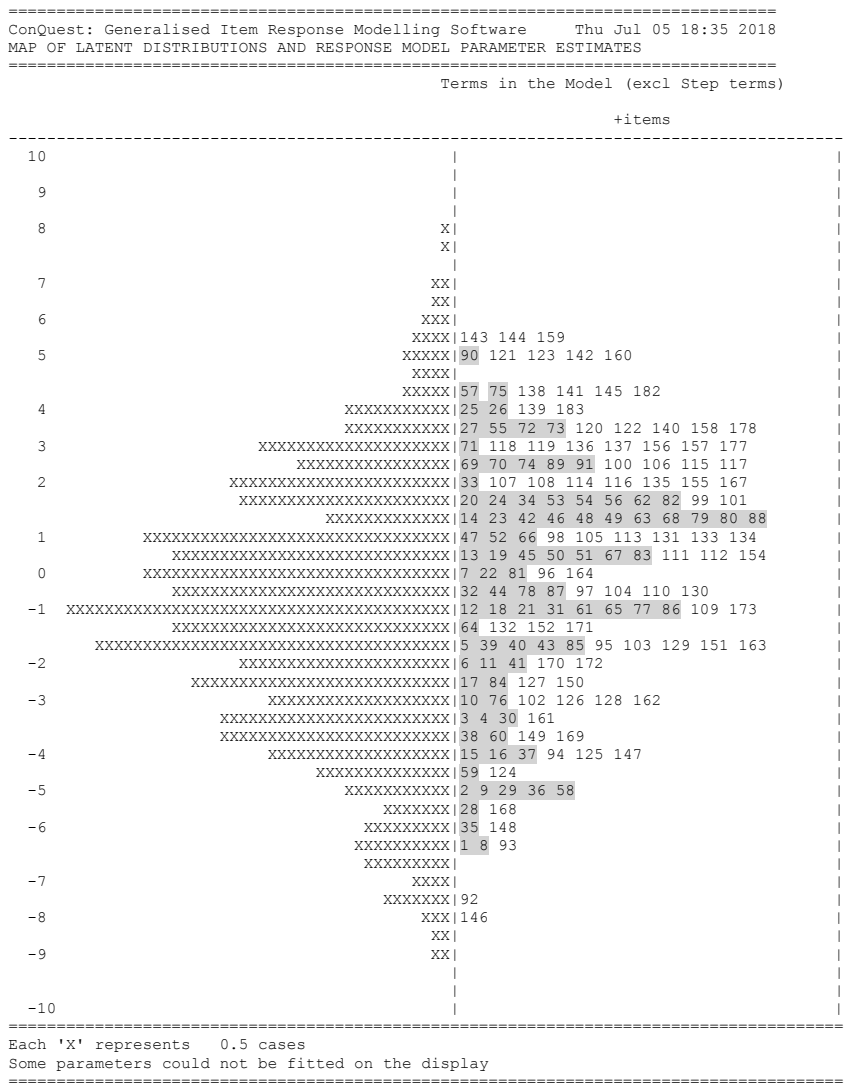


Figure 7-10: variable map of combined literacy-reading and writing items

Review of the variable map revealed a broad spread of items across ability levels. At the lowest ability range writing items outnumbered reading and the highest ability items were also drawn from the writing subdomain.

The combined output was cross referenced and reviewed to inform the proposed standards for each of the subdomains. Masters and Forster (1996) identify learning progressions as:

> …a description of skills, understandings and knowledge in the sequence in which they typically develop: a picture of what it means to 'improve' in an area of learning (p.1)

To inform the development of learning progressions the calibrated item difficulty estimates were used to organise items in order from least to most difficult in each of the instrument subdomains. Subsequent review by the researcher focussed on examining the ordering of items and identifying where cut points might be included to reflect developmental shifts of proficiency for students. Seven levels of proficiency were identified and empirically based learning progressions were developed based on the calibrated order of items, reflecting the pathways students with ASD are likely to follow in their development of competence, relative to each subdomain. Derived standards developed for all subdomains of the instrument are outlined in the following sections.

7.4. DERIVED STANDARDS FOR THE RESEARCH INSTRUMENT

The following tables identify items included in the final version of the instrument and reflected in the derived standards developed for each subdomain.

7.4.1. Communication-functions derived standards for the subdomain

Table 7-13: Item, estimate and derived standard for communication-functions, Level A

Label	Estimate	Item	Derived standard
CL2_1	-5.582	reach for preferred object to request item	While students may not communicate with intent meaning might be assignable to their actions by an observer. When these are consistently reinforced with a response that interprets the action as communicative, the student is more likely to be used to communicate intentionally in the future.
CL4_2	-4.585	demonstrate an understanding through behaviour of no/not allowed to have e.g. protests	

Table 7-14: Item, estimate and derived standard for communication-functions, Level B

Label	Estimate	Item	Derived standard
CL5_1	-4.425	respond to some visuals and key words linked to familiar and motivating routines and activities	Students are beginning to demonstrate intentionality in some of
CL5_3	-3.847	respond to one word instructions within the classroom e.g. “come” “finish”	

CL4_1	-3.789	begin to respond through 'accept' or 'reject' gestures or actions e.g. extend hand to receive, push unwanted item away	their communicative behaviour within the context of familiar routines and with scaffolding from adults. Attempts to engage jointly with another increase in frequency and quality while student's actions are more clearly indicative of their requests and protests.
CE1_3	-3.693	glance at a teacher in a 1:1 setting when engaged in a motivating activity	
CL3_1	-3.507	pull adult's hand to object to request assistance e.g. pull teacher to door and place their hand on the handle to get door opened	
CE2_2	-3.437	respond to greeting/ farewell by glancing at a familiar person	
CE2_1	-3.436	respond to familiar people e.g. turn towards or away	
CL3_2	-3.388	give / offer play objects to an adult to initiate request for assistance	
CE1_4	-3.343	make brief eye contact & *g*esture towards inaccessible item to communicate a request for the object	
CL_2	-3.164	look briefly at adult when called by name in familiar environments	

Table 7-15: Item, estimate and derived standard for communication-functions, Level C

Label	Estimate	Item	Derived standard
CE2_3	-2.914	use a gesture/word to respond to a greeting/farewell with teacher direction	Students begin to use a small bank of single communications, inclusive of gesture, word and photo/pictograph, to request and reject objects and actions with familiar adults in routine environments. They are becoming more purposeful in attempts to engage communicative partners
CL3_3	-2.756	glance at adult for assistance when engaged in some familiar activities	
CL2_3	-2.647	attempt to point to a preferred object to request the item	
CL4_4	-2.523	reject an action/activity by using "no", "bye", "finish" e.g. say "bye", place item in a finish box	
CL_3	-2.439	stop an activity briefly when name called in familiar environments	
CE2_4	-2.164	use a single word/gesture to respond to greet/farewell a familiar person	
CL2_4	-1.959	use a single word communication with teacher modelling to request object /activity	
CL5_4	-1.793	demonstrate through response understanding of safety words e.g. "stop", "wait", "no", "don't"	
CL4_3	-1.652	react when cross is placed over preference to indicate it is unavailable	
CL3_4	-1.423	use a single word communication with visual support to request assistance/action	
CE1_5	-1.249	gain another person's attention by saying their name or tapping their arm/hand when supported by a teacher	
CL2_6	-1.124	use a single word communication to request familiar objects/activities in the classroom	
CL_7	-1.104	respond to questions about personal possessions with own name e.g. "whose book?" "Dan's book"	
CL3_5	-0.903	use a single word communication to request assistance linked to a familiar activity	

Table 7-16: Item, estimate and derived standard for communication-functions, Level D

Label	Estimate	Item	Derived standard
CL5_7	-0.897	follow 2 part related directions connected to familiar routine e.g. “get your hat and go to the door”	Students use some two-word communications to request and decline activities and objects. They are refining their joint attention with others and responding to simple requests and directions in routine contexts. Students respond to simple questions in context with visual or gestural cues and may imitate longer utterances that have been modelled for them.
CE1_6	-0.712	approach and gain a person’s attention spontaneously in familiar settings	
CL2_8	-0.673	use 2 word communication to request objects/activities	
CL_5	-0.66	respond when name is called in an unfamiliar environment	
CL3_9	-0.497	use 2 word communication to request action e.g. “open drink”	
CL6_3	-0.123	answer ‘what’ questions in relation to familiar objects/ activities e.g. “what’s this?”	
CL2_10	-0.079	use modelled phrase “I want” and 1-2 word communication to request an object/activity e.g. “I want blue texta”	
CL6_2	0.043	answer “who” questions in relation to familiar person e.g. “who?” with gesture toward known person	
CE2_6	0.082	sometimes combine familiar person’s name with greeting or farewell e.g. bye/hi mum	
CL6_1	0.13	respond to questioning tone by pausing in an activity &/or glancing at the speaker	
CE6_3	0.153	point to item of interest to engage an adult	
CL6_5	0.339	answer “what” questions relating to a picture that is shown e.g. “what’s this?”	
CE6_4	0.471	show a favourite item to a significant person	

Table 7-17: Item, estimate and derived standard for communication-functions, Level E

Label	Estimate	Item	Derived standard
CL2_11	0.48	use 3-4 word communication to request a range of known objects and activities e.g." I want 2 cups”	Students use 3-4 word communications when requesting and declining and respond to simple questions and instructions. They are developing their attentional focus in small groups and engage in social interaction through sharing simple comments and responses.
CL3_10	0.538	use 3 word modelled communication to request action e.g. “cut red paper”	
CE5_1	0.549	show an object/ photo to a small class group and make a comment with teacher support	
CL4_6	0.583	use yes/no responses to consistently indicate likes and dislikes	
CE5_3	0.746	make simple comments during familiar activities, e.g. ‘look, red car”	
CL5_9	1.024	follow 2 part directions related to a single task e.g. “get an egg and crack it into the cup”	
CL6_6	1.035	answer ‘where’ questions relating to a picture that is shown e.g. “where is…?”	
CL6_4	1.19	answer “who” questions in relation to familiar people e.g. “who drove the bus?”	
CL7_1	1.247	ask “what” questions to identify objects e.g. “what’s this?”	

CL5_8	1.376	follow routine 2 part directions relating to objects not in view e.g. “go to the kitchen and get the big bowl	
CL4_9	1.514	use “I don’t want…” with an appropriate tone to reject or refuse	
CL3_11	1.585	use 3 word communication to request action e.g. “zip my coat”	
CE1_7	1.6	approach, gain attention and wait for response before making request	
CL2_12	1.66	request familiar objects and activities in 4-5 word sentences	
CE4_6	1.735	attend appropriately to others in a small group and shift attention appropriately to other speakers	
CE1_9	1.737	raise hand to gain attention when action has been modelled	
CE6_7	1.796	respond to another’s conversation by repeating or using a 1-2 word communication	
CE5_5	2.027	make 1-2 related comments within an activity e.g. “car is going”, “fast red car”	

Table 7-18: Item, estimate and derived standard for communication-functions, Level F

Label	Estimate	Item	Derived standard
CL4_12	2.03	use prohibiting language to control the behaviours of others e.g. “don’t do that”, “stop pushing me”	Students consistently use phrases of 4-5 words to communicate and generally establish joint attention effectively prior to engaging in communicative acts. They comment to draw attention to items and events of personal interest and respond to questions and requests from others. They can take turns in short conversations and share past information about events of interest.
CE4_8	2.102	follow a classroom discussion about familiar topics or new topics that are well supported by visual material	
CE2_9	2.181	initiate greetings to fellow students, teachers and significant others	
CL7_4	2.239	ask “where” questions to identify location of familiar objects and people	
CL3_12	2.247	request assistance using a range of verbs in 4-5 word sentences	
CE6_11	2.351	engage in simple conversations of up to 2 turns	
CE6_10	2.47	give news about a past personal experience using a 3-4 word communication	
CL5_10	2.657	follow 2 part directions not related to familiar routines	
CL3_15	2.711	request permission using appropriate phrases “can I go to....”, “can I play with...”	
CL7_3	2.779	ask “who” questions to identify people	
CL2_14	2.959	use complete sentences and correct grammar to appropriately request objects/activities e.g. “can I have the...”	
CL6_9	3.049	answer questions asked by peers incidentally	
CL5_12	3.057	follow 2 –3 part instructions that include referential language for objects in view e.g. “get the blue cup next to the jug”.	

CE5_7	3.359	show an item to a small class group and makes 2 – 3 comments.
CE4_7	3.393	attend appropriately to others in a large group shifting attention between consecutive speakers
CL3_13	3.487	negotiate simple social or learning activities by suggesting, initiating or directing, e.g. Play football? Later?
CL3_14	3.487	clearly identify issues and use appropriate phrases to request assistance e.g. "my shoelace is undone. can you help me?"
CL7_5	3.572	ask questions of another student about items in the immediate environment
CL6_11	3.677	answer how & why questions related to simple familiar sequences e.g. making toast
CE6_14	3.76	participate in short, structured social interactions, e.g. exchanging basic information about family, school
CL5_11	3.795	question to check meaning, to clarify, or to confirm, e.g. Teacher: "put it in your book." Student: "home book?"
CE6_13	3.975	sequence 3 or more ideas, when relating past events about personal experiences with visual supports
CE1_12	4.104	raise hand and wait for teacher to acknowledge before answering/ asking question or making comment

Table 7-19: Item, estimate and derived standard for communication-functions, Level G

Label	Estimate	Item	Derived standard
CL7_6	4.334	ask questions using *why* and *how* to teacher to request an explanation, e.g. "why is there no library?"	Students have a grasp of language and grammar conventions and use these to fulfil a wide breadth of communicative functions. They show awareness of a range of social conventions and attempt to apply these in their interactions. Students may attempt to consider their listener's perspective and interests when conversing.
CL5_14	4.344	follow a short sequence of instructions related to classroom procedures or learning activities, e.g. book borrowing procedures, rules for using the class computer, order information from a short spoken text using pictures	
CE4_14	4.585	express ideas, humour, simple opinions and describe feelings, e.g. I am very happy	
CE6_15	4.988	maintain a topic of conversation for 3-4 turns matching comments to topic	
CE4_12	5.001	talk about class topics in class discussions	
CE1_13	5.486	raise hand to gain attention and if not called upon by teacher to respond, drop hand and remain calm as lesson progresses	
CL7_7	5.67	ask questions of another student about items not in view	
CL7_10	6.326	link questions and comments to a peer's comments rather than own interests	

7.4.2. Communication-vocabulary derived standards for the subdomain

Table 7-6: Item, estimate and derived standard for communication-vocabulary, Level A

Label	Estimate	Item	Derived standard
CL15_1	-6.967	respond to first/then sequence presented visually e.g. 1st drink, then computer with teacher support	Students are scaffolded to engage in familiar routines and activities with an educator who consistently models functional expectations with concrete props and language.
CL18_1	-6.848	respond to a few simple verb instructions in context with teacher support e.g. "come" while teacher holds child's hand	

Table 7-7: Item, estimate and derived standard for communication-vocabulary, Level B

Label	Estimate	Item	Derived standard
CL11_1	-6.342	match an item to another of the same colour	Students experience vocabulary through routine interactions with objects and actions. Educators overlay language and visual supports on familiar objects and actions, enabling associations to be formed for a small vocabulary bank that holds interest and meaning to the individual student.
CL13_1	-5.997	coactively select 'one' item when supported	
CL12_1	-5.727	show understanding of some spatial concepts (as actions) in familiar contexts e.g. "up" gets up	
CL15_2	-5.15	respond to language '1st/then' in context of familiar activities	
CL5_5	-4.484	demonstrate an understanding of verbs within routine classroom and personal activities e.g. wash, sit, open, cut, etc.	

Table 7-8: Item, estimate and derived standard for communication-vocabulary, Level C

Label	Estimate	Item	Derived standard
CL15_3	-3.527	follow sequence of 2-3 step numbered schedule e.g. 1. Walk 2. Lunch 3. play	Students show understanding of simple verbs in context by following instructions related to routine activities. They respond to requests to 'give one', and can request 'more'. They begin to demonstrate their understanding of 'same' and 'different' and may use yes/no to indicate
CL12_3	-3.333	put object in and out of a container based on a single verbal direction	
CL11_6	-3.18	label 3 primary colours	
CL13_6	-2.924	rote count up to 3	
CL13_3	-2.861	respond to instruction "give one" in familiar context with cue from teacher	
CL10_1	-2.66	show understanding of hot/cold/wet/dry in the context of familiar activities e.g. avoids hot surface	
CL8_1	-2.572	match same size objects	

CL_6	-2.287	refer to self by name	affirmation and negation.
CL4_5	-2.209	answer “no /yes” to the question “is this a …?”	
CL14_2	-2.181	use one word communication to request “more” of a motivating action or item	

Table 7-9: Item, estimate and derived standard for communication-vocabulary, Level D

Label	Estimate	Item	Derived standard
CL18_3	-1.794	use terms to describe simple movements e.g. climb, dance	Students use some verbs to describe actions that can be viewed. They use the personal pronoun ‘my’ to identify their own possessions. Students begin to understand and use simple language to describe a range of attributes such as size, speed and temperature.
CL11_7	-1.712	label up to 6 colours	
CL12_4	-1.679	label simple position of an object during structured tasks e.g. in, out.	
CL4_8	-1.107	answer “yes/no” in relation to action/location e.g. “does it go in the kitchen?”	
CL13_7	-1.082	count groups of 3 items	
CL8_3	-0.972	attempt to indicate an object to meet the criteria, for example big/ little (object not always correct)	
CL10_2	-0.946	label hot/cold/wet/dry	
CL16_5	-0.853	name some of the days of the week	
CL17_1	-0.83	use numeral and item to indicate plural form e.g. 2 cake	
CL10_7	-0.813	regulate speed of own body in relation to direction e.g. clap fast/slow	
CL_9	-0.398	use personal pronoun ‘my’ to indicate possession e.g. “my bag”	
CL18_4	-0.35	use a range of language to relate actions that can be viewed e.g. dig, bite, pull	
CL10_8	-0.225	regulate own actions to increase/decrease volume in response to direction e.g. loud/soft drum”	

Table 7-10: Item, estimate and derived standard for communication-vocabulary, Level E

Label	Estimate	Item	Derived standard
CL12_6	-0.093	move object to place it next to’ another in response to a teacher direction	Students describe items with a range of general, size and colour attributes and show an understanding of spatial language describing position and temporal concepts such as now, before and after. They demonstrate an understanding of
CL10_4	-0.055	label items as clean/ dirty/messy	
CL13_8	-0.01	make groups of 1 to 5 items using one to one correspondence to count	
CL15_4	0.079	place objects in order 1st-5th	
CL14_3	0.12	match groups of item by size (number of items)	
CL15_5	0.243	identify 1st and last in a sequence	
CL4_11	0.292	use single word or phrase response to questions, e.g. Yes, No, I don’t know	

CL9_3	0.346	attempt to indicate an object to meet the criteria, for example long/short (choice not always correct)	quantity and ordinal concepts up to 5 and demonstrate emerging understanding of regular plurals.
CL_11	0.385	use she/he to indicate gender with teacher modelling e.g. “she is running”, “he is sitting”	
CL8_5	0.673	use language “big/little/small” to distinguish between like objects of different sizes e.g. big/little box	
CL12_7	0.677	point to a pictured item based on its relative position as directed. i.e. “in front”, “behind”	
CL11_8	0.856	label 10+ colours	
CL16_2	0.903	Understand ’now, before, after’ in the context of routine activities	
CL10_9	0.923	use language fast/slow/quick to describe movement	
CL13_9	1.047	use one to one correspondence to make groups of items up to 10	
CL16_4	1.205	begin to relate days of the week to familiar events	
CL_10	1.233	use personal pronouns ‘my’, ’your’ to indicate possession e.g. “my texta”, “your texta”	
CL9_5	1.507	use terms ‘tall’, ‘long’, ‘short’ to distinguish between like objects of different lengths/heights e.g. short/ tall building, long/short hair	
CL14_4	1.524	distinguish between groups of unequal size using number to label e.g. look 2...3	
CL10_13	1.633	begin to use some simple descriptive concepts to describe items e.g. yucky apple	
CL17_2	1.693	select correct item when asked to discriminate between simple regular plural/single pictures e.g. cats/cat	

Table 7-11: Item, estimate and derived standard for communication-vocabulary, Level F

Label	Estimate	Item	Derived standard
CL_16	1.877	regularly use appropriate pronouns, e.g. I/me/he/him/she/he/it	Students regularly use appropriate pronouns and personal pronouns accurately in context. They use a range of vocabulary to describe the relative attributes of items inclusive of size, length and colour. Students use regular plurals consistently and begin to use irregular forms that have been regularly modelled. Verb use expands and begins to reflect abstract notions that
CL9_6	1.961	familiar objects to lengthen or shorten them, e.g. play dough snake, make a building taller etc.	
CL4_10	2.186	use “not’ in a simple sentence to indicate a negative e.g. “turtle not fast”	
CL18_5	2.193	use appropriate action language to label senses and feelings e.g. be scared, be sick, hear, feel	
CL16_3	2.204	use language ‘now, before, after’ to query timing of events e.g. “computer now or later?”	
CL15_7	2.305	identify location of objects within a sequence e.g. middle, end	
CL16_6	2.523	identify past events as occurring ‘yesterday’ and a future event as ‘tomorrow’	
CL17_3	2.615	include “s” at the end of nouns to request in plural form e.g. dogs, mouses	
CL12_9	2.647	use terms ’next to/beside/ in front of’ to describe own location relative to other students	

CL_14	2.694	use objective pronouns appropriately in context i.e. “give it to *him/her/them”*	include senses and feelings.
CL15_6	2.769	use sequence makers to link ideas in speech e.g. next, and then, after	
CL8_6	2.868	use language ‘smaller’ and ‘bigger’ when contrasting items of different size	
CL8_7	2.875	attempt to compare and identify ‘largest’, ‘smallest’	
CL10_14	3.002	use a range of simple descriptors to label, request and reject items e.g. smelly textas	
CL_17	3.064	regularly use appropriate possessive pronouns, e.g. his, her, its, our, their, my	
CL10_15	3.636	discriminate between items based on descriptive information e.g. fat/skinny cat, full/empty glass	
CL17_4	3.768	begin to use some familiar irregular plurals in context e.g. children	
CL14_6	3.926	use terms ’less/more/all’ to describe group size as it is manipulated	
CL16_7	3.926	consistently use ‘today/ yesterday/tomorrow’ to describe when events may occur	
CL9_8	4.249	use language to label and compare ‘longest’, ‘smallest’, ‘shortest’, ‘tallest’	

Table 7-12: Item, estimate and derived standard for communication-vocabulary, Level G

Label	Estimate	Item	Derived standard
CL12_10	4.617	use prepositions ‘near, far’ to describe relative distance of objects	Students have a comprehensive vocabulary and use this to add breadth to their expressive communication. They use descriptive attributes and concepts to compare and contrast objects. Students demonstrate mastery of temporal and locational concepts.
CL10_16	4.82	use a range of adjectives to describe or add emphasis to own communication e.g. young/old, dark/light, brave/careful	
CL17_5	5.035	use a range of irregular plurals accurately e.g. knives, sheep	
CL14_7	5.278	use terms ‘few/some/many/more’ to compare and contrast groups of objects	
CL12_13	5.279	move self, left and right in response to a direction	
CL16_9	5.535	use terms ’day/week/month/year’ to accurately describe the passage of time	

7.4.3. Literacy-reading derived standards for the subdomain

Table 7-13: Item, estimate and derived standard for literacy-reading, Level A

Label	Estimate	Item	Derived standard
RT2_1	-6.105	attend briefly to books, stories and visual information	Students are beginning to react briefly to visual and auditory information in their environment.
RT1_1	-6.031	react to sounds in the environment	

Table 7-14: Item, estimate and derived standard for literacy-reading, Level B

Label	Estimate	Item	Derived standard
RT7_1	-5.839	match shapes	Students are beginning to understand that some frequently shown photos, pictures and pictographs have an association with familiar activities, events and people. They tolerate and begin to engage in brief activities that use songs and visual texts, supported by a familiar educator.
RT6_2	-5.475	begin to respond to pictograph paired with language in the context of a familiar activity e.g. toilet	
SM1_2	-5.15	attend briefly to a photo when read to in a 1:1 setting	
RT7_2	-4.949	match simple pictures and lotto cards	
RT1_2	-4.925	respond to the beat or rhythm of some chants, rhymes and songs	
RT2_3	-4.863	look at pictures when directed by a teacher in 1: 1 settings	
RT6_4	-4.745	identify familiar pictographs used in the classroom	

Table 7-15: Item, estimate and derived standard for literacy-reading, Level C

Label	Estimate	Item	Derived standard
SM1_3	-4.352	engage with a familiar story when read to by a teacher	Students are able to attend to motivating texts for short periods and engage in simple labelling of known pictures and pictographs. They show an interest in logographic print and may recognise a few numbers or letters. They begin to listen and respond to some words and sounds in familiar songs and stories with teacher guidance.
RT3_2	-4.201	link some visual aids to objects and people e.g. photo represents a familiar person	
RT7_3	-4.179	identify own photo paired with a name label	
RT3_5	-4.094	help turn pages of book/story when sharing with an adult	
SM1_5	-3.822	sit and look at a favoured book for a short time	
RT7_4	-3.482	identify familiar signage and labels e.g. McDonalds, Ben 10	
RT1_5	-3.355	sit, listen to and respond to interactive picture books	
RT1_4	-3.352	listen and respond to familiar rhymes and stories with teacher support	
RT6_5	-3.233	label some pictographs used in the classroom	
RT2_4	-2.826	point to some motivating pictures in books	
LK1_4	-2.765	recognise a few letters and numbers	
PK1_5	-2.359	imitate 1 or 2 sounds as part of a familiar song e.g. ooh, ooh, ooh	
RT3_7	-2.317	recognise that books have fronts and backs	
RT7_8	-2.103	identify own name from choice of two (focussing on visual features)	

Table 7-16: Item, estimate and derived standard for literacy-reading, Level D

Label	Estimate	Item	Derived standard

RT1_7	-1.895	label an object, character, action in texts when directed by the teacher	Students are able to label some details of pictures in texts including characters, objects and some actions. They show a developing awareness that words can be written and may begin to identify words that have personal significance. Students understand the main ideas of simple stories that are well supported by images. They are able to match a small bank of labels to corresponding images. They can discriminate and recognise different sounds.
RT2_5	-1.802	label a few motivating pictures in books	
RT8_1	-1.748	show awareness that words can be written	
RT1_6	-1.53	collect a preferred text and approach an adult	
PK1_8	-1.523	imitate a range of words modelled by a teacher	
RT7_7	-1.426	recognise labels for items of personal interest e.g. ninja turtles	
RT7_6	-1.349	match word to a printed word	
SM2_1	-1.174	identify some characters in a narrative	
PK1_9	-0.745	correctly identify a range of familiar sounds as part of a game e.g. sound lotto	
SM1_9	-0.737	join in with shared reading activities e.g. whole class reading of repetitive Big Book	
LK1_9	-0.627	recognise most common letters and label with name	
RT3_10	-0.623	differentiate between pictures and texts	
RT4_3	-0.567	initiate pointing to text though 1:1 correspondence may be inaccurate	
SM2_2	-0.558	understand some main ideas in a simple story read aloud, supported by visuals.	
RT6_8	-0.501	match and label familiar noun/activity pictographs	
RT2_8	-0.476	label illustrations in a range of texts using 2 words	
RT8_3	-0.352	match word label to photo/picture/item presented in small groups	

Table 7-17: Item, estimate and derived standard for literacy-reading, Level E

Label	Estimate	Item	Derived standard
PK1_10	-0.193	imitate a few simple phonetic sounds modelled by a teacher	Students engage with texts, moving front left to right on the page and are able to read simple texts that include familiar vocabulary. Students engage in text activities that involve responding to stories. They begin to imitate modelling of letter sounds and can name the letters of the alphabet.
LK1_12	-0.106	list the letters of the alphabet	
RT6_9	-0.026	combine and read aloud 2-3 picture words e.g. “red smarties”	
RT1_10	0.231	read aloud repetitive phrase that has been modelled	
LK2_5	0.299	identify common letters in different words consistently, e.g. point to all the ‘t’s in a sentence	
RT4_7	0.371	show awareness of basic print conventions e.g. follow text from left to right and from the top to the bottom of the page	
RT9_1	0.426	read 2 word (number/ noun) statement and match to a picture e.g. 2 plates	
RT8_4	0.577	read 5-10 noun labels linked to familiar items	

SM2_5	0.614	complete simple activities based around texts, e.g. sequence pictures to retell story, paint or draw characters	
RT2_9	0.666	initiate comments and point to illustrations in reading materials	
RT9_2	0.717	read 2 word (adjective/ noun) statement and match to a picture e.g. big frog, red shoes	
SM2_4	0.815	show a personal response to a text e.g. look at or read book in own time, draw a picture	
LK2_10	0.819	recognise and name all letters of the alphabet	
RT3_11	0.833	use title and front cover to make simple predictions about what a text might be about	
RT8_8	1.016	read simple adjective labels i.e. colour, size, number	
RT9_3	1.057	read aloud some simple sentences that include familiar words and labels	
RT8_13	1.538	recognise a range of simple high frequency words e.g. is, can	
SM1_13	1.553	participate in small group of 2-3 students reading with a teacher	
RT8_6	1.561	read 10-25 noun labels linked to known items	
LK1_14	1.575	create words by assembling letters in order to make a word label	
SM2_6	1.65	understand main ideas and recognise characters in a well-illustrated story read aloud	
RT7_13	1.668	read a range of environmental labels and text e.g. toilet, exit, shops, post office	

Table 7-18: Item, estimate and derived standard for literacy-reading, Level F

Label	Estimate	Item	Derived standard
LK1_16	1.668	match letters that are the same presented in different fonts and handwritten styles	Students bank of sight words is expanding to include a greater range of pronouns, adjectives and verbs that are less concrete. They can demonstrate their comprehension of texts by performing written actions or matching a picture. Students engage in a range of literacy activities with a teacher and peers, predicting and retelling stories and factual information. Students show
RT8_9	1.68	read verb labels related to familiar actions	
PK1_13	1.692	identify some sounds in words	
RT2_11	1.794	use illustrations to make simple predictions about the attempt to imitate intonation pattern that has been modelled when reading familiar texts story line of a text	
RT9_6	1.891	read sentence (pronoun/ verb/noun) i.e. “she is climbing the slide” & show comprehension by matching to a picture	
RT9_14	1.897	read a range of topic related classroom texts with support	
LK2_8	1.915	recognise the difference between upper and lowercase letters	
RT5_2	1.923	attempt to imitate intonation pattern that has been modelled when reading familiar texts	
RT6_11	2.038	combine 3-4 picture words to request or recount an activity	

RT9_9	2.265	read a sentence and retain information contained to complete an action related to its content e.g. get the big bowl	awareness of rhyming words.
SM1_12	2.307	take turns with a peer in predicting and reading texts with teacher guidance	
RT3_12	2.308	understand and use some basic language related to book layout and aspects of reading, e.g. word, letter, page, title, cover	
RT5_4	2.356	read well known texts with some fluency, e.g. appropriate pauses and intonation	
RT6_10	2.655	re-read picture sentence when meaning is unclear by returning to the beginning	
SM3_1	2.901	identify whether a text tells a story or gives information	
SM2_8	2.903	recall factual information from texts read and viewed in class	
SM2_9	2.903	retell main events in sequence with guidance and prompts from teacher	
PK1_15	2.987	identify repetitive word or letter patterns in sentences and phrases	
PK1_19	3.262	recognise rhyming words	
SM2_10	3.661	express opinions about the actions of characters	

Table 7-19: Item, estimate and derived standard for literacy-reading, Level G

Label	Estimate	Item	Derived standard
RT9_11	4.134	consistently read back own writing or sentences scribed by another	Students recognise that texts have different functions. They use texts purposefully and can find information and relate what they read to their own experiences. Students can read silently and when reading aloud attempt to use intonation and rhythm that has been previously modelled for them.
RT5_7	4.392	read, modelling some rhythm, intonation and pronunciation on the example of other readers	
SM2_11	4.427	use texts purposefully, e.g. follow simple procedural texts, find basic information in texts, locate specific information from a known text, use a simple contents page and index to locate information	
SM2_12	4.427	relate something learned from a text to own experience, e.g. by commenting or by identifying with the characters in a story	
RT5_5	5.086	modify intonation when reading to differentiate questions, exclamations or dialogue.	
RT5_6	5.086	sub-vocalise when reading silently	
SM3_5	5.38	identify texts as factual or fictional and make comparisons, e.g. using topic, content, layout, illustrations	
RT9_18	5.541	read and sequence sentences of a familiar text, e.g. narrative, recount, procedure, explanation	
PK1_18	6.021	recognise some common prefixes and suffixes and how they change the meaning of words, e.g. un, -er	

7.4.4. Literacy-writing derived standards for the subdomain

Table 7-20: Item, estimate and derived standard for literacy-writing, Level A

Label	Estimate	Item	Derived standard
WS1_3	-8.132	pick up small items using thumb and fingers	Students engage in fine motor tasks and experience marking a range of surfaces. When using implements they may swap hands intermittently.
CI1_4	-7.811	use hands to make marks in sensory substance e.g. finger paint on an easel	
CI1_5	-6.672	grasp a thick paintbrush and mark the paper	
WS2_2	-6.276	transfer objects from one hand to the other	

Table 7-21: Item, estimate and derived standard for literacy-writing, Level B

Label	Estimate	Item	Derived standard
CS1_1	-5.796	match some simple shapes	Students explore the manner in which they use their hands to engage in fine motor tasks. They engage in purposeful application with drawing implements, generally holding markers with a fisted grip.
CW1_2	-4.926	draw a vertical line using a variety of writing tools	
CI1_7	-4.851	engage in circular scribble	
CW1_4	-4.504	draw a horizontal line and cross	
WS1_7	-4.435	pick up small objects with tongs and place in a container	
WS2_4	-4.405	hand and thumb up when encouraged to make marks on paper	

Table 7-22: Item, estimate and derived standard for literacy-writing, Level C

Label	Estimate	Item	Derived standard
CS1_2	-4.354	match some letters and numbers	Students recognise and label a range of familiar pictographs and can point to pictures to communicate an idea. They can draw a face with several features and can match some letters and numbers. Students attempt to write letters from their name or from modelled examples. They can manipulate a computer mouse to make marks on a screen.
WS3_2	-3.96	make marks on screen by moving a mouse no click in a draw or colour program	
CW1_8	-3.358	trace over lines, shapes, letters and patterns with some accuracy	
WS3_3	-3.303	point to items on screen and left click to select a familiar item	
CI2_2	-3.291	recognise and label a range of familiar pictographs	
CW1_6	-3.283	attempt to copy letters and simple words from modelled examples	
CW1_7	-3.141	write some letters of first name	
WS2_10	-2.994	colour a simple picture and attempt to confine colour within lines	
WS3_4	-2.432	press a key for a particular letter or function on a keyboard e.g. arrows to move an item on screen	
CI2_3	-2.408	point to familiar pictures to communicate an idea	
CW1_9	-2.333	copy letters and numbers with limited accuracy	

CI1_9	-2.33	draw a face with 3 features e.g. eyes, nose & mouth	

Table 7-23: Item, estimate and derived standard for literacy-writing, Level D

Label	Estimate	Item	Derived standard
CS1_3	-2.265	imitate initial word sounds modelled by a teacher	Students may draw pictures that have significance for themselves or to communicate an interest or simple idea. They label drawings and images in their environment and can combine up to two picture symbols to represent items, people and actions. Students are beginning to use a tripod grip, engage in role play writing and attempt to copy some letters and numbers. They can identify some letters and find them on a keyboard.
WS2_11	-2.261	hold and use a pencil with a tripod grasp but move forearm and wrist to write/ draw/colour	
CS1_6	-2.161	write a few letters of the alphabet	
CS1_4	-2.058	identify some letters and numbers named by another e.g. “give me B”	
WS2_12	-1.86	hold and use pencil with a tripod grasp	
CW2_1	-1.662	discriminate between words and picture in a book when asked “where’s the picture?”	
CS1_7	-1.46	copy or write some familiar letters with beginning accuracy	
CI4_1	-1.448	imitate writing behaviours with teacher assistance e.g. role play writing	
CI4_2	-1.266	label some images or drawings in the classroom environment	
CW1_10	-1.076	copy letters and numbers with accuracy	
CI2_5	-0.942	combine 2 photographs, pictures or symbols to represent objects people and actions	
CI1_11	-0.918	name pictures for teacher to label	
WS3_6	-0.861	type the letters of own name from a written model with teacher assistance to find letters on the keyboard	
CI1_10	-0.594	draw and create picture of personal significance e.g. mother, train, draw to communicate	

Table 7-24: Item, estimate and derived standard for literacy-writing, Level E

Label	Estimate	Item	Derived standard
CI4_3	-0.188	point to environmental text to request teacher reads it aloud	Students spell some frequently used words correctly and separate words with spaces when writing, also using words copied from classroom resources. They can use a keyboard to type their name and to copy a sentence that is provided to them. Students may write in uppercase letters in preference to lower
CI4_4	-0.094	ask teacher to label own drawings or scribbles	
CW2_2	-0.007	indicate some individual words on a page using spaces and clusters of letters as a guide	
WS3_8	0.073	find some letters on the keyboard that match a printed uppercase word and type each letter of first name	
CS1_11	0.155	attempt to copy words, phrases or sentences accurately	
CI1_12	0.166	draw picture with at least 6 details included e.g. bus= body, windows, doors, wheels, driver, passenger	

WS2_15	0.21	form most letters of the alphabet correctly	case. They can dictate sentences to a teacher that reflect the manner in which they employ oral language. Students use drawings to illustrate simple texts.
CW1_12	0.27	assign meaning to strings of letters written by self	
CS1_8	0.356	write some favoured words repetitively represent words by groups of letters	
CW2_6	0.438	use some conventions for printed English, e.g. left to right, top to bottom, although not always consistently	
CI4_7	0.557	dictate key words for teacher-constructed texts to describe pictures they have selected	
WS2_14	0.622	write in upper case letters in preference lower case	
CI2_7	0.658	learn to combine up to three key words or images to communicate ideas	
WS3_10	0.676	copy a sentence by typing letters on a keyboard	
CS2_2	0.836	write some identifiable words from memory although spelling may not inaccurate	
WS2_16	0.881	write using upper and lowercase letters	
CI1_17	0.996	dictate sentences about a drawing or an experience for others to write	
CI1_14	1.021	draw to illustrate a simple text, e.g. to relate an ongoing activity, to give additional information, to retell a simple story	
CI4_10	1.109	dictate sentence or phrase that reflect their oral structures, e.g. go to school, go home, come from	
CW2_8	1.235	consistently separates words with spaces when writing	
CI3_5	1.497	contribute ideas, words or sentences to a class or group shared story	
CS2_5	1.497	write some commonly used words correctly	
CS1_9	1.504	expect words to have consistent spellings, e.g. copy words carefully, ask how to spell, ask for a word to be written to copy	
CI3_3	1.546	reread their own texts, or sentences scribed by another	
CI4_12	1.645	write well known symbols, words, phrases or short texts, e.g. Today is Monday	

Table 7-25: Item, estimate and derived standard for literacy-writing, Level F

Label	Estimate	Item	Derived Standard
CI3_2	1.717	assign meanings to words that sometimes match what is written	Students understand and can use simple terminology related to writing. They may initiate writing for their own purposes or write a brief text reflecting their own experiences.
CI4_13	1.794	dictate 'run-on sentences', e.g. at school we work and at school we play …	
WS2_18	1.799	sometimes places capital letters incorrectly	
WS3_11	1.799	use basic keyboard skills to write personally significant words and simple modelled sentences, e.g. own name, 'I went to the park'	

CI4_11	1.95	write sentence or phrase that reflect their oral structures, e.g. go to school, go home, come from	Students demonstrate some elements of layout planning when presenting their work. They may attempt to spell new words based on known spelling patterns and demonstrate some awareness of letter sound relationships.
CW2_10	1.95	understand the difference between upper and lowercase letters	
CS2_4	2.011	consistently write some words with same but not necessarily accurate spelling	
CI1_16	2.119	use illustrations to provide more detail to a written text	
CI4_16	2.29	choose a topic to write or draw about	
CW2_12	2.476	understand some terminology of writing, e.g. word, letter, sentence, space, full stop	
CS1_15	2.478	use words copied from various sources, e.g. labels, signs, word lists	
CI4_18	2.678	write a simple text related to own interests or experiences	
WS2_19	2.681	use appropriate size, spacing and letter formation	
CI4_21	3.145	dictate a simple factual text	
CI4_25	3.145	initiate writing for own particular purposes, e.g. label drawings, make a birthday card, write a recount about a recent experience	
CW2_16	3.145	write simple sentences and begin to rely less on copying	
CS1_17	3.146	attempt to spell unknown words	
WS2_20	3.148	show evidence of layout or planning in writing, e.g. place text appropriately on a page, leave space for a drawing	
CS2_8	3.428	demonstrate awareness of some sound-letter relationships, e.g. represent words by initial letter, or several letters, such as 'bk' for book	
CW2_15	3.43	write sentences based on simple repetitive, modelled patterns, e.g. I went …	
CS2_7	3.773	attempt to spell new words, based on known spelling patterns and base words, e.g. walk, walked, walking	
CW2_17	3.774	use some common verbs appropriately, e.g. draw, cut, stop, run, Mix the …, Cook the ...	

Table 7-26: Item, estimate and derived standard for literacy-writing, Level G

Label	Estimate	Item	Derived standard
CS2_10	4.224	Use sound or visual features of words to attempt own spelling e.g. vae/very, ar/are, perpl/purple	Students write for a range of real tasks and include common punctuation conventions in their writing. They employ simple text structures such as titles,
CW2_14	4.226	include full stops and capital letters in most writing	
CW2_23	4.226	use upper and lowercase letters appropriately	
CI4_23	4.909	write repetitive patterns to produce longer texts, e.g. I like ..., and I like	

CI4_26	4.909	write for a 'real task', e.g. make a list, write a letter, write a story at home	beginnings and endings. Students may draw upon visual and sound features of words to spell words.
CW2_19	4.909	ask teacher for explanation when meaning is unclear	
WS2_28	4.911	use size of writing, colour, layout and choice of media to help transmit messages, e.g. making a sign or a poster.	
CW2_20	6.286	link sentences using common conjunctions and connectives, e.g. but, after, when	
CW2_21	6.286	use some punctuation consistently, e.g. full stops, question marks, commas	
WS2_23	6.287	use a variety of simple text structures, e.g. a title, an opening, ending, caption	

7.5. CHAPTER SUMMARY

This chapter provided an overview of the calibration and correlation of the scores between subdomains of the research instrument. The empirically derived standards developed reflected the construct variables for each subdomain. Chapter 8 revisits the study's aims, processes and summarises the validation argument for the research instrument.

8. CONCLUSION

8.1 REVISITING THE AIMS OF THE STUDY

This study's aim was to design and validate assessment tools that both captured and informed teacher observation of student progress in relation to the communication and literacy skills of learners with ASD. At the time the rationale for this study was initially conceived, educators working with students with additional learning needs had no access to explicit curriculum standards or assessments for learners with disabilities in Victoria, Australia. These tools aimed to assist teachers in identifying developing competencies, in the domain of communication and literacy, so that they could effectively target and differentiate instruction for students with ASD, measuring their progress over time.

For many years mandated assessments for students with ASD have been primarily related to eligibility for PSD-ASD funding support. Successful applications are dependent on an ASD diagnosis and evidence of significant deficits of two standard deviations in both adaptive behaviour and language skills domains. However, these assessments are not revisited as progress measures over time.

In addition to eligibility assessments, students deemed eligible for PSD funding within the state schooling system have an established Student Support Group (SSG) comprising of parents/carers, educators, school leaders and support staff. The SSG is responsible for identifying the student's individual needs, planning for and monitoring progress. An Individual Learning Plan (ILP) is mandated for all students with ASD and is expected to reflect key goals and strategies that are a focus of the student's learning program (Department of Education and Training, 2016a).

In 2015, the introduction of the Victorian Curriculum -Towards Foundation, levels A-D provided curriculum resources for teachers to create targeted goals and interventions for learners with additional needs. In combination with the ABLES assessment tools for learners these resources have potential to progress accountability requirements for DET and schools working with learners with disabilities working towards typical school entry standards. However, there remained tremendous scope for the development of assessment tools designed explicitly for use for learners with ASD that teachers could utilise with students to identify intervention points for instruction and monitor learning.

Internationally, policies and reports of programs for students with disabilities share key issues, in relation to the capacity of governments and schools to develop pedagogy, curriculum and assessment that support the diverse range of learners (Slee, 2013). In many cases teachers working with students with ASD lack training and expertise in identifying appropriate goals (FCDC, 2017). This, amongst other factors, have led to increased demands for evidence based educational assessment.

A range of researchers have identified that students learn best when teaching is targeted just beyond their current level of knowledge and student learning skilfully scaffolded through teacher management of the educational environment (Wood, Bruner & Ross, 1976). Vygotsky (1978; 1929/1993) proposed that teaching interventions should occur at the point where the student is most ready to learn, the ZPD and highlighted the role of developmental assessments in observing and recording qualitative transformations and transitions that provide evidence of students' increase in proficiency. However, there is limited access and availability to appropriate assessment tools that identify where to intervene and proceed with instruction for autistic students when they have a lowered starting base of skill and knowledge, in comparison to other students.

The goal of this study was to develop assessments underpinned by a developmental learning framework that would support educators in their observation and assessment of students, enabling them to effectively target communication and literacy instruction for learners with ASD. The research questions for this study related to the validation of a developmental assessment measuring the communication and literacy skills of young learners with ASD. The extent to which a student's competency in communication would correlate with literacy acquisition and proficiency was also explored. The process undertaken to address the research questions below are explored in the following sections;

- What is the developmental learning pathway that students with ASD typically progress through in the acquisition of communication and literacy skills?
- To what extent can appropriate points of intervention be determined along the communication and literacy developmental pathways?
- To what extent does a pattern emerge between communication and literacy development for learners with ASD?

8.2. INSTRUMENT DEVELOPMENT

Consistent with guidelines for assessment design this project commenced with the development of the instrument's purpose and a clear definition of the construct to be measured (Millman & Greene, 1993; Wolfe & Smith, 2007a). The fundamental purpose underpinning this research project was to develop an instrument that would draw on and inform teacher observation in relation to young learners with ASD. The assessment tools were designed to reflect the underlying learning continuum that unfolds for young learners with ASD in relation to the domains of communication and literacy. Additionally, test outcomes could be utilised by teachers to differentiate their educational planning in order to progress student learning and measure progress over time.

Learners with ASD present across a continuum that ranges from pre-intentional to active engagement in communication and literacy development. ASD has consistently been defined as a complex disorder with impairments in communication, social understanding and interaction, in addition to a repetitive range of activities and interests (WHO, 1992; APA, 2013). For teachers working with learners with ASD, identifying what to consider, what to prioritise and where to begin are daunting tasks. Current assessments measuring these emergent capabilities for school aged students with ASD tend to be deficit focussed and executed by an external paraprofessional in a single event, rather than as an educational assessment designed for ongoing teacher use.

In the context of this study the notion of 'biologically primary abilities' and 'secondary cognitive abilities' provided a useful lens to highlight the broad continuum of learner capabilities that would need to be reflected in an assessment for learners with ASD (Geary, 1995). Typically developing students commence schooling primed to access secondary cognitive abilities through teacher instruction and engagement in the learning environment. For learners with disabilities these biologically primary abilities may only be partially or substantially evident as a direct result of explicit instruction and considerable opportunities for practise and skills generalisation (Kleinert et al, 2009).

The research study targeted teachers working with students in the early years of schooling. Their students were deemed eligible under the Victorian DET's program for students with disabilities (PSD) with a confirmed diagnosis of autism spectrum disorder and enrolled in a Victorian school. Students funded under the PSD submit diagnostic

evidence and reports of significant delays in adaptive and communicative functioning of at least two standard deviations below mean. Therefore, while the students assessed by teachers in this study would not necessarily have a formal diagnosis of ID, the continuum of cognitive functioning for the target population was assumed to span from profound to mild ID, given each student's eligibility under the PSD.

8.3 CONSTRUCT CENTRED DESIGN & VALIDATION

Guidelines for educational measurement developed jointly by AERA, APA, NCMC, 1999, 2014) highlight that validity must be considered in relation to a test's capacity to reveal evidence of the characteristics the test was designed to measure (Wilson, 2005). In this study Pellegrino et al.'s (2001) framework approach to conceptualising the validity of educational assessments and Wilson's (2005) 'four building blocks approach' was used to build upon and reflect multiple aspects of validity identified within the standards. The applied framework reflected a coherent system on which to identify, organise and interpret validity evidence for assessments developed to support and measure classroom learning and teaching (Pellegrino et al, 2016). The processes and priorities utilised in the instrument design and development are outlined in the following sections.

8.3.1. Learning theories informing the construct

In order to support the assessment's function of providing an opportunity for standards referenced interpretation of student progress the model was informed by learning theory to reflect the developmental nature of skill progression. Approaches to assessment and intervention for learners with ASD have historically been rooted within behaviourist paradigms (Skinner, 1957; Lovaas, 1977). However, this study aligned with an increasing shift towards approaches reflecting a socio-cultural emphasis and a broader learning theory base (Houghton, Casey, Shaw & Murphy, 2013; Pellegrino, 2001; Fleer & Hedegaard, 2010).

A situative, socio-cognitive perspective was adopted to enable breadth across both social and cognitive theorists. The 'socio' aspect was relative to those cultural and linguistic patterns that structure the engagement of individuals with the environment and each other, while the 'cognitive' represented the unique patterns of cognition demonstrated by individuals, that are influenced by their experiences and internal resources (Greeno, Collins & Resnick, 1997). The addition of a situative perspective highlighted that the

resources developed by individuals are strongly linked to their learning situations. Given the challenges learners with ASD have in generalising their understanding across different contexts this provided a significant and valid distinction.

This learning theory perspective complemented the theories selected to highlight the impact of ASD on learning. Baron-Cohen's (1985) theory of mind deficits provided valuable insight into the impact of ASD on communication, as did Frith's (1989) notion of weak central coherence and the impact of compromised executive functioning on the performance of individuals with ASD (Ozonoff & Strayer, 1997; Goldberg, 2002). The biological basis for these challenges have also been reflected in investigations of aspects of neural systems disorders, evident across individuals with ASD (Just et al., 2012; Kana et al., 2015; Schipul & Just, 2016).

The learning theories identified shaped the approach taken in the research project in relation to informing construct definitions, domain content, items and standards. Significantly, they supported the articulation of knowledge and skills that were critical for mastery for learners, relative to the identified construct.

8.3.2. Defining the construct

A key task in the creation of this measurement tool was the development of a construct model reflecting those aspects of the underlying theoretical model which would structure the range of skills and capabilities represented. The constructs of communication and literacy were considered and defined in a manner that was inclusive of the diversity of the targeted student population and the manner by which learners might demonstrate their developing competence.

Communication was articulated as *the act of affecting another in such a way that a receiving communicative partner is able to infer the intent of the initiator*. The definition of the communication construct was informed by research and practise related to communication development for typically developing and autistic learners. Theoretical perspectives reflected Bruner's (1983) focus on the role of intention and joint attention in communication as a critical driver of social action. Metarepresentational approaches to communication development were also reflected to capture the development of communication from pre-intentional to accomplished usage (Ninio & Snow, 1996; Papafragou, 2002).

Consistent with the premise that communicative behaviour could be conceptualised along two dimensions, means and functions, the communication subdomains of the instrument were identified separately as functions and vocabulary (Wetherby & Prizant, 1989). Both functions and vocabulary subdomains were inclusive of verbal and augmentative modalities. The separation of functions and vocabulary within the communication subdomain also served to highlight an important understanding in relation to communication for learners with ASD. Specifically, that while communication can exist without language, it can also fail where language is present (Frith & Happé, 1994).

The communication construct encompassed three main developmental stages; pre-linguistic, one word and multiple word phases and typical developmental sequences of communication and vocabulary (Dore et al., 1976). Content within the communication domain was organised in a manner that prioritised communication functions of a pragmatic nature and reflected both enactive and interactive functions (Bruner, 1981). The communication construct also reflected the common disassociation between object and person intelligence frequently seen amongst individuals with ASD (Kanner, 1943; 1973). It highlighted that communicative functions with a regulatory use were likely to be relatively unimpaired for learners while speech acts of a social nature were often absent or infrequently utilised (Wetherby & Prizant, 1989; 1993).

Literacy was articulated as *the process of inferring and conveying shared meaning via symbols and words* in order to maximise the inclusion of students across the full continuum of the disorder (Alberto et al., 2007). The literacy framework was developed with reference to core understandings encompassing the emergence of symbolic representation and the development of reading and writing behaviours.

Key literacy capabilities were unpacked as focus areas within the framework and were inclusive of picture and symbol recognition, comprehension, letter, spelling, word and phonological conventions (Bruner, 1966; Ehri, 1995; Frith, 1986; Clay, 1967; Chall, 1993). A range of early to more developed responses related to pictures, symbols and words, in addition to knowledge of literacy conventions such as print, alphabetic and phonological awareness. The framework also reflected the use of visual literacy and sight word approaches as evidence supported instructional approaches for learners with disabilities (Alberto et al., 2007; Browder et al., 2006).

The reading subdomain incorporated developmental stages that commenced with understandings conceptualised as logographic or pre-reading, progressed to alphabetic

and moved towards fluency stages (Ehri, 1995; Frith, 1986; Chall, 1993). The construct map reflected both theory and research relating to the challenges common to learners with ASD such as mastery of decoding without comprehension and the importance of these processes being integrated (Nation et al., 2006; Grigorenko et al., 2002).

The writing subdomain of the construct was informed by an understanding of the complexity required to simultaneously integrate cognitive, motor and linguistic processes to attain fluency for writing tasks. Writing was conceptualised as a communicative act, thus prioritising the inclusion of indicators relating to students developing competency in utilising symbols and words to communicate and engage with others. The construct reflected that spelling typically moves through stages of increasing proficiency from pre-communicative to mastery of orthographic systems (Lutz, 1986; Gentry, 1982; Read, 1975). Additionally, it reflected those motor aspects related to writing, frequently aligned with handwriting or computer use that are likely impacted by motor planning dysfunction for many learners with ASD (Smith, 2004; Ming et al., 2007; Just, 2006; Helinckx, 2013).

8.3.3. Development of the item bank

Rubrics were utilised by the researcher in the development of the item bank. Vertical structures reflected increasing proficiency in typical sequences of development while horizontal rows structured content knowledge and skills jointly informing the construct (Masters, 2013; Thomson et al., 2013).

For each of the focus areas identified in the elaboration of the communication and literacy construct, items were developed in the form of behavioural indicators by the researcher. While many young children with ASD would be challenged to articulate their knowledge in unfamiliar contexts and test conditions, the inclusion of a broad developmental range of performance tasks which could be observed by a familiar teacher, in a familiar setting, ensured that observations of learning could be made.

Items specified the types of actions that a student might reasonably engage in, within the context of their classroom or learning environment and were phrased in a manner that enabled inferences to be made about an individual's competence, relative to the constructs of communication or literacy. Indicators described the actions students could demonstrate and were refined where appropriate with quality criteria or examples that reflected the level of performance required. Limits were not set on the number of items

within subdomains and focus areas although a spread of 5-14 indicators was typical for each foci.

The initial impetus for this research project was related to an intention to validate a locally developed instrument co-constructed by the researcher. While this intent was later dismissed a number of indicators from the item bank were included as items in the draft instrument and can be reviewed in Appendix B.

In addition to the expertise of the researcher, the inclusion of subject matter feedback from experienced educators of students with ASD was utilised to fine tune the pilot instrument consistent with the premise that the partnership of learning and cognition specialists alongside of assessment experts enhances assessment tool development (Hendrickson et al., 2013). These subject matter experts were able to draw on a deep understanding of how children with ASD learn relative to the domain of communication and literacy. Most feedback related to the provision of examples that might be applied to specific indicators to clarify expectations in relation to the degree of complexity sought. Some fine tuning of wording was employed after feedback and a small number of the hypothesised sequences of indicators varied.

During the development of indicators a degree of ordering occurred. This also comprised a discrete stage of the instrument development. Prior to the technical calibration of the instruments the researcher engaged in a judgement based ordering of items within the four subdomains, reflecting the hypothesised frameworks for the instrument. Behavioural indicators were organised according to their perceived complexity within focus areas of each subdomain. Once ordered they were labeled and ranked in a hierarchical order, reflecting their increasing task difficulty from easiest to most difficult.

As part of the argument for the instrument's construct validity this would later be compared to the calibrated output of the research instrument. Wright and Stone (1999) recommend that this process has a twofold purpose. Firstly, the observed item sequence reflects and supports the definition of the construct variable. Secondly, the hypothesised and calibrated item sequences can be compared later in the project and if high degrees of consistency are evident this can be interpreted as evidence of construct validity.

8.3.4. Instrument calibration & standards development

The Rasch model was selected to provide validation evidence for the construct-centred research instrument on the basis of its strong measurement properties and capacity to reflect an interval measure. Measures of fit to the Rasch model were used to confirm that the items were appropriate for their purpose and to validate the measure's technical quality. Items were well spread across foci and ability estimates and discrimination and fit values for the content of all subdomains were very high. Further discussion of the calibration of the instrument is included in section 8.4.

The calibration of items in the final instrument was used to inform the researcher's development of the learning progression standards. The learning progression standards were selected as a preferred assessment output that would support teacher ease of use and assist educators to understand what was likely to have come before and occur next, in relation to their student's learning in a specified subdomain. Learning progressions based on empirical evidence differentiate and add substance to outlined learning trajectories in a superior manner to traditional scope and sequence materials developed with only disciplinary knowledge and educator input (Duschl, Schweingruber & Shouse, 2007).

8.4. VALIDATION OF THE INSTRUMENT

The Rasch model encompasses a range of strong measurement properties, and was selected to provide validation evidence for the research instruments. Exploration of fit to the Rasch model was used to provide confirmation that the items within the assessment tool were appropriate for their purpose and to validate the technical quality of the measure (Wright & Stone, 1979). Person fit was reviewed in this study to highlight inconsistencies in teacher responses that might be attributed to student characteristics, such as gender or severity of disability.

After an initial calibration, it was identified that some teachers exhibited an irregularity in their scoring. In cases where students had moved beyond very early indicators of proficiency, it appeared that some respondents had bypassed easier items and commenced marking of items in a mid-zone of ability. As a result of this hypothesis being formed, responses were recoded so that patterns containing marking commenced in a mid-zone of

ability now had the lower proficiency items scored as missing rather than not observed. This solution was applied as it was not possible to ascertain why the response had been missed or if the missed response was indicative of a student's failure to demonstrate competency with the identified item.

This irregularity in responses indicated that the instrument might be strengthened by an alternate marking system. The research instrument format provided a single checkbox against each indicator for teachers to check if an item was observed. A more robust future approach could include three options for teachers to select i.e. not present, surpassed, observed. Items identified as surpassed could then be coded for assessment in the same manner as observed responses. Additionally, marking of indicators as surpassed would acknowledge that a student had progressed to more sophisticated skills and understandings and would be likely minimise irregular responses.

Items included in the final instrument were well spread across foci and ability estimates overall. Both draft and final instruments used the same calibration process. The calibration of the draft instrument items was mainly used to inform the selection and reduction in the number of items for the final instrument. Overall, item fit and discrimination values for items in all subdomains of the instrument were very high.

8.4.1. Correlation between subdomains of the instrument

To explore the correlation between subdomains of the instrument, analysis of student raw scores was utilised to establish the degree to which each correlated to the other subdomains. High degrees of correlation were established, ranging from .94 -.84, indicating a strong predictive relationship between the instrument subdomains. This was particularly evident for vocabulary and reading .94, in addition to functions and vocabulary .94.

Examination of correlation between subdomains, based on review of the derived test difficulty scores for each mode revealed an outcome consistent with the developmental expectations of the construct model. The order of the subdomains, relative to test difficulty from easiest to most difficult were; functions, vocabulary, reading and writing. Given that children assume greater mastery of communication functions and vocabulary preceding, and as a foundation for reading and writing development this provided further evidence of the instrument's validity.

8.4.2 Validation supported by instrument development processes

A construct modelling framework makes explicit the alignment between instrument construction and its functions. Therefore, the resulting instrument may be considered as evidence supporting a logical argument that the results it provides can be used to validate those decisions intended by the test developer (Wilson, 2005). It follows that evidence of validity is necessarily linked to the processes utilised to develop the tools and analysis of the instrument's assessment outcomes. The process utilised to develop the research instrument was consistent with Wilson's (2005) 'four building blocks approach' and reflective of the evidentiary reasoning of Pellegrino et al.'s (2001) assessment triangle model.

The development of the pilot and draft construct drew upon review of literature, researcher expertise and subject matter expert feedback to reflect the focus of the assessment and appropriate content within each subdomain. The construct map, informed by the definitions for communication and literacy provided the framework for further development of the instrument's mode and focus elements reflecting procedural and conceptual knowledge related to the latent trait being measured.

Instrument items were designed to focus teacher observations and based on assumptions about the type of tasks that would cue students to say, do, or create in a manner that reflected the learning models underpinning the assessment instrument. The validity of basing assessments on the observation of individuals and groups engaged in activities of inquiry is well supported (Greeno, 1997; Mislevy, 1993). This assessment approach, underpinned by the identified learning theories was well suited to measure performance of young learners with ASD in this study as evidenced by technical validation and assessment results that were consistent with the model proposed+.

The contents of the empirically derived levels were compared to those that had been hypothesised during the development of the instruments. Further evidence of construct validity was provided by testing that demonstrated a high degree of consistency between the hypothesised and demonstrated proficiency levels. This was also underpinned by a high degree of consistency between hypothesised and calibrated difficulty estimates for individual items when the draft and final instruments were compared. This observation, in addition to very high person and item separation reliability evident for each subdomain of the instrument was perceived as robust evidence of the instrument's validity.

A limitation of this study related to its external validity as all teachers who took part in the study were drawn from the same autism specialist school. The original design of the study planned for teachers working across a range of special education settings with students with ASD, to be included as participants. However, only one school accepted the research invitation and this increased the likelihood that the teachers would share similar beliefs and expectations that may not be equally reflected by other educators working across a broader range of specialist settings.

Given that the average of teaching experience was 6.29 years for teacher participants it is likely that their experience was reflective of a degree of expertise and that this contributed to their marking of the instrument. However, future research would benefit from teacher participants drawn from a broader range of specialist settings to potentially provide evidence of the tool's generalisability across different educational contexts.

8.5 REFLECTIONS AND FUTURE DIRECTIONS

A number of assumptions were significant to the progress of this research. First, the understanding that learners with ASD are not simply delayed, they are also disordered in their development. As a result individual's skills and the timeline on which capabilities and exceptionalities emerge may be unique. Significantly, the early and persistent challenges experienced by learners with ASD in initiating communication with others have a profound and ongoing impact on the cognitive and social processes that facilitate their learning and development. As a result, these understandings are significant for educators to assess, teach and monitor.

Second, while typical developmental progressions in communication and literacy can be applicable they should also be used flexibly (Prizant & Wetherby, 1989). Ideally, approaches to communication and literacy development should optimise the relative strengths of the ASD cognitive profile to maximise learning opportunities for individuals.

Third, the decision to develop an empirically validated assessment reflected a strong belief that when teachers have access to appropriate tools that reflect foundational priorities for learners with ASD they can apply these tools and use the results to better understand and target the learning needs of their students. The research questions

prioritised in this study were guided by these assumptions and the findings are summarised in the section below.

- What is the developmental learning pathway that students with ASD typically progress through in the acquisition of communication and literacy skills?

The empirically derived and validated construct maps underpinning the assessment instrument make explicit the developmental pathways identified for learners with ASD in this study. These were developed through a construct-centred approach which commenced with a definition of communication and literacy for learners with ASD. Learning theories reflecting a situative, socio-cultural framework and the impact of ASD on individuals' cognition, in addition to researcher expertise and a broad review of literature, were drawn upon to develop the domain map and items. Items within each subdomain articulated student actions that could be observed to enable inferences of developing competency to be made.

- To what extent can appropriate points of intervention be determined along the communication and literacy developmental pathways?

Learning progression standards were selected as a preferred assessment output to support ease of use and assist educators to understand what might come before and follow next, in student's development within a subdomain. The calibrated items in the final instrument were well spread across foci and ability estimates with high discrimination, item fit and separation reliability values. The validated ordering of items, from easy to difficult, were used to inform the researcher's articulation of the seven learning progression levels.

Learning progressions based on empirical evidence differentiate and add substance to outlined learning trajectories in a superior manner to traditional scope and sequence materials developed with only discipline knowledge and educator input (Duschl, Schweingruber & Shouse, 2007). Construct validity was demonstrated by the consistency shown when the ordering and difficulty of hypothesised and calibrated items in both draft and final instruments were compared. This observation, in addition to very high person and item separation reliability was interpreted as robust evidence of the instrument's validity and capacity to reflect appropriate points of intervention along the communication and literacy pathways for learners with ASD.

- To what extent does a pattern emerge between communication and literacy development for learners with ASD?

Analysis of student raw scores was used to reflect the degree to which subdomains correlated with each other. There was a strong relationship between vocabulary and reading (.94), and between functions and vocabulary (.94). Respectively, functions: reading, vocabulary: writing and reading: writing (0.90, 0.89 and 0.90) also demonstrated a very strong relationship. While the lowest correlation was between functions and writing this was still substantial at .84 and raw score correlations overall indicated a consistent and predictive relationship existing between communication and literacy competence for learners with ASD.

In addition, review of the derived test difficulty scores for each subdomain of the instrument revealed an outcome consistent with the developmental expectations of the construct model. The test difficulty of subdomains, from easiest to most difficult were ordered; functions, vocabulary, reading and writing. This reflected that children develop competency in their use of communication functions and vocabulary before and as a foundation for more complex reading and writing development.

8.5.1. Future research directions

The current assessment covers a broad range of student ability in each subdomain. Future development of the instrument could separate each subdomain into several, shorter assessments focused on a discrete developmental range. For example, assessment '1' could primarily monitor the learning of students at current learning progressions A, B and emergent C. Assessment '2' would focus on students developing skills consistent with C, D, E and assessment '3' would be recalibrated for students progressing through learning standards at levels E, F and G. Connections between assessments would utilise anchoring of common items to enable long term monitoring of progress while providing a finely grained snapshot of the learner at different stages of their communication and literacy development.

The rationale of targeting this research project to young learners reflected the potential for gains in communication and literacy exhibited by students in the early years of schooling. However, a longer term validation of the assessment instrument would explore and validate its use by a broader cohort of teachers to assess learning, target instruction and

monitor progress over time and could include older students progressing through early stages in their development of communication and literacy skills.

8.5.2. Review of potential impact

The intention behind the development of these tools was to support teachers to target their observations and interventions for students with ASD to maximise their students' potential to learn. While no single test is able to provide a definitive measure of student competency this assessment exhibits the properties of comprehensiveness, coherence and continuity (Pellegrino & Chudowsky, 2003).

In cases where teachers are unfamiliar with a theoretical model for understanding the challenges and strengths of learners with ASD, use of this assessment instrument may serve as a guide to identifying learning priorities. As the research instrument is based on a conceptual model for learning for students with ASD this has the potential to be reflected by a compatible model within each student's broader learning context when teachers engage in planning and teaching with the aim of achieving coherence with assessment progressions. As a result, the assessment instrument, developed in this study is novel in its capacity to assess and monitor learners with ASD in educational settings.

While item response theory models have been widely used in large scale assessment and high stakes testing they have not been commonly employed in in the development of classroom assessments for learners with ASD. The psychometric approach used in the validation of this instrument provides an empirically based validation of a developmental continuum that can be used with continuity, to measure progress over time.

This study validated the research instrument through evidence of the process used in its development and through presentation of an argument that explained and defended assessment outcomes. The development of learning progressions that describe shifts in competency from very early stages of communication and literacy through to more developed knowledge and skills are represented as a continuum of learning. As such, they provide a frame of reference for teachers to assess and monitor students at their current point of learning and to measure of progress over time.

To support ease of use by teachers, assessment results were designed to be expressed as a standard within an articulated learning progression, rather than as a discrete score. By referencing assessment outcomes against the empirically derived learning progression

standards, teachers would then be able to effectively target their teaching to each individual's zone of proximal development.

The research tool was designed to reflect a balance between formative and summative assessment, through a focus on observing the performances of learners engaged in regular classroom activities that would allow competence and progress to be inferred and measured. This is underpinned by the assumption that all individuals with ASD have the capacity to learn and are likely to show the greatest progress when teachers are provided with high quality assessment tools that enable them to efficiently target and scaffold educational interventions to their students' individual needs.

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APPENDIX A: TOWARDS FOUNDATION VICTORIAN CURRICULUM LEVELS

Table 1: Victorian Curriculum F-10 Levels A to D (Students with disabilities) with Achievement Standards.

Victorian Curriculum F–10		*Students with Disabilities (Levels A to D)*				
		A	B	C	D	Foundation
English		Standard	Standard	Standard	Standard	Standard
Mathematics		Standard	Standard	Standard	Standard	Standard
The Arts	Dance	Standard	Standard	Standard	Standard	Standard
	Drama	Standard	Standard	Standard	Standard	Standard
	Media Arts	Standard	Standard	Standard	Standard	Standard
	Music	Standard	Standard	Standard	Standard	Standard
	Visual Arts	Standard	Standard	Standard	Standard	Standard
	Visual Communication Design					
Critical and Creative Thinking		Standard	Standard	Standard	Standard	→
Ethical Capability						→
Health and Physical Education		Standard	Standard	Standard	Standard	Standard
The Humanities	Civics and Citizenship					
	Economics and Business					
	Geography	Standard	Standard	Standard	Standard	→
	History	Standard	Standard	Standard	Standard	→
Intercultural Capability						→
Languages	F–10 Sequence					→
	7–10 Sequence					
Personal and Social Capability		Standard	Standard	Standard	Standard	Standard
Science		Standard	Standard	Standard	Standard	→
Technologies	Design and Technologies	Standard	Standard	Standard	Standard	→
	Digital Technologies	Standard	Standard	Standard	Standard	→

APPENDIX B: COMPARISON OF WAS ITEMS AND NOVEL INSTRUMENT ITEMS

Expressive & Receptive Communication

Requesting Objects		Request an object using a single word	***Request a motivating object or activity using a single word***	***Use 2 words to request objects/activities***	**Request objects and activities in 4-5 word sentences**	**Use complete sentences and correct grammar to appropriately request objects/activities**
		Travel to request an object using a single word		***Use 3 words to request objects/activities***		
Requesting assistance	**Give / Offer play objects to an adult to initiate request for assistance**	Hand over the "help" symbol to request assistance	Hand over "help" symbol to request assistance	Use 2 photos or pictographs combinations on a sentence strip, to request assistance e.g. *"Help shoe"*		
Requesting Assistance		***Use a single word to request assistance***	***Use a single word to request assistance spontaneously***	Use 2 words to request assistance e.g. *"Help shoe"* or *"drink help*	Request assistance by giving an explanation of the problem e.g. "help me tie shoelaces"	**Clearly identify issues and use appropriate phrases to request assistance e.g. *"My shoelace is undone. Can you help me?"***
				Use 3 words to request assistance e.g. *"Help shoe on"* or *"want help drink"*		
Request permission					**Request permission using phrases "can I have", "Can I go", " Can I play"**	
Requesting Actions		Request a motivating action using a single **word**, (e.g. open push, cut)	***Use a single word (e.g. push) to request an action***	**Use 2 words to request an action**	***Request actions in 4-5 word sentences***	Use complete sentences and grammar to appropriately request actions
				Use 3 words to request an action		

Giving Instructions				Use a range of verbs, in 2-3 word combinations, to give instructions *"cut red apple", "push car", "grate carrot".*	Use a range of verbs in 4-5 word sentences to give instructions	Combine 2 instructions to direct an [adult/peer] to perform actions, e.g. *"Get the …and give..."?*
Asking questions					***Ask 'who', 'what', and 'where' questions***	**Ask questions using *why* and *how***
Negation		Student is exposed to 'no' (not allowed to have) in the form of red cross.	***Say "no" to indicate a range of negatives***	Answer "no" to the question *"Do you want …?"*	**Express " I don't want _____" to reject or refuse**	**Use *"I don't want…"* to reject or refuse**
		Demonstrate an understanding (through behaviour) of *no/not allowed to have/not available/absent* in the form of a red cross.	***Refuse object using "no"***	**Answer "no" to *"Is this a _____?"* question and "*is it a _____?"* question.**		Use a range of negative language forms
				Demonstrate an understanding and use of negatives in sentences by pointing to the correct picture e.g. the boy is not jumping, or saying, "not jumping."		
Prohibition						**Use prohibiting language to control the behaviours of others e.g. *"Don't do that", "Stop pushing me".***
Affirmation				**Answer "yes" in relation to action/location e.g., *"Does it go in the kitchen?"*** Answer "yes" when asked *"Do you want _____?"* **Answer "yes" when asked "*Is this a____?"* or *"Is it a ____?"***		

Commenting				Comment on immediate events that have occurred in the classroom	**Show a toy/object/photo to a small class group and make a comment**	**Show a toy/object/photo to a small class group and makes 2 – 3 comments.**
				Make simple comments during familiar activities, e.g. playing games e.g. *'it popped', 'I got a blue one'* **Make 1-2 related comments within an activity. e.g. *"car going", "dog running***	**Comment on immediate concrete item/activity produced in class in a structured small group situation using a complete sentence.**	
					Answer a question related to the item shown	Answer questions asked by peers related to the shown item. Ask questions of and makes comments to another student about their shown item
					Give news about a past personal experience in 1-2 sentences	***Combine 2 –3 sentences to comment on past event/activity***
					Make novel comment in familiar activities and events. e.g. "there's a red car"	**Sequence 3 or more ideas, when relating past events about personal experiences**
					Make comments about missing and/or incorrect items in a familiar setting with familiar people	***Describe a 3 –4 picture sequence with support from an adult.***
						Begin to use the language of stories e.g. "first, *then, the end"* when orally telling about a story or event.
						Describe a 3 -4 step procedure with visual support, step by step

Following instructions	Follow directions (come, finish, bye, stand up, sit down) in 1:1 setting using an object / gesture in a structured classroom setting	**Respond to one word instructions "come" "finish"**	Respond appropriately to instructions which include child's name and "turn" e.g. "Jim's turn".	**Follow 2 part related directions e.g. *"Unpack your bag and hang up your hat"* connected to familiar routine.**	**Follow 2 part directions not related to familiar routines.**	Follow 3 part sequential instructions
			Respond appropriately to instructions which include child's name and possession e.g. "Jim's book".	Follow a series of 1 part directions related to a single task e.g. *"Get the cordial", "Pour the water".*	**Follow 2 part directions related to a single task e.g. "get an egg and crack it into the cup"**	
			Demonstrate through response understanding of inhibitory words e.g. "stop", "wait", "no", "don't".	***Follow 2 part unrelated directions e.g. "Turn off the tap and then go outside".***	**Follow routine 2 part directions relating to objects not in view e.g., "go to the kitchen and get the big bowl from the cupboard**	**Follow 2 –3 part instructions that include referential language for object/s in view e.g. *Get the blue cup next to the water jug".***
			Demonstrate an understanding of verbs in context (with routine classroom and personal activities) e.g. wash, sit, open, cut, stir/mix etc.	Follow less familiar 1 part directions, pertaining to an object not in view e.g. *"Get the milk".*		**Follow 2 – 3 part instructions that include referential language for object/s not in view e.g. *"Go next door and get the red texta from the teacher".***
			Respond to instructions as part of play e.g. "feed the doll", "throw the ball".	Follow 1 part commands, non-routine, not in view, to a third person e.g. *"Give the cake to Pam".*	Describe a 2-3 step procedure step by step	
			Point to a picture in which there is a specific action performed.		Describe 2-3 step picture sequences	
Answering Questions				***Answer "who", "what" "where" questions about routine events that already have occurred or will occur e.g. "What did you do today?"***	**Answer "what" questions relating to a picture.**	***Answer "how" questions in relation to routine activities e.g. "How do you make pikelets?***

			Answer questions about student's own possessions with own name e.g. *"Whose book?" "John's book".*	Answer 'where' questions in relation to 'where' known actions/events occur.	**Answer 'where' questions relating to a picture**	**Answer *"who"* questions in relation to routine activities e.g. *"Who drove the bus?"***
				Answer "where" questions when the person, place or thing can be seen or is usual place *"Where's Daddy?"*	**Answer questions about factual knowledge such as "what does mum buy at the shops?"** Questions are related to student's personal experiences and environment.	Answer *"why"* questions in relation to routine activities e.g. *"Why did we put on our smocks?"*
				Answer "who", "what", "where", "is", "are", "have" questions about self, events, people, places or things in the surrounding environment e.g. *"What are you doing?", "What do you have for lunch?" "What is Wendy doing?"*	Answer yes/no questions accurately including "Are you ..?", "Can you ...?", "Do you want ..?", "Is this..?"	Answer questions about non-routine events that have occurred or will occur e.g. "*Who visited school today?"* **Answer social questions, e.g. *"What's your name?",*** *"Where do you live?", "What school do you go to?", and "What's your phone number?"*

Interpersonal Development

	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Eye contact/ Gaining attention	**Look at object that an adult is playing with when adult is engaged in shared play activity with him/her.**	**Gain an adult's attention by saying the adult's name or tapping the adult's arm/hand**	Approach an adult to gain attention	**Approach and gain adult's attention spontaneously in familiar settings with familiar people.**	**Use attention gaining words such as "look, here you are" in 2-3 word sentences**	
			Approach an adult and say person's name to gain their attention	**Approach and gain attention and wait for response before making request.**	**Raise hand and wait for teacher to acknowledge raised arm before answering/asking question making comment.**	
	Reach for offered objects with the support of an adult in a structured session			Approach and say person's name to get attention spontaneously		
	Look at adult's face when adult is engaged in shared play activity with him/her.			**Approach and say person's name to gain attention and wait for response before making request e.g. Liz, (pause) Liz looks and says "yes" student then makes request**.		
	Use eye contact in a 1:1 setting when engaged in motivating activity with an adult independent of object exchange			Say person's name to gain attention, wait for response and make request. (Student recognises subsequent requests do not need to be initiated by using person's name)		
Greetings & Farewells	Respond to word "bye" by looking briefly at adult or waving with coactive support.	***Use a gesture to respond to a farewell from a familiar adult***	***Use a gesture to spontaneously farewell familiar people***	***Appropriately initiate or respond to greetings and farewells with familiar people by combining 2 word***		

		Use a gesture to respond to a greeting from a familiar adult	***Use a gesture to spontaneously greet familiar people***	***sentences e.g. "Hi Marie", "Bye Natalie".***		
		Use a single word to respond to a farewell from a familiar adult	***Use a single word to farewell familiar people***			
		Use a single word to respond to a greeting from a familiar adult	***Use a single word to spontaneously greet familiar people***			
Name	**Look briefly at adult when called by name**	**Stop an activity when name called**	**Respond when name is called in an unfamiliar environment**			
	Stop & turn to an adult when called by name	**Stop, turn and come when name is called**	**Refer to self by name**			
			Respond to questions about student's own possessions with own name e.g. "Who's book?"			
Conversation					**Engage in simple conversations of up to 2 turns**	Take turns in conversation
					Take turn in conversations independently in a structured setting.	**Maintain a topic of conversation for up to 3-4 turns.**

Personal Learning

	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Joint attention/ Attending skills	***Attend to classroom and personal objects when shown and verbally labelled by the teacher.***	**Attend to an object or an activity for more than one minute**	**Sit and complete a familiar activity that has been chosen by an adult**	**Complete an unfamiliar activity that has been chosen by an adult**	**Maintain attention and sit appropriately, in group activities.**	Sit, maintain attention and complete 3 to 5 simple work

	Sit still for 3 minutes when engaging in a preferred activity **Sit among a group of 2-3 students supported by an adult in a structured session**	Attend to an object or activity jointly with a peer	**Remain seated independently during schedule and small group activities requiring him/her to wait for short periods.**	**Remain seated independently during schedule and small group activities requiring him/her to wait for extended periods.**	**Sit, maintain attention and complete 2 to 3 simple activities**	**Attend appropriately to others in large and small groups**

Reading

	Level 3	**Level 4**	**Level 5**	**Level 6**
Reading for Meaning	***Recognise common schedule pictographs, work, eat, lunch, play, morning tea, bag, book, computer, art, music, dance, exercises, shopping, rest, cooking, toilet, excursion, bus, home, school.***	Identify single words in the context of regular scheduled events and demonstrates his/her understanding of the meaning of a text by taking part in a familiar routine.	Demonstrate an understanding of meaning of action pictographs Use illustrations to aid comprehension of a story Read daily schedule to check sequence of activities Complete a sentence read by a teacher, using picture to provide cue e.g. George is eating…	**Respond and/or anticipate missing words i.e. cloze activity** **Re-read when meaning is disturbed by returning to the beginning of the sentence.**
				Sequence a simple picture story • of 4 pictures • of 6 pictures
				Use illustrations to extend meaning **Use title and illustrations to predict what a text might be about.**
				Demonstrates the sequence of a daily schedule by selecting and placing items appropriately.
				Demonstrates comprehension by matching simple sentences to photos of familiar events/activities. Acts on personalised stories, e.g. social stories
Word Recognition	***Recognise single personal objects in a picture photo, e.g. cup, bag, coat***	**Match name to name with photo of students in class/group**	Match letters of own name	Recognise colour adjectives when reading, e.g. the girl is wearing a red dress

	Match photo to photo Match object to photo Match word to word with picture/pictograph	Match name to name with photo of teachers ***Match name to photo of students and adults***		Recognise size adjectives when reading, e.g. the boy has a big green ball Recognise adverbs when reading, e.g. the girl in the pink dress walking quickly.
		Recognises their own name in print ***Read names of pupils in class/group without photos*** Read names of teachers without photos	Look at an adult to make an appeal or requests assistance when encountering an unknown word. ***Ask 'what is this?' when encountering an unknown word.***	***Recognise 10 of the 100 most commonly used words, a, the, and, I can, see, in, is, we are.*** Recognises 20 of the 100 most commonly used words, *a, the, and, I, can, see, in, is, we, are, going, will, up, out, for, this, with, be, of, at.*
		Match word to word with pictograph for the following schedule words, work, eat, lunch, play, morning tea, bag, book, computer, art, music, dance, exercises, shopping, rest, cooking, toilet, excursion, bus, home, school. ***Match word to pictograph, for the following schedule words, work, eat, lunch, play, morning tea, bag, book, computer, art, music, dance, exercises, shopping, rest, cooking, toilet, excursion, bus, home, school.*** Read schedule words without pictures, work, eat, lunch, play, morning tea, bag, book, computer, art, music, dance, exercises, shopping, rest, cooking, toilet, excursion, bus, home, school.	***Read the action word attached to a single familiar label e.g. open drink*** Match word to word with pictograph for the following verbs, eating, drinking, clapping, jumping, swimming, brushing, cutting, drawing, crawling, climbing, kicking, throwing, blowing, walking, running, digging, painting, riding, sleeping, washing ***Match word to pictograph, for the following, verbs to photos such as, eating, drinking, clapping, jumping, swimming, brushing, cutting, drawing, crawling, climbing, kicking, throwing, blowing, walking, running, digging, painting, riding, sleeping, washing*** ***Read verbs without a pictograph, eating, drinking, clapping, jumping, swimming, brushing, cutting, drawing, crawling, climbing, kicking, throwing, blowing, walking, running, digging, painting, riding, sleeping, washing.***	**Recognises letters of own name** Match upper and lower case letters Identify letters of the alphabet by their name Reads familiar words written in both upper and lower case letters
			Read schedule sentences with visuals, e.g. *as, today, we, will, have, going, go, the, is, to*.	Reads schedule sentences without visuals e.g. *We are going shopping* ***Demonstrate knowledge of word order by assembling individual words not in order to make a meaningful sentence.***

				Reads an increasing range of functional nouns, e.g. clothes, body parts, food, utensils, classroom material.
				When reading can ask 'what is this word?'
Book knowledge	*Attend to a book sitting with an adult.* Help turn pages of book story when sharing with an adult Participate in next action/gesture/sound/ prompt in a familiar story/poem/rhyme, with help, e.g. 5 Little Ducks anticipating a sound.	*Open books and point to pictures in the book* Turns pages one at a time Hold a book the right way up	***Identify the front and back of a book***	***Point to each word when reading*** Is able to read from left to right with return sweep, and from top to bottom Recognises the beginning and end of a sentence.
		Ask for a specific story/digital book Find a specific book on request	***Use repetitive passage when 'reading' independently i.e. Look at the lion, Look at the zebra, Look at the giraffe.***	Retell a familiar story orally following the appropriate sequence with the aid of visual props e.g. puppets, character cut outs
		Attend to a book with a communicative partner Track text left to right in a sequencing direction with picture cues whilst an adult reads.		
		Listen and respond to familiar rhymes, action songs and stories as part of a small group.		
		Join in with repetitive verse, actions, gestures as part of a small group Anticipate and carry out familiar actions, gestures and say repetitive phrases in a familiar story		

Writing

Fine motor Skills	Use a palmer grasp with either hand Scribble a few quick strokes with no apparent link between hand and eye co-ordination, i.e. chalk, pastels, textas and thick pencils	***Trace*** • ***a straight line*** • ***wavy line*** • ***curly patterns*** • in between two parallel lines	Trace • shapes • letters • own name	***Hold a writing implement using the tripod grasp*** Use second hand to hold paper while writing.

	Attend to scribbling action ***Scribble in anti-clockwise circular manner*** Scribble freely using paintbrush, mouse, touch screen follow lines within tracks with fingers			
	Use a palmer grasp with preferred hand when using a writing tool	Draw around a simple shape	Begin to use a tripod grasp with a pencil grip. Form initial letter of own name with support	
Word Skills		Trace • patterns from left to right • own name	Write initial letter of name from memory Attempt to write own name from memory on a piece of work Write own name	Find first blank page in book & start writing on left of page Write left to right
		Use the computer to copy their own name **Point and select objects on the computer screen**	Join dots to write letters of the alphabet correctly ***Copy the letters of the alphabet from left to right (letter size variable)***	**Copy all letters of the alphabet correctly**
			Trace • individual schedule words with pictographs, e.g. lunch, music, play • simple three word sentences 'Today is Monday'	**Ask how to write a word** Use have-a-go-card ***Use a word list***
			Copy • *individual schedule words with pictographs, e.g. lunch, music, play a sentence underneath a picture/photo* • ***individual words on computer*** • a sentence/word from a separate sheet with direction	***Frequently use correct initial letter of word*** **Use letter sound knowledge in writing**
				Copy single words from separate piece of paper ***Leave a space between groups of letters*** **Copy from the board**
Communicating Ideas		***Dictate to an adult a simple sentence to describe a picture***	***Dictate to an adult a sentence about weekend news***	***Write*** • ***all letters in own name from memory*** • own name in correct sequence of letters

			Dictate greetings/messages to an adult for cards	• own name on the computer
				Use a single letter to represent words ***Group letters together to represent a word*** ***Write part of the words from memory*** Write schedule words independently without visual support.
				Copy a modelled sentence recounting personal experiences, such as weekend or holiday news, using pictographs. E.g. On the weekend… ***Use the computer to record messages about familiar events/activities, e.g. weekend news, excursions*** Write a sentence with an adult using a photo of themselves engaged in a familiar activity, using conventional letters.
				Illustrate their own work to support ideas and information.
				Fill in the word or phrase in cloze activity either by hand or using the computer.

APPENDIX C: ITEMS SELECTED FROM ESL STAGE 1: TEACHER SUPPORT MATERIAL FOR LOWER PRIMARY NEW ARRIVALS

The content below reproduces the DEECD (2007) ESL Stage A1: *Teacher Support material for lower primary new arrivals*. Items highlighted in grey have been included as indicators in the research instruments.

Stage A1 – Speaking and listening

Stage A1: Texts and responses to texts.

At the end of Stage A1, students can routinely use spoken English to do the following things:

Receptive

- **display attentive listening behaviour, i.e. sit on floor and listen for sustained periods with some visual support**
- follow simple instructions in familiar school routines, relying on key words, non-verbal language and context
- respond appropriately with simple non-verbal language to comments, or indicate non-comprehension, e.g. smile when greeted, shake or nod head
- participate in simple, familiar songs, rhymes and chants
- check on understanding of simple, familiar instructions and routines, e.g. T: It's playtime. S: Go outside?
- identify single items of information from short spoken texts, pictures or diagrams in a known context, e.g. number, colour, name, 'Point to the three little pigs.'

Productive

- **give some basic personal information, using learned formulas or brief answers, e.g. My name is ..., I'm a boy/girl ...**
- **expand on basic personal information when prompted, supported and given adequate time**
- make simple requests or express basic needs using learned sentence patterns or 2–3 word utterances, e.g. May I have a drink, please?, It's home time, Go now?
- use learnt phrases in play, e.g. give me, stop it, I don't like
- usually respond to questions with a single word or phrase, but can make longer utterances by substituting words in known sentence patterns
- negotiate simple social or learning activities by suggesting, initiating or directing, e.g. Play football? Stop that!

Stage A1: Cultural conventions of language use.

At the end of Stage A1, students' understanding of the contexts and purposes of spoken texts is shown when they:

Receptive

- distinguish English from other languages, e.g. on hearing English, respond in English
- tune in to the particular sounds of English, e.g. recognise rhyming words in a listening game, respond to known words in texts
- recognise that some particular words, gestures or intonations may be appropriate or inappropriate in certain contexts

Productive

- **use acceptable social formulas and gestures and interact appropriately in context, e.g. thank you, excuse me, please**
- recognise that conversation breakdown is not acceptable and repeat, re-pronounce or self-correct words in order to help the other person understand
- can tell when a response is required and attempt to respond either non-verbally or using known words
- can appear to be interacting appropriately by copying the actions of other students.

Stage A1: Linguistic structures and features.

At the end of Stage A1, students' understanding of the linguistic structures and features of spoken English is shown when they:

Receptive

- understand gender in common pronouns and possessive adjectives
- respond to key words in a range of common spoken instructions, e.g. Shut the door
- understand the tense of statements or instructions, mostly through time references, e.g. We went yesterday, Tomorrow we will go, Now we can eat lunch
- have difficulty understanding discussions between teacher and learners at native speaker speed

Productive

- create original utterances by substituting new words in learned patterns or formulas, e.g. It's home time. It's go time.
- use words from word sets related to need, interest or experience, e.g. family, school, colours, numbers, days, months
- **use single word or phrase response to questions, e.g. Yes, No, I don't know**
- use a range of formulas appropriately for different purposes and functions, e.g. What's the time? Oh, no! Very good!
- construct simple subject-verb-object sentences, largely using present tense, e.g. We buy house
- demonstrate variable placement of common **adjectives to describe or add emphasis**, e.g. big truck, car blue
- use some grammatical patterns to create new meanings, e.g. played, eated, goed; to the farm, to the Australia.
- use intonation to enhance meaning or to distinguish statements from questions
- use comprehensible pronunciation
- speak with breakdowns in fluency and meaning due to limited English resources
- express negation using 'no' or 'not' e.g. I no like vegetable, I not go
- use 'telegraphic' speech patterns, where function words may be omitted or not used correctly, e.g. 'Me go to shopping and buyed many thing.'

Stage A1: Maintaining and negotiating communication

At the end of Stage A1, students may use the following strategies to maintain and negotiate spoken communication:

Receptive

- **listen to a sustained text, focusing on visual support, e.g. instructions and demonstrations about an art activity**
- **question to check meaning, to clarify, or to confirm, e.g. T:** Stick **it in your book, S**: language **book?**
- check understanding of classroom conversations or instructions by asking other first language speakers to clarify
- use strategies such as watching and listening to what other students are doing, following them, watching the teacher's face

Productive

- ask for attention or assistance from the teacher or a friend, e.g. check understanding, ask for repetition
- use non-verbal language to sustain interaction with others, e.g. nod, smile, laugh, gesture
- substitute words or manipulate learned formulas to create new phrases e.g. in chants
- borrow key words from previous speaker, e.g. Child 1: Do you want to play chasey? Child 2: Yeah, play chasey
- imitate pronunciation, stress and intonation patterns, e.g. from stories, songs, rhymes, media
- rehearse or role play using formulas or short exchanges, e.g. from popular stories or songs; 'Little pig, little pig let me in.'
- provide the initial context for a conversation and then rely on another speaker to provide appropriate words in English, e.g. read with the teacher, interact through gestures, facial expressions, point to illustrations, repeat words.

Stage A1 – Reading

Stage A1: Texts and responses to texts

At the end of Stage A1, students can routinely read the following kinds of texts, and respond to them in the following ways:

- read short, learned texts, e.g. simple rhymes, songs, repetitive texts

- read some environmental print and familiar words in context, e.g. recognise names, some letters, some common signs and logos, numbers
- **read their own writing, or a** simple **text written by the teacher, e.g. about a shared experience**
- **join in with shared reading activities e.g. whole class reading of repetitive Big Book**
- **complete simple activities based around texts, e.g. sequence pictures to retell story, dramatise a story, paint or draw characters,**
- adopt teacher's intonation patterns when reading familiar texts
- **show a personal response to a text, e.g. look at or read a book in own time, role-play, draw a picture**
- **recognise some familiar vocabulary, mainly content words in supported context, e.g. shared reading**
- follow simple written texts that are read to them
- **identify characters in a narrative**
- **draw pictures of the stages of a narrative; match pictures and words of a procedure**
- concentrate during group reading activities
- **understand some main ideas in a simple story read aloud, supported by visuals.**

Stage A1: Cultural conventions of language use

At the end of Stage A1, students' understanding of the contexts and purposes of the texts they read is shown when they:

- show awareness that written and visual texts are created to share a message
- can recognise that environmental print is significant, e.g. asks the teacher to read a sign
- **identify whether a text tells a story or gives information**
- understand that print contains a consistent message, e.g. indicates when the ending of a well-known story varies
- identify reading purposes of texts, e.g. enjoyment, information
- choose books to look at or read independently.

Stage A1: Linguistic structures and features

At the end of Stage A1, students' understanding of the linguistic structures and features of the texts they read is shown when they:

- are able to distinguish Roman script from non-Roman script
- **recognise the function of capital letters and full stops** , e.g. count sentences
- show awareness of basic conventions of print in English, **e.g. follow text with finger from left to right and from the top to the bottom of the page**
- **show awareness that words are separated by spaces, e.g. by pointing to words, counting words**
- **understand and use** the metalanguage for some **basic** conventions of **book layout and aspects of reading, e.g. word, letter, page, title, cover**
- **recognise and name some letters of the alphabet**
- **identify common letters in different words consistently, e.g. point to all the 't's in a sentence**
- **relate some letters of the alphabet** to sounds, e.g. relate some non-consonants **to their usual/common sounds**
- **identify some sounds in words**
- **recognise some common letters and letter patterns in words, e.g. refer to charts,** books
- **identify repetitive word or letter patterns in sentences and phrases**
- recognise some familiar personally significant words in context, e.g. own name, peers' names, 'today is'
- match words to sentence in a known text
- match familiar words or simple sentences with pictures.

Stage A1: Maintaining and negotiating communication

At the end of Stage A1, students may use the following strategies to assist them to read and comprehend texts:

- use illustrations to discern the story line of a text
- use illustrations to predict individual words in texts about familiar topics
- **read with or slightly after the teacher, e.g. join in the familiar part of a story**
- focus on reading **repetitive words or phrases in known texts**
- listen for key words in a shared reading text, e.g. names of characters
- memorise a familiar or favourite part of a text

- practise by re-reading their favourite texts
- choose texts to read that are familiar or well supported by illustrations
- attempt to decode known and unknown words using initial sounds and other early decoding skills
- **focus on meaning of content words (particularly nouns and verbs) associated with accompanying pictures or words pointed to by teacher,**
- **tend to ignore meaning carried by structural words such as the, and, as, in, of and other language not pointed out or supported by illustrations**
- show comprehension through appropriate contextual activities, e.g. sequencing pictures
- use simple dictionaries and word charts.

Stage A1 – Writing

Stage A1: Texts and responses to texts

At the end of Stage A1, students can routinely write the following kinds of texts and respond in the following ways to texts they have read or heard:

- **write a simple text that fulfils a function, e.g. simple description, recount, procedure**
- **draw to illustrate a simple text, e.g. to relate an ongoing activity, to give additional information, to retell a simple story**
- **contribute ideas, words or sentences to a class or group shared story**
- **write well-known symbols, words, phrases or short texts, e.g. Today is Monday**
- **complete simple repetitive modelled sentences, e.g. I like …; I went to …; Today is …**
- **reread their own texts, or sentences scribed by another**
- **choose a topic to write or draw about**
- **write or complete simple sentences from own experience**
- write a caption or label for an illustration.

Stage A1: Cultural conventions of language use

At the end of Stage A1, students' understanding of the contexts and purposes of texts they write is shown when they:

- show awareness that English writing consists of words formed by letters, and sentences made up of words, e.g. leave spaces between groups of letters or between words
- **use some conventions for printed English, e.g. left to right, top to bottom, copied letters are identifiable**
- respond to the terms writing and drawing appropriately
- **understand some terminology of writing, e.g. word, letter, sentence, space, full stop**
- **expect words to have consistent spellings, e.g. copy words carefully, ask how to spell a word, or ask for a word to be written so they can copy it**
- **show evidence of layout or planning in writing, e.g. place text appropriately on a page, leave space for a drawing**
- take particular care with handwriting, drawing, or choosing materials when writing for special purposes, e.g. 'publishing' a story, making a birthday card
- **use appropriate size, spacing and letter formation.**

Stage A1: Linguistic structures and features

At the end of Stage A1, students' understanding of the linguistic structures and features of the texts they write is shown when they:

- **write sentences or phrases that reflect their oral structures, e.g. go to school, go home, come from**
- **dictate sentences or phrases that reflect their oral structures, e.g. go to school, go home, come from**
- **label drawings of everyday personal activities using language learnt in the classroom, e.g. live here, play, study**
- **write 'run-on sentences', e.g. at school we work and at school we play**
- **dictate 'run-on sentences', e.g. at school we work and at school we play …**
- **demonstrate awareness of some sound-letter relationships, e.g. represent words by initial letter, or several letters, such as 'bk' for book**
- write some words using correct spelling
- **spell with accuracy some CVC words (consonant-vowel-consonant) and common words learned in the classroom**
- **consistently write the same letters and numbers the same way**

- **understand the difference between upper and lower case letters**
- **begin to include/experiment with some familiar punctuation, e.g. full stops, capital letters.**

Stage A1: Maintaining and negotiating communication

At the end of Stage A1, students may use the following strategies to assist them to write texts:

- **use illustrations to provide more detail to a written text**
- **use illustrations as a prompt for a scribe to write for them**
- **use words copied from various sources, e.g. labels, signs, word lists**
- use invented spelling which draws heavily on phonetic strategies or based on own pronunciation
- **dictate sentences about a drawing or an experience for others to write**
- write the same very simple texts repeatedly
- **practise correct formation of letters**
- **ask for a word to be written so it can be copied**
- **copy words, phrases or sentences accurately**
- **use basic keyboard skills to write personally significant words and simple modelled sentences, e.g. own name, 'I went to the park'**
- **begin to experiment and attach meaning to their writing.**

Stage A2 – Speaking and listening

Stage A2: Texts and responses to texts

At the end of Stage A2, students can routinely use spoken English to do the following things:

Receptive

- **follow a classroom discussion about familiar topics or new topics that are well supported by visual material**
- **follow a short sequence of instructions related to classroom procedures or learning activities, e.g. book borrowing procedures, rules for using the class computer, order information from a short spoken text using pictures**
- **listen to a story then retell or sequence using pictures**
- **identify key points of information from short spoken texts with reduced visual support, e.g. the day the excursion will take place**
- **understand key information from viewing a range of media, e.g. computer programs, TV, DVDs**
- demonstrate active listening

Productive

- **talk about class topics in class discussions**
- **negotiate simple transactions, e.g. at the school canteen**
- **participate in short, structured social interactions, e.g. exchanging basic information about family, school**
- negotiate activities with peers in small group tasks, e.g. suggesting, agreeing, disagreeing, clarifying
- **speak in front of a group on a familiar topic, e.g. sharing, recounting personal experience**
- **describe a series of events or actions**
- **express ideas, humour, simple opinions and describe feelings, e.g. I am very happy**
- **participate in discussions between teacher and learners, but still have some difficulty with** discussions at native speed, or with idiomatic or **figurative language**.

Stage A2: Cultural conventions of language use

At the end of Stage A2, students' understanding of the contexts and purposes of spoken texts is shown when they:

Receptive

- identify a number of spoken text types and forms, e.g. stories, poems, plays
- understand instructions or explanations, when supported by clear contexts in the classroom
- understand that intonation, volume or stress affects spoken interaction, e.g. modify own pronunciation appropriately

Productive

- adjust speech according to audience and purpose, e.g. giving a talk, speaking to a friend, adult etc, giving an apology

- negotiate familiar social and learning situations, using language appropriate to the situation, e.g. explaining a problem to a teacher, negotiating the rules of a game with a friend, participating in a class discussion, describing an object
- initiate and manage interaction through conversational formulas, e.g. Oh no? Very lucky! 'Oh sorry, I don't know where is the book. I lost it'
- use modality to express possibility or obligation, e.g. must, should, might.

Stage A2: Linguistic structures and features

At the end of Stage A2, students' understanding of the linguistic structures and features of spoken English is shown when they:

Receptive

- understand common sequence markers in speech, e.g. first, next, then
- understand phrases of place or location, e.g. over here, next to the chair
- recognise questions or statements through word order and vocabulary as well as through intonation, e.g. Do you ...? Can anybody ...? Anybody can ...
- **understand some common phrases in both their full and contracted forms, e.g. I'm/I am, You're/you are**

Productive

- combine known formulas, structures and other vocabulary to communicate, e.g. Yesterday I went to the swim
- apply some grammatical rules, but may overgeneralise for irregular forms, e.g. formation of plurals (mouses); past tenses (swimmed, buyed)
- use common prepositions, e.g. in, at, on, near
- use appropriate verb and noun endings with some consistency, e.g. -ing, -ed, -s
- use correctly some forms of the verbs to be, to have, e.g. Her name is Maria.
- express simple negation correctly, e.g. don't, can't
- **regularly use appropriate pronouns, e.g. I/me/he/him/she/he/it**
- **regularly use appropriate possessive pronouns, e.g. his, her, its, our, their, my**
- **use sequence markers to link ideas. e.g. next, and then, after that**
- **use how, when, where, why, who question forms.**

Stage A2: Maintaining and negotiating communication

At the end of Stage A2, students may use the following strategies to maintain and negotiate spoken communication:

Receptive

- ask a speaker to repeat or speak slowly, e.g. Say again, please
- predict meaning from context, e.g. of an unknown word in a conversation
- **ask what a word means, e.g. I don't understand. What's 'fete'?**
- ask for the translation of specific words from other first language speakers

Productive

- initiate and maintain simple conversations, incorporating courtesy formulas, e.g. for turn taking, leave taking
- repeat or modify a sentence or phrase, modelling rhythm, intonation and pronunciation on the speech of others
- use communicative strategies, for example the use of intonation or gesture, to enhance meaning
- use a repertoire of common classroom formulas, e.g. Just a minute, Give me hand, Be quiet, please, Can I have a brush, please?
- use vocabulary learned from written texts in speech.

Stage A2 – Reading

Stage A2: Texts and responses to texts

At the end of Stage A2, students can routinely read the following kinds of texts, and respond to them in the following ways:

- **read a range of topic related classroom texts with support**
- **read well-known words or phrases in new contexts, e.g. Tuesday, Once upon a time**
- **demonstrate understanding of new texts, and respond, e.g. read along with repetitive sections, predict**
- **consistently read back own writing or sentences scribed by another**
- **participate in simple group activities based on shared texts**

- **ask questions, retell and talk about texts read and viewed in class, or give factual information from texts read and viewed in class, e.g. can tell who does what and why**
- **recall factual information from texts read and viewed in class**
- **retell main events in sequence with guidance and prompts from teacher**
- **express opinions about the actions of key characters**
- **understand main ideas and recognise characters in a well illustrated story read aloud**
- obtain information from simple diagrams or graphs
- respond to texts through art, drama, movement and music
- **talk about features of a story or poem that have personal appeal, e.g. fantasy elements, favourite characters, interesting words/phrases**
- **identify features of a range of text types, e.g. recount, report, procedure, narrative**
- **read well known texts with some fluency, e.g. appropriate pauses and intonation**
- **modify intonation when reading to differentiate questions, exclamations or dialogue.**

Stage A2: Cultural conventions of language use

At the end of Stage A2, students' understanding of the contexts and purposes of the texts they read is shown when they:

- **identify the basic purpose of a new text**
- **identify texts as factual or fictional and make comparisons, e.g. using topic, content, layout, illustrations**
- identify stories, lists, poems or songs when reading or listening to text read aloud
- **use texts purposefully, e.g. follow simple procedural texts, find basic information in texts, locate specific information from a known text, use a simple contents page and index to locate information**
- **relate something learned from a text to own experience, e.g. by commenting or by identifying with the characters in a story**
- choose books to read that are appropriate and of interest.

Stage A2: Linguistic structures and features

At the end of Stage A2, students' understanding of the linguistic structures and features of the texts they read is shown when they:

- **sequence a familiar text, e.g. narrative, recount, procedure, explanation**
- read frequently heard phrases fluently, e.g. 'and then', 'and he said'
- **recognise familiar words in different contexts**
- sequence words or phrases in a familiar sentence
- **match a range of familiar spoken words with written words**
- **recognise and name all letters of the alphabet**
- **relate most letters of the alphabet to sounds**
- **recognise some common syllables and patterns within words, e.g. in, on, ing**
- **recognise some common prefixes and suffixes and how they change the meaning of words, e.g. un, -er**
- **recognise rhyming words**
- **recognise beginning, middle or final sounds in words**
- **recognise the difference between upper and lower case letters**
- demonstrate that full stops and question marks break up text, e.g. pause appropriately when reading.

Stage A2: Maintaining and negotiating communication

At the end of Stage A2, students may use the following strategies to assist them to read and comprehend texts:

- draw upon experiences and oral repertoire to anticipate words or phrases
- choose books that are appropriate and interesting by looking at cover, illustrations or amount of text
- re-read well-known books and texts
- **sub-vocalise when reading silently**
- use picture cues when reading, e.g. pictures in narratives or in information texts
- **use a range of cues when reading, i.e. meaning, visual, structure**
- use developing knowledge of the patterns of English to predict some words or phrases
- use knowledge of letters and sounds to read a new word or locate key words
- **read, modelling rhythm, intonation and pronunciation on the example of other readers**
- find words in a dictionary or from class word lists.

Stage A2 – Writing

Stage A2: Texts and responses to texts

At the end of Stage A2, students can routinely write the following kinds of texts and respond in the following ways to texts they have read or heard:

- **write simply for a variety of authentic purposes related to classroom topics, using known and modelled structures and features, e.g. a personal recount, simple description**
- **initiate writing for own particular purposes, e.g. label drawings, make a birthday card, write a recount about a recent experience**
- **write for a 'real task', e.g. make a list, write a letter, write a story at home**
- write beyond the immediate environment and beyond known language only if patterning and modelling has been provided by the teacher
- **use vocabulary, modelled writing or ideas from texts read or viewed in class in own writing or drawing.**

Stage A2: Cultural conventions of language use

At the end of Stage A2, students' understanding of the contexts and purposes of texts they write is shown when they:

- **use a variety of simple text structures, e.g. a title, an opening, ending, caption**
- **write, using a text type appropriate to the purpose, e.g. a story, a list, a procedure, a report**
- **describe the purpose of a text, e.g. to inform, to describe an event, to tell a story**
- **demonstrate an understanding that written texts usually need to be planned, edited and presented**
- **use a range of writing implements and writing styles for different purposes, e.g. work for display, first draft on a computer, making a poster**
- **use size of writing, colour, layout and choice of media to help transmit messages, e.g. making a sign or a poster.**

Stage A2: Linguistic structures and features

At the end of Stage A2, students' understanding of the linguistic structures and features of the texts they write is shown when they:

- write, reflecting spoken English in vocabulary and structure
- **write sentences based on simple repetitive, modelled patterns, e.g. I went …**
- **write simple sentences and begin to rely less on copying**
- **use some common imperatives appropriately, e.g. draw, cut, stop, run, Mix the …, Cook the ...**
- use some common irregular past tense verbs correctly, e.g. went, saw
- **use a mixture of tenses within one text**
- **link sentences using common conjunctions and connectives, e.g. but, after, when**
- use small range of reference items, e.g. definite article and pronouns, with some accuracy in short written texts, e.g. Once there was a monster. The monster was hungry. It eats my lunch
- **spell high frequency words correctly appropriate to year level**
- **attempt to spell unknown words**
- **use some punctuation consistently, e.g. full stops, question marks, commas**
- **demonstrate that a sentence starts with a capital letter and ends with a full stop**
- **use upper and lower case letters appropriately**
- write legibly.

Stage A2: Maintaining and negotiating communication

At the end of Stage A2, students may use the following strategies to assist them to write texts:

- use pictures, drawings or graphic organisers to develop a simple plan for writing
- **use a simple framework to write a particular text type, e.g. a recipe, a report**
- begin simple editing and redrafting of their writing
- read own writing aloud to check meaning
- **model writing on other texts, e.g. use words, phrases or sentence patterns from a teacher model or favourite story**
- **write repetitive patterns to produce longer texts, e.g. I like ..., and I like ...**
- **create and use a bank of known words appropriate to year level in own writing**
- **ask how to write new words**

- **attempt to spell new words, based on known spelling patterns and base words, e.g. walk, walked, walking**
- **use sound or visual features of words to attempt own spelling, e.g. vae/very, ar/are, perpl/purple**
- **use a range of resources to find words or phrases needed for own writing or to check spelling, e.g. simple dictionaries, vocabulary lists, modelled texts, familiar books and environmental print**

APPENDIX D: LETTERS OF INVITATION TO PRINCIPALS AND TEACHERS

Elizabeth Richardson
Student Researcher
Victoria University
Unit 11, Level 2, 8-18 Whitehall Street,
Footscray, VIC, 8001

March 12, 2011

Ms……
Principal
Autism Specialist College,
Melbourne, Victoria, 3000

Dear Ms……..,

Re: Monitoring the Development of Communication and Literacy Skills among Learners with an Autism Spectrum Disorder.

I am writing to invite your school to participate in a research project entitled *"Monitoring the Development of Communication and Literacy Skills among Learners with an Autism Spectrum Disorder".* This project is being conducted by a student researcher Ms. Elizabeth Richardson as part of a PhD study at Victoria University under the supervision of Associate Professors Shelley Gillis & Tarquam McKenna, Victoria University.

The project aims to validate a developmental framework for assessing and reporting communication and literacy skills of young learners with an Autism Spectrum Disorder (ASD). The study will be based on a strong theoretical framework for developing learning profiles that will enable an assessment tool to be developed. For educators working with students with ASD the validated framework will provide an accessible formative assessment tool that enables targeted communication and literacy intervention that matches the learning style of students with an ASD.

Please find attached *Information to Schools involved in Research* which provides additional information about the project. If you are interested in your school participating in this project please sign the attached consent form and return to the research team in the self-addressed envelope provided with your information pack. Once received the research team will contact you and arrange a convenient time for an information session at the school.

Yours Sincerely,

Elizabeth Richardson
Student Researcher

Elizabeth Richardson
Student Researcher
Victoria University
Unit 11, Level 2, 8-18 Whitehall Street,
Footscray, VIC, 8001

March 12, 2011

Dear Teachers,

Re: Monitoring the Development of Communication and Literacy Skills among Learners with an Autism Spectrum Disorder.

I am writing to invite you to participate in a research project entitled *"Monitoring the Development of Communication and Literacy Skills among Learners with an Autism Spectrum Disorder".* This project is being conducted by a student researcher Ms. Elizabeth Richardson as part of a PhD study at Victoria University under the supervision of Associate Professors Shelley Gillis & Tarquam McKenna, Victoria University.

The project aims to validate a developmental framework for assessing and reporting communication and literacy skills of young learners with an Autism Spectrum Disorder (ASD). The study will be based on a strong theoretical framework for developing learning profiles that will enable an assessment tool to be developed. For educators working with students with ASD the validated framework will provide an accessible formative assessment tool that enables targeted communication and literacy intervention that matches the learning style of students with ASD.

Please find attached *Information to Teacher Participants involved in Research* which provides additional information about the project. If you are interested in participating in this project please sign the attached consent form and questionnaires and return them to the research team in the self-addressed envelope provided with your information pack.

Yours Sincerely,

Elizabeth Richardson
Student Researcher

INFORMATION TO SCHOOLS INVOLVED IN RESEARCH

You are invited to participate

Your school is invited to participate in a research project entitled *"Monitoring the Development of Communication and Reading Skills among Learners with an Autism Spectrum Disorder".* This project is being conducted by a student researcher Ms. Elizabeth Richardson as part of a PhD study at Victoria University under the supervision of Associate Professors Shelley Gillis & Tarquam McKenna, Victoria University.

Project explanation

The research project aims to validate a developmental framework for assessing and reporting communication and reading skills of young learners with an Autism Spectrum Disorder (ASD). The study will be based on a strong theoretical framework for developing learning profiles that will enable an assessment tool to be developed. The assessment will monitor student progress as well as target intervention for student learning in the areas of communication and reading that match the learning style of students with ASD. Research participants will be drawn from schools that employ teachers who work with students between 4 and 18 years of age in specialist autism settings. For educators working with students with ASD the validated framework will provide an accessible
assessment tool that enables targeted communication and reading intervention that matches the learning style of students with ASD.

What will you be asked to do?

Principals of potential schools will be contacted with information about the research project. On receipt of the Principal's consent form the researcher will contact the Principal to identify a convenient time to visit the school and meet with potential participants. The researcher will provide the school with a flyer for display at the school in the staffroom inviting teachers to take part in the research project and attend an information session where they will be provided with information about the study and a research pack.

What will teachers in my school be asked to do?

Interested teachers will be invited to attend an information session in their workplace and receive a research pack including:

- Plain Language Statement
- Consent form
- 4 copies of the Communication and Reading Questionnaires
- Self-addressed envelope to return consent form and questionnaires to the researcher

Background information about teaching experience, special education qualifications and access to professional learning related to the needs of students with ASD is requested as well as information related to student communication and reading skills. The information gathered will not enable identification of the participants.
Each participant will complete separate questionnaires on 2-3 students, focusing on what they currently know about each student's communication skills, literacy development and simple background information to respond to the survey. The background data recorded for students will be age, gender, years of schooling and whether they have additional needs. Teachers will use a self-addressed envelope provided to return their consent form and completed questionnaires to the researcher.

What will the school gain from participating?

For teachers engaged in the difficult task of individualising programs to meet the learning needs of students with Autism Spectrum Disorder this research provides a comprehensive communication and reading assessment within a developmental framework that can be used to inform the development of Individual Learning Plans and educational programs for students. Once established teachers can utilise the questionnaire to identify a student's current competence and target their teaching and support to move a student towards a sophisticated skills in relation to their developing skills.

How will the information given be used?

Confidentiality of teacher responses will be preserved through the use of non-identifiable teacher and student codes. Each participant will complete separate questionnaires on 2-3 students, focusing on what they currently know about each student's literacy development and simple background information to respond to the survey. The questionnaire contains no identifying information for individual respondents. The background information collected for teachers relates to: years of experience in teaching students with additional needs, special education qualifications and access to professional development related to teaching students with an Autism Spectrum Disorder.

The background data recorded for students will be age, gender, years of schooling and whether they have additional needs. Students do not take part in this research. Student anonymity is protected because only the teacher who selects students for observation will know who they have observed and this information is not recorded or submitted for research purposes. Schools and participants will not be named in any report arising from this research.

What are the potential risks of participating in this project?

To avoid any psychological risk associated with coercion, teacher participation in this study must be completely voluntary and the sole choice of each participant. If individuals do not wish to engage with the project there will be no penalty to staff in any way. Staff may elect to withdraw from the research at any time. Students of teachers who do not participate will not be restricted in their access to educational experience as a result of their teacher's exercise of choice. Assessments may be used by the teacher for formative purposes but it will have no impact on the student's summative results. If any participant experiences stress and/or anxiety associated with completing the questionnaires he/she can access counselling, free of charge provided by Anne Graham, a registered psychologist at Victoria University by calling 9919 2159.

How will this project be conducted?

If you allow your school to participate in this research please sign the attached consent form and return to the research team in the self-addressed envelope provided with your information pack. Once approval has been granted the research team will contact you and arrange a convenient time for an information session at the school. You will be provided with an information flyer to place at your school to invite interested staff to attend a meeting at the time you have designated. Individual voluntary consent will be obtained from teachers who wish to participate.

Who is conducting the study?

Principal Researcher: Assoc. Prof. Shelley Gillis PH: 99197157
Email: shelley.gillis@vu.edu.au

Student Researcher Ms. Elizabeth Richardson PH: 0400480357
Email: richardson.elizabeth.e1@edumail.vic.gov.au

Any queries about your participation in this project may be directed to the Principal Researcher listed above. If you have any queries or complaints about the way you have been treated, you may contact the Ethics and Biosafety Coordinator, Victoria University Human Research Ethics Committee, Victoria University, PO Box 14428, Melbourne, VIC, 8001 phone (03) 9919 4148.

APPENDIX F: DRAFT INSTRUMENT

Communication and Literacy Questionnaire

School Code: 201 **Teacher Code: 101** **Student Code: 001**

INSTRUCTIONS
Please mark your response by writing or ticking the best response.

Teacher Background

Gender Female ☐ Male ☐

How many years have you been teaching? ☐

How many years have you been teaching students with Autism Spectrum Disorder? ☐

Do you have Special Education qualifications? Yes ☐ No ☐

Do you have access to ongoing professional development related to teaching students with an Autism Spectrum Disorder? Yes ☐ No ☐

Child Background

Please consider a student you know and provide the following information

Gender Female ☐ Male ☐

Age in years: ☐

How many years has this student attended school? ☐

Does this student have additional learning or medical needs in addition to a diagnosis of Autism Spectrum Disorder? *Please add any relevant information in the box below.*

INSTRUCTIONS

For each of the descriptors listed please tick any indicator which describes a skill that the student you are assessing can typically demonstrate. If a student is not currently demonstrating any of the listed descriptors within an area this can be indicated by selecting "Does not typically demonstrate these skills". There are no right or wrong responses. Items tend to be presented in order of increasing difficulty within each section but a student may demonstrate some skills at a higher level and others at a lower level within the same area. Communication may be verbal or augmentative. ***Use a tick (√) to indicate your selection.***

Communication - Understanding and Using Language

Tick all indicators that apply (√)	
Understanding names and pronouns	
respond inconsistently to the sound of their name in familiar environments	
look briefly at adult when called by name in familiar environments	
stop an activity briefly when name called in familiar environments	
stop, turn and come when name is called in familiar environments	
respond when name is called in an unfamiliar environment	
refer to self by name	
respond to questions about personal possessions with own name e.g. "whose book?" "Dan's book"	
respond to questions about turn taking with person's name e.g. Ngan's turn"	
use personal pronoun 'my' to indicate possession e.g. "my bag"	
use personal pronouns my/your to indicate possession e.g. "my texta, your texta"	
use she/he to indicate gender with teacher modelling e.g. "she is running", he is sitting"	
use personal pronouns his, her, we and they accurately in context	
use range of personal pronouns accurately including: our, their, everyone, etc.	
use objective pronouns appropriately in context i.e. "give it to *him/her/them"*	
understand some common phrases in both their full and contracted forms, e.g. I'm/I am, You're/you are	
regularly use appropriate pronouns, e.g. I/me/he/him/she/he/it	
regularly use appropriate possessive pronouns, e.g. his, her, its, our, their, my	
Does not typically demonstrate these skills	

Requesting objects	
reach for preferred object to request item	
place item in hard to open container in adult's hand to request e.g. packet of chips	
attempt to point to a preferred object to request the item	
use a single word communication with teacher modelling to request object /activity	
use a single word communication to request a preferred object/ activity	
use a single word communication to request familiar objects/activities in the classroom	
repeat some modelled 2 word communications to request objects/activities e.g. "want cup"	
use 2 word communication to request objects/activities	
use modelled phrase "I want" and 1 word communication to request objects/activities e.g. "I want chips"	
use modelled phrase "I want" and 1-2 word communication to request an object/activity e.g. "I want blue texta"	
use 3-4 word communication to request a range of known objects and activities e.g." I want 2 cups"	
request familiar objects and activities in 4-5 word sentences	
request clarification of labels for objects/actions to request less familiar items e.g. "what's that thing?"	
use complete sentences and correct grammar to appropriately request objects/activities e.g. "can I have the..."	
negotiate simple transactions, e.g. at the school canteen	
Does not typically demonstrate these skills	

Tick all indicators that apply (√)	
Request assistance/actions. Giving instruction	
pull adult's hand to object to request assistance e.g. pull teacher to door and place their hand on the handle to get door opened	
give / offer play objects to an adult to initiate request for assistance	
glance at adult for assistance when engaged in some familiar activities	
use a single word communication with visual support to request assistance/action	
use a single word communication to request assistance linked to a familiar activity	
request a motivating action using a single word communication e.g. open, push, cut	
use a single word communication to request action/assistance within familiar settings	
begin to repeat modelled 2 word communication to request assistance e.g. "help shoe"	
use 2 word communication to request action e.g. "open drink"	
use 3 word modelled communication to request action e.g. "cut red paper"	
use 3 word communication to request action e.g. "zip my coat"	
request assistance using a range of verbs in 4-5 word sentences	
negotiate simple social or learning activities by suggesting, initiating or directing, e.g. Play football? Later?	
clearly identify issues and use appropriate phrases to request assistance e.g. "my shoelace is undone. can you help me?"	
request permission using appropriate phrases "can I go to....", "can I play with..."	
Does not typically demonstrate these skills	

Affirmation/negation	
begin to respond through 'accept' or 'reject' gestures or actions e.g. extend hand to receive, push unwanted item away	
demonstrate an understanding through behaviour of no/not allowed to have e.g. protests	
react when cross is placed over preference to indicate it is unavailable	
reject an action/activity by using "no", "bye", "finish" e.g. say "bye", place item in a finish box	
answer "no /yes" to the question "is this a …?"	
use yes/no responses to consistently indicate likes and dislikes	
point to a picture to indicate understanding of negatives e.g. who is not jumping?	
answer "yes/no" in relation to action/location e.g. "does it go in the kitchen?"	
use "I don't want…" with an appropriate tone to reject or refuse	

use “not’ in a simple sentence to indicate a negative e.g. “turtle not fast”	
use single word or phrase response to questions, e.g. Yes, No, I don’t know	
use prohibiting language to control the behaviours of others e.g. *“don’t do that”, “stop pushing me”*	
Does not typically demonstrate these skills	

Following instructions	
respond to some visuals and key words linked to familiar and motivating routines and activities	
follow simple directions in 1:1 setting with visual support in a structured classroom setting	
respond to one word instructions within the classroom e.g. “come” “finish”	
demonstrate through response understanding of safety words e.g. “stop”, “wait”, “no”, “don’t”	
demonstrate an understanding of verbs in within routine classroom and personal activities e.g. wash, sit, open, cut, etc.	
respond to instructions as part of play/game e.g. “throw the ball”	
follow 2 part related directions connected to familiar routine e.g. “get your hat and go to the door”	
follow routine 2 part directions relating to objects not in view e.g. “go to the kitchen and get the big bowl	
follow 2 part directions related to a single task e.g. “get an egg and crack it into the cup”	
follow 2 part directions not related to familiar routines.	
question to check meaning, to clarify, or to confirm, e.g. Teacher: put it in your book, Student: home book?	
follow 2 –3 part instructions that include referential language for objects in view e.g. *get the blue cup next to the jug”.*	
follow 2 – 3 part instructions that include referential language for objects not in view e.g. *“go next door and get the red texta from the teacher”.*	
follow a short sequence of instructions related to classroom procedures or learning activities, e.g. book borrowing procedures, rules for using the class computer, order information from a short spoken text using pictures	
Does not typically demonstrate these skills	

Tick all indicators that apply (√)	
Answering questions	
respond to questioning tone by pausing in an activity &/or glancing at the speaker	
answer “who” questions in relation to familiar person e.g. “who?” with gesture toward known person	

answer 'what' questions in relation to familiar objects/ activities e.g. "what's this?"	
answer "who" questions in relation to familiar people e.g. "who drove the bus?"	
answer "what" questions relating to a picture that is shown e.g. "what's this?"	
answer 'where' questions relating to a picture that is shown e.g. "where is…?"	
answer questions about factual knowledge e.g. "what sound does a cow make?"	
answer simple questions asked by peers during small group activities	
answer questions asked by peers incidentally	
answer social questions, e.g. "what's your name?", "how old are you?"	
answer how & why questions related to simple familiar sequences e.g. making toast	
Does not typically demonstrate these skills	

Asking questions	
ask "what" questions to identify objects e.g. "what's this?"	
ask "what" question to get a "who" response e.g. point at person and ask "what him?"	
ask "who" questions to identify people	
ask "where" questions to identify location of familiar objects and people	
ask questions of another student about items in the immediate environment	
ask questions using *why* and *how* to teacher to request an explanation. e.g. "why is there no library?"	
ask questions of another student about items not in view	
ask what a word means, e.g. I don't understand. What's 'fete'?	
use how, when, where, why, who question forms	
link questions and comments to a peer's comments rather than own interests	
Does not typically demonstrate these skills	

Attributes- size	
match same size objects	
repeat modelled language "big", "little" during structured tasks	
attempt to indicate an object to meet the criteria, for example big/ little (object not always correct)	

point to/select an item based on its size when directed e.g. “what’s big?”	
use language “big/little/small” to distinguish between like objects of different sizes e.g. big/little box	
use language smaller and bigger when contrasting items of different size	
attempt to compare and identify the largest, smallest	
Does not typically demonstrate these skills	

Tick all indicators that apply (√)	
Size attributes - Long/tall/short	
match same length objects	
repeat modelled language “long”, “short” during structured tasks	
attempt to indicate an object to meet the criteria, for example long/short (object not always correct	
point to/select an item based on its size when directed e.g. “show me short”	
use language “tall, long, short” to distinguish between like objects of different lengths/heights e.g. short/ tall building, long/short hair	
manipulate familiar objects to lengthen or shorten them, e.g. play dough snake, make a building taller etc.	
use descriptive terms *longer*, *taller* and *smaller* to compare length of pairs of familiar objects	
use language to label and compare longest, smallest, shortest, tallest	
Does not typically demonstrate these skills	

General attributes	
show understanding of hot/cold/wet/dry in the context of familiar activities e.g. avoids hot surface	
label hot/cold/wet/dry	
show understanding of clean/ dirty/messy in context e.g. tries to wipe hands when sticky	
label items as clean/ dirty/messy	
show understanding through movement of quick/fast/slow when directed	
show understanding of quiet through response in familiar context e.g. “quiet voice”	
regulate speed of own body in relation to direction e.g. clap fast/slow	
regulate own actions to increase/decrease volume in response to direction e.g. loud/soft drum”	

use language fast/slow/quick to describe movement	
use language quiet/loud to describe volume of action in the immediate environment	
respond to some simple descriptive concepts happy/sad/angry	
use some modelled descriptors in own communication e.g. good work	
begin to use some simple descriptive concepts to describe items e.g. yucky apple	
use a range of simple descriptors to label, request and reject items e.g. smelly textas	
discriminate between items based on descriptive information e.g. fat/skinny cat, full/empty glass	
use a range of adjectives to describe or add emphasis to own communication e.g. young/old, dark/light, brave/careful	
Does not typically demonstrate these skills	

Colour attributes	
match an item to another of the same colour	
group different items of the same colour	
sort and match a range of items into like colour groups	
hand a single colour card to a teacher when asked e.g. “give red”	
discriminate between 2 colour cards and select correct colour card when directed	
label 3 primary colours	
label up to 6 colours	
label 10+ colours	
use terms light/dark to further distinguish shades of colour	

Spatial concepts	
show understanding of some spatial concepts (as actions) in familiar contexts e.g. “up” gets up	
respond during routine activities to simple spatial instructions e.g. “put on/ off”	
put object in and out of a container based on a single verbal direction	
label simple position of an object during structured tasks e.g. in, out.	
move object to place it “under” another in response to a teacher direction	
move object to place it “next to” another in response to a teacher direction	

point to a pictured item based on its relative position as directed. i.e. “in front”, “behind”	
label relative position of an object e.g. “beside” “behind”	
use terms “next to/beside/ in front of” to describe own location relative to other students	
use prepositions “near, far” to describe relative distance of objects	
use language “above, below, beside and between” to describe position	
identify “left and right” sides of body in self consistently	
move self, left and right in response to a direction	
Does not typically demonstrate these skills	

Quantity concepts-numeric	
coactively select “one” item when supported	
point to individual items with assistance while teacher counts	
respond to instruction “give one” in familiar context with cue from teacher	
repeat numbers during number songs, rhymes, and counting	
select one object in response to a cue, e.g. “give me one”	
rote count up to 3	
count groups of 3 items	
make groups of 1 to 5 items using one to one correspondence to count	
use one to one correspondence to make groups of items up to 10	

Quantity concepts-relative	
use one word communication with modelling to request “more”	
use one word communication to request “more” of a motivating action or item	
match groups of item by size (number of items)	
distinguish between groups of unequal size using number to label e.g. look 2...3	
select and give “less” or “more” of an item e.g. counters	
use terms “less/more/all” to describe group size as it is manipulated	
use terms few/some/many/more to compare and contrast groups of objects	
use terms nearly/almost/just under/most to describe small variations in quantity	

Does not typically demonstrate these skills	

Sequencing concepts	
respond to first/then sequence presented visually e.g. 1st drink, then computer with teacher support	
respond to language 1st/then in context of familiar activities	
follow sequence of 2-3 step numbered schedule e.g. 1. Walk 2. Lunch 3. play	
place objects in order 1st-5th	
identify 1st and last in a sequence	
use sequence makers to link ideas in speech e.g. next, and then, after	
identify location of objects within a sequence e.g. middle, end	

Time concepts	
identify day and night	
understand now, before, after in the context of routine activities	
use language now, before, after to query timing of events e.g. “computer now or later?”	
begin to relate days of the week to familiar events	
name some of the days of the week	
identify past events as occurring “yesterday” and a future event as “tomorrow”	
consistently use “today/yesterday/tomorrow” to describe when events may occur	
use “in a week/last week” as predictors of time	
use terms “day/week/month/year” to accurately describe the passage of time	
Does not typically demonstrate these skills	

Plurals	
use numeral and item to indicate plural form e.g. 2 cake	
select correct item when asked to discriminate between simple regular plural/single pictures e.g. cats/cat	
include “s” at the end of a noun to request in plural form e.g. lollies, mouses	
begin to use some familiar irregular plurals in context e.g. children	

use a range of irregular plurals accurately e.g. knives, sheep	

Verb use	
respond to a few simple verb instructions in context with teacher support e.g. “come” while teacher holds child’s hand	
respond to a few simple verb instructions during familiar activity e.g. “sit”	
use terms to describe simple movements e.g. climb, dance	
use a range of language to relate actions that can be viewed e.g. dig, bite, pull	
use appropriate action language to label senses and feelings e.g. be scared, be sick, hear, feel	
Does not typically demonstrate these skills	

Tick all indicators that apply (√)	
Gaining attention	
look briefly at play object when adult is engaged in shared play activity with him/her	
lead a teacher towards an object to communicate a request	
glance at a teacher in a 1:1 setting when engaged in a motivating activity	
make brief eye contact & *g*esture towards inaccessible item to communicate a request for the object	
gain another person’s attention by saying their name or tapping their arm/hand when supported a teacher	
approach and gain a person’s attention spontaneously in familiar settings	
approach, gain attention and wait for response before making request	
use attention gaining words such as “look”, “hey”, in 2-3 word sentences e.g. “look, blue flower”, “hey, it goes”	
raise hand to gain attention when action has been modelled	
occasionally raise hand to gain attention (student does not wait to be acknowledged before communicating)	
raise hand and wait briefly for teacher to acknowledge raised arm before communicating	
raise hand and wait for teacher to acknowledge before answering/ asking question or making comment	
raise hand to gain attention and if not called upon by teacher to respond, drop hand and remain calm as lesson progresses	
Does not typically demonstrate these skills	

Communication- Engaging with others and the environment

Greetings	
respond to familiar people e.g. turn towards or away	
respond to greeting/ farewell by glancing at a familiar person	
use a gesture/word to respond to a greeting/farewell with teacher direction	
use a single word/gesture to respond to greet/farewell a familiar person	
recognise familiar people and may recall a name when supported by a teacher	
sometimes combine familiar person's name with greeting or farewell e.g. bye/hi mum	
recognise familiar people and use a name or particular greeting to acknowledge them	
respond to greeting/ farewell when meeting an unfamiliar person	
initiate greetings to fellow students, teachers and significant others	
use modelled phrase "what's your name?" when meeting an unfamiliar person	
initiate identity query by saying "what's your name?" when meeting an unfamiliar person	
give some basic personal information, using learned formulas or brief answers, e.g. My name is ..., I'm a boy/girl ...	
expand on basic personal information when prompted, supported and given adequate time	
use acceptable social markers and gestures to interact appropriately in context, e.g. thank you, excuse me, please	
Does not typically demonstrate these skills	

Attending skills- task orientation	
react to highly preferred activity in view	
attend briefly to an object when shown a preferred object/activity	
attend to preferred classroom and personal objects for 30-60 seconds	
attend to a preferred object or activity for more than one minute	
sit and attend for 2-3 minutes when engaged in a preferred activity	
sit and complete a familiar activity that has been chosen by an adult	
complete an unfamiliar activity that has been chosen by an adult	
sit and maintain attention to task to complete 2 to 3 simple activities	
display attentive listening behaviour, i.e. sit on floor and listen for sustained periods with some visual support	

Does not typically demonstrate these skills	

Tick all indicators that apply (√)	
Attending skills- group work	
sit among a group of 2-3 students supported by an adult in a structured session	
remain seated independently during small group activities attending for short periods	
listen to a sustained text, focusing on visual support, e.g. instructions and demonstrations about an art activity	
remain seated during small group activities that require student to wait for extended periods for a turn	
maintain attention and sit appropriately, in group activities	
attend appropriately to others in a small group and shift attention appropriately to other speakers	
attend appropriately to others in a large group shifting attention between consecutive speakers	
follow a classroom discussion about familiar topics or new topics that are well supported by visual material	
listen to a story then retell or sequence using pictures	
identify key points of information from short spoken texts with reduced visual support, e.g. the day the excursion will take place	
understand key information from viewing a range of media, e.g. computer programs, TV, DVDs	
talk about class topics in class discussions	
speak in front of a group on a familiar topic, e.g. sharing, recounting personal experience	
express ideas, humour, simple opinions and describe feelings, e.g. I am very happy	
participate in discussions between teacher and learners, but still have some difficulty with abstract or figurative language	
Does not typically demonstrate these skills	

Commenting	
show an object/ photo to a small class group and make a comment with teacher support	
contribute to small-group discussions by using some key words in response to cues provided by the teacher e.g. “I see...”	
make simple comments during familiar activities, e.g. ‘look, red car”	
show an item to a small class group and make a simple comment e.g. “my book”	
make 1-2 related comments within an activity e.g. “car is going”, “fast red car”	

comment on immediate concrete item/activity produced in class in a structured small group situation using a complete sentence. E.g. “I like Pokemon cards”	
show an item to a small class group and makes 2 – 3 comments.	
describe a 3 -4 step procedure with visual support, step by step	
describe a series of events or actions	
Does not typically demonstrate these skills	

Conversation	
actively respond to communication from others by withdrawing attention	
engage with others, environment and a range of offered experiences	
point to item of interest to engage an adult	
show a favourite item to a significant person	
repeat a modelled comment linked to immediate events in the classroom e.g. “mum gone”	
use a personal word or phrase to comment on an immediate event e.g. “uh oh”	
respond to another’s conversation by repeating or using a 1-2 word communication	
make comments about missing and/or incorrect items in a familiar setting with familiar people	
use 2 word communication to make a meaningful comment e.g. ‘it popped’	
give news about a past personal experience using a 3-4 word communication	
engage in simple conversations of up to 2 turns	
combine 1-2 sentences to comment on past event/activity	
sequence 3 or more ideas, when relating past events about personal experiences with visual supports	
participate in short, structured social interactions, e.g. exchanging basic information about family, school	
maintain a topic of conversation for 3-4 turns matching comments to topic	
Does not typically demonstrate these skills	

Reading

Text level knowledge

Tick all indicators that apply (√)	
Interacting with texts	
react to sounds in the environment	
respond to the beat or rhythm of some chants, rhymes and songs	
learning to clap along with the beat or rhythm of chants with teacher support	
listen and respond to familiar rhymes and stories with teacher support	
sit, listen to and respond to interactive picture books	
collect a preferred text and approach an adult	
label an object, character, action in texts when directed by the teacher	
complete a sentence read by a teacher using the picture to provide a cue	
respond &/or anticipate missing words when read to e.g. “George is eating...” story has a consistent pattern	
read aloud repetitive phrase that has been modelled	
Does not typically demonstrate these skills	

Attending to texts	
attend briefly to books, stories and visual information	
look briefly at motivating pictures in books when shown	
look at pictures when directed by a teacher in 1: 1 settings	
point to some motivating pictures in books	
label a few motivating pictures in books	
label pictures using single words in response to teacher pointing	
read aloud words that have been modelled by a teacher to describe a picture	
label illustrations in a range of texts using 2 words	
initiate comments and point to illustrations in reading materials	
use illustrations to make simple predictions about the topic of reading	
use illustrations to make simple predictions about the story line of a text	
Does not typically demonstrate these skills	

Tick all indicators that apply (√)	
Book knowledge	
show some interest in familiar objects and/or people	
link some visual aids to objects and people e.g. photo represents a familiar person	
focus on single pieces of visual information presented by a teacher e.g. photo, pictograph	
turn pages of photo book with teacher assistance	
help turn pages of book/story when sharing with an adult	
turn pages sometimes skipping pages	
recognise that books have fronts and backs	
hold books or other reading material the right way up	
turn each page from the front to the back of reading material	
differentiate between pictures and texts	
use title and front cover to make simple predictions about what a text might be about	
understand and use some basic language related to book layout and aspects of reading, e.g. word, letter, page, title, cover	
Does not typically demonstrate these skills	

Reading behaviours	
coactively place finger on text when it is read	
point to text with a teacher model	
initiate pointing to text though 1:1 correspondence may be inaccurate	
show awareness that words are separated by spaces, e.g. by pointing to individual words	
point to individual words in text moving left to right	
match a spoken word to each printed word within the sentence	
show awareness of basic print conventions e.g. follow text from left to right and from the top to the bottom of the page	
ask teacher for explanation when meaning is unclear	
recognise the function of capital letters and full stops	
Does not typically demonstrate these skills	

Reading fluency	
read aloud with some breakdowns in fluency and meaning	
attempt to imitate intonation pattern that has been modelled when reading familiar texts	
read with or slightly after the teacher, e.g. join in the familiar part of a story	
read well known texts with some fluency, e.g. appropriate pauses and intonation	
modify intonation when reading to differentiate questions, exclamations or dialogue.	
sub-vocalise when reading silently	
read, modelling some rhythm, intonation and pronunciation on the example of other readers	
Does not typically demonstrate these skills	

Reading picture texts	
glance at photo/pictograph when shown	
begin to respond to pictograph paired with language in the context of a familiar activity e.g. toilet	
identify a small number of familiar schedule pictographs/photos used in the classroom	
identify familiar pictographs used in the classroom	
label some pictographs used in the classroom	
read high frequency activity labels with picture support e.g. schedule / task board	
sequence familiar daily activities by selecting and placing pictograph items in order appropriately	
match and label familiar noun/activity pictographs	
combine and read aloud 2-3 picture words e.g. “red smarties”	
re-read picture sentence when meaning is unclear by returning to the beginning	
combine 3-4 picture words to request or recount an activity	
Does not typically demonstrate these skills	

Logo and early text recognition	
match shapes	
match simple pictures and lotto cards	
identify own photo paired with a name label	
identify familiar signage and labels e.g. McDonalds, Ben 10	
match name to name with photo of students in class group	

match word to a printed word	
recognise labels for items of personal interest e.g. ninja turtles	
identify own name from choice of two (focussing on visual features)	
match name to a few photos of students in class group	
recognise own name in the classroom environment	
recognise some names of fellow students or family members	
ask teacher to read c e.g. points to sign and says “what’s that?”	
read a range of environmental labels and text e.g. toilet, exit, shops, post office	
Does not typically demonstrate these skills	

Word level knowledge

Understanding word meanings	
show awareness that words can be written	
begin to recognise that words have consistent meanings	
match word label to photo/picture/item presented in small groups	
read 5-10 noun labels linked to familiar items	
select a known word on request by picking up and handing to a teacher	
read 10-25 noun labels linked to known items	
label a word shown in response to the question “what’s this?”	
read simple adjective labels i.e. colour, size, number	
read verb labels related to familiar actions	
match a range of familiar spoken words with written words	
match simple descriptive words to a picture	
recognise familiar words in different fonts and contexts	
recognise a range of simple high frequency words e.g. is, can	
Does not typically demonstrate these skills	

Tick all indicators that apply (√)	
Reading simple texts	
read 2 word (number/ noun) statement and match to a picture e.g. 2 plates	

read 2 word (adjective/ noun) statement and match to a picture e.g. big frog, red shoes	
read aloud some simple sentences that include familiar words and labels	
place words in sequence to create a simple sentence	
read their own writing, or a simple text written by the teacher, e.g. about a shared experience	
read sentence (pronoun/ verb/noun) i.e. “she is climbing the slide” & show comprehension by matching to a picture	
recognise some familiar vocabulary, mainly content words in supported context, e.g. shared reading	
read repetitive words or phrases in known texts	
read a sentences and retain information contained to complete an action related to its content e.g. get the big bowl	
focus on meaning of content words (particularly nouns and verbs) associated with accompanying pictures or words pointed to by teacher,	
consistently read back own writing or sentences scribed by another	
tend to ignore meaning carried by structural words such as the, and, as, in, of and other language not pointed out or supported by illustrations	
read well-known words or phrases in new contexts, e.g. Tuesday, shops	
read a range of topic related classroom texts with support	
begin to reread to ensure meaning is clear	
demonstrate understanding of some new texts, and respond, e.g. read along with repetitive sections, predict	
use a range of cues when reading, i.e. meaning, visual, structure	
read and sequence sentences of a familiar text, e.g. narrative, recount, procedure, explanation	
Does not typically demonstrate these skills	

Self-management and direction

Self-management and e**ngagement**	
look briefly at familiar book briefly when shown a photo story	
attend briefly to a photo when read to in a 1:1 setting	
engage with a familiar story when read to by a teacher	
show interest in choosing a story when directed to by a teacher	
sit and look at a favoured book for a short time	

sit with 2-3 students and attend to a simple story with teacher support	
focus on simple texts labelling with teacher support	
remain seated during small group reading and respond to simple questions	
join in with shared reading activities e.g. whole class reading of repetitive Big Book	
remain seated during small group reading and make simple comments	
take turns with a teacher in predicting and reading simple texts	
take turns with a peer in predicting and reading texts with teacher guidance	
participate in small group of 2-3 students reading with a teacher	
participate in simple group activities based on shared texts	
Does not typically demonstrate these skills	

Responding to texts	
identify some characters in a narrative	
understand some main ideas in a simple story read aloud, supported by visuals.	
draw pictures of the stages of a narrative or match pictures and words of a procedure	
show a personal response to a text e.g. look at or read book in own time, draw a picture	
complete simple activities based around texts, e.g. sequence pictures to retell story, paint or draw characters	
understand main ideas and recognise characters in a well-illustrated story read aloud	
ask questions, retell and talk about texts read and viewed in class, or give factual information from texts read and viewed in class, e.g. can tell who does what and why	
recall factual information from texts read and viewed in class	
retell main events in sequence with guidance and prompts from teacher	
express opinions about the actions of characters	
use texts purposefully, e.g. follow simple procedural texts, find basic information in texts, locate specific information from a known text, use a simple contents page and index to locate information	
relate something learned from a text to own experience, e.g. by commenting or by identifying with the characters in a story	
Does not typically demonstrate these skills	

Understanding text types	
identify whether a text tells a story or gives information	
identify features of a range of text types, e.g. recount, report, procedure, narrative	
talk about features of a story or poem that have personal appeal, e.g. fantasy elements, favourite characters, interesting words/phrases	
identify the basic purpose of a new text	
identify texts as factual or fictional and make comparisons, e.g. using topic, content, layout, illustrations	
Does not typically demonstrate these skills	

Letter and name knowledge

Tick all indicators that apply (√)	
Letter recognition	
match like shapes with teacher assistance	
complete simple picture word matching activity with support	
sort and match some letters and numbers	
recognise a few letters and numbers	
recognise first letter of own name in other words	
recognise and label most letters of their name	
label and assemble letters in own first name using concrete materials e.g. magnetic letters	
recognise some letters of the alphabet by their distinct shape or association e.g. AFL	
recognise most common letters and label with name	
recognise and label letter names in view	
recognise that words are made up of individual letters	
list the letters of the alphabet	
recognise letters out of sequence	
create words by assembling letters in order to match a word label	
match upper to lower case letters	
match letters that are the same presented in different fonts and handwritten styles	
Does not typically demonstrate these skills	

Developing letter knowledge and understandings	
sort letters and words	
select letter, word when directed	
sort letters, words, sentences	
recognise and name some letters of the alphabet	
identify common letters in different words consistently, e.g. point to all the 't's in a sentence	
recognise some letter similarities between words e.g. "d is for dad & dog"	
point to letter, word, sentence when directed	
recognise the difference between upper and lower case letters	
state words that start with some common letters	
recognise and name all letters of the alphabet	
identify words starting with most letters of the alphabet	
use the labels letter, word, sentence appropriately in context	
Does not typically demonstrate these skills	

Phonological knowledge

Phonological knowledge	
react to sounds associated with familiar activities and people	
respond to a range of familiar environmental sounds	
respond to the sound of key words e.g. lunch	
recognise that specific sounds are associated with certain activities e.g. bell ringing for end of play	
imitate 1 or 2 sounds as part of a familiar song e.g. ooh, ooh, ooh	
identify familiar sound effect by pointing to the correct photo from a choice of two e.g. car or guitar	
correctly identify familiar sounds by pointing to correct photo from a choice of 6 photos	
imitate a range of words modelled by a teacher	
correctly identify a range of familiar sounds as part of a game e.g. sound lotto	
imitate a few simple phonetic sounds modelled by a teacher	
imitate a range of simple phonetic sounds	
relate some letters of the alphabet to their usual/common sounds	

identify some sounds in words	
recognise some common letters and letter patterns in words, e.g. refer to charts, books	
identify repetitive word or letter patterns in sentences and phrases	
relate most letters of the alphabet to sounds	
recognise some common syllables and patterns within words, e.g. in, on, ing	
recognise some common prefixes and suffixes and how they change the meaning of words, e.g. un, -er	
recognise rhyming words	
recognise beginning, middle or final sounds in words	
Does not typically demonstrate these skills	

Writing

Communicating ideas

Tick all indicators that apply (√)	
Developing Expression of Ideas	
experience moving sensory substance coactively e.g. hand movement through rice or water	
use materials for drawing coactively	
use drawing materials with some physical assistance	
use hands to make marks in sensory substance e.g. finger paint on an easel	
grasp a thick paintbrush and mark the paper	
draw non-linear shapes and forms	
engage in circular scribble	
partially complete a drawing with teacher modelling e.g. draw eyes on a face	
draw a face with 3 features e.g. eyes, nose & mouth	
draw and create picture of personal significance e.g. mother, train draw to communicate	
name pictures for teacher to label	
draw picture with at least 6 details included e.g. bus= body, windows, doors, wheels, driver, passenger	
label drawings of everyday personal activities using language learnt in the classroom, e.g. live here, play, study	
draw to illustrate a simple text, e.g. to relate an ongoing activity, to give additional information, to retell a simple story	

use illustrations as a prompt for a scribe to write for them	
use illustrations to provide more detail to a written text	
dictate sentences about a drawing or an experience for others to write	
Does not typically demonstrate these skills	

Assign meaning to picture texts	
use familiar objects to convey a message about a personal interest	
recognise and label a range of familiar pictographs	
point to familiar pictures to communicate an idea	
match and sort pictures, photographs and objects	
combine 2 photographs, pictures or symbols to represent objects people and actions	
select pictures that are important to them to create a picture story book	
learn to combine up to three key words or images to communicate ideas	
select and sequence 3-4 pictographs to describe personally significant events and/or experiences	
Does not typically demonstrate these skills	

Assign meaning to written texts	
begin to experiment and attach meaning to their writing.	
assign meanings to words that sometimes match what is written	
reread their own texts, or sentences scribed by another	
reread own text to check meaning and content is clear	
contribute ideas, words or sentences to a class or group shared story	
Does not typically demonstrate these skills	

Tick all indicators that apply (√)	
Communicate ideas	
imitate writing behaviours with teacher assistance e.g. role play writing	
label some images or drawings in the classroom environment	
point to environmental text to request teacher reads it aloud	
ask teacher to label own drawings or scribbles	

add writing-like scribbles to label own drawings	
retell a picture story about a favourite topic using key words to describe each picture	
dictate key words for teacher-constructed texts to describe pictures they have selected	
complete simple repetitive modelled sentences, e.g. I like …; I went to …; Today is …	
read back own attempt at writing	
dictate sentence or phrase that reflect their oral structures, e.g. go to school, go home, come from	
write sentence or phrase that reflect their oral structures, e.g. go to school, go home, come from	
write well known symbols, words, phrases or short texts, e.g. Today is Monday	
dictate 'run-on sentences', e.g. at school we work and at school we play …	
write 'run-on sentences', e.g. at school we work and at school we play	
write or complete simple sentences from own experience	
choose a topic to write or draw about	
dictate a simple text related to own interests or experiences	
write a simple text related to own interests or experiences	
dictate a simple text related to a story	
write a simple text related to a story	
dictate a simple factual text	
write a simple text that fulfils a function, e.g. simple description, recount, procedure	
write repetitive patterns to produce longer texts, e.g. I like ..., and I like	
write simply for a variety of authentic purposes related to classroom topics, using known and modelled structures and features, e.g. a personal recount, simple description	
initiate writing for own particular purposes, e.g. label drawings, make a birthday card, write a recount about a recent experience	
write for a 'real task', e.g. make a list, write a letter, write a story at home	
use vocabulary, modelled writing or ideas from texts read or viewed in class in own writing or drawing.	
Does not typically demonstrate these skills	

Conventions of writing

Understand letter forms	
make marks on paper with teacher assistance	
draw a vertical line using a variety of writing tools	
trace over line patterns with coactive assistance	
draw a horizontal line and cross	
attempt to trace lines and patterns	
attempt to copy letters and simple words from modelled examples	
write some letters of first name	
trace over lines, shapes, letters and patterns with some accuracy	
copy letters and numbers with limited accuracy	
copy letters and numbers with accuracy	
write using strings of letters	
assign meaning to strings of letters written by self	
Does not typically demonstrate these skills	

Understand writing conventions	
discriminate between words and picture in a book when asked “where’s the picture?”	
indicate some individual words on a page using spaces and clusters of letters as a guide	
write without spaces between words	
put some spaces between words when writing	
seek clarification on how to write a word	
use some conventions for printed English, e.g. left to right, top to bottom, although not always consistently	
write letters from left to right on a page	
consistently separates words with spaces when writing	
use some conventions for printed English, e.g. left to right, top to bottom	
understand the difference between upper and lower case letters	
include punctuation when copying text	
understand some terminology of writing, e.g. word, letter, sentence, space, full stop	

begin to include/experiment with some familiar punctuation, e.g. full stops, capital letters.	
include full stops and capital letters in most writing	
write sentences based on simple repetitive, modelled patterns, e.g. I went …	
write simple sentences and begin to rely less on copying	
use some common verbs appropriately, e.g. draw, cut, stop, run, Mix the …, Cook the ...	
ask teacher for explanation when meaning is unclear	
use a mixture of tenses within one text	
link sentences using common conjunctions and connectives, e.g. but, after, when	
use some punctuation consistently, e.g. full stops, question marks, commas	
demonstrate that a sentence starts with a capital letter and ends with a full stop	
use upper and lower case letters appropriately	
Does not typically demonstrate these skills	

Writing strategy

Tick all indicators that apply (√)	
Fine motor and planning	
hold small objects in hand	
reach forward and to the side with accuracy	
pick up small items using thumb and fingers	
reach across the body to grasp and retrieve an object	
remove and replace objects from and into a container	
roll and shape dough and clay into a snake shape	
pick up small objects with tongs and place in a container	
string small beads onto a small rigid thread	
open and close a zip lock bag	
fold paper so that edges are close to meeting	
Does not typically demonstrate these skills	

Developing control and planning	
reach purposefully for item in view	
transfer objects from one hand to the other	
hold thick crayon or texta with whole	
hand and thumb up when encouraged to make marks on paper	
engage in circular scribble freely, using paintbrush, pencils or computer mouse	
hold thick crayon or texta with thumb and all fingers, forearm is turned so that thumb is pointing down	
hold and use a thick pencil to make purposeful marks on a piece of paper	
use a pencil with teacher direction to apply some colour to a picture with minimal regard for lines	
consistently use a preferred hand when writing and drawing	
colour a simple picture and attempt to confine colour within lines	
hold and use a pencil with a tripod grasp but move forearm and wrist to write/ draw/colour	
practise correct formation of letters	
write in upper case letters in preference lower case	
form most letters of the alphabet correctly	
write using upper and lower case letters	
write using lower case letters and capital for 'I'	
sometimes places capital letters incorrectly	
use c, spacing and letter formation	
show evidence of layout or planning in writing, e.g. place text appropriately on a page, leave space for a drawing	
use a simple picture plan with support to write a text	
create a simple plan using pictures before writing a simple text	
use a variety of simple text structures, e.g. a title, an opening, ending, caption	
write, using a text type appropriate to the purpose, e.g. a story, a list, a procedure, a report	
describe the purpose of a text, e.g. to inform, to describe an event, to tell a story	
demonstrate an understanding that written texts usually need to be planned, edited and presented	
use a range of writing implements and writing styles for different purposes, e.g. work for display, first draft on a computer, making a poster	

use size of writing, colour, layout and choice of media to help transmit messages, e.g. making a sign or a poster.	
use a simple framework to write a particular text type, e.g. a recipe, a report	
ask teacher for explanation when meaning is unclear	
model writing on other texts, e.g. use words, phrases or sentence patterns from a teacher model or favourite story	
Does not typically demonstrate these skills	

Tick all indicators that apply (√)	
Developing mouse and keyboard skills	
make marks on screen by moving a mouse (no click) with teacher assistance in a draw or colour program	
make marks on screen by moving a mouse (no click) in a draw or colour program	
point to items on screen and left click to select a familiar item	
press a key for a particular letter or function on a keyboard e.g. arrows to move an item on screen	
click on an item to select and drag into position within a familiar program	
type the letters of own name from a written model with teacher assistance to find letters on the keyboard	
type some letters on the keyboard to create a label or short sentence with teacher assistance	
find some letters on the keyboard that match a printed upper case word and type each letter of first name	
use of letters and some words in the writing of brief texts about topics of personal interest	
Copy a sentence by typing letters on a keyboard	
use basic keyboard skills to write personally significant words and simple modelled sentences, e.g. own name, 'I went to the park'	
Does not typically demonstrate these skills	

Conventions of spelling

Understanding spelling conventions	
match some simple shapes	
match some letters and numbers	
imitate initial word sounds modelled by a teacher	
identify some letters and numbers named by another e.g. “give me B”	
may mix shapes, letters and numbers when writing	
write a few letters of the alphabet	
copy or write some familiar letters with beginning accuracy	
write some favoured words repetitively represent words by groups of letters	
expect words to have consistent spellings, e.g. copy words carefully, ask how to spell ,ask for a word to be written to copy	
ask for a word to be written so it can be copied	
attempt to copy words, phrases or sentences accurately	
copy words correctly from classroom board	
copy words, phrases or sentences accurately	
use classroom word lists to identify and write words correctly	
use words copied from various sources, e.g. labels, signs, word lists	
spell high frequency words correctly appropriate to year level	
attempt to spell unknown words	
create and use a bank of known words appropriate to year level in own writing	
Does not typically demonstrate these skills	

Letter and sound understandings	
consistently write the same letters and numbers the same way	
write some identifiable words from memory although spelling may not inaccurate	
ask how to write new words	
consistently write some words with same (but not necessarily accurate) spelling	
write some commonly used words correctly	

spell with accuracy some words learned in the classroom	
attempt to spell new words, based on known spelling patterns and base words, e.g. walk, walked, walking	
demonstrate awareness of some sound-letter relationships, e.g. represent words by initial letter, or several letters, such as 'bk' for book	
use a range of resources to find words or phrases needed for own writing or to check spelling, e.g. simple dictionaries, vocabulary lists, modelled texts, familiar books and environmental print	
use sound or visual features of words to attempt own spelling, e.g. vae/very, ar/are, perpl/purple	
Does not typically demonstrate these skills	

APPENDIX G: PLAIN LANGUAGE STATEMENT

INFORMATION TO TEACHER PARTICIPANTS INVOLVED IN RESEARCH

You are invited to participate

You are invited to participate in a research project entitled *"Monitoring the Development of Communication and Reading Skills among learners with an Autism Spectrum Disorder".* This project is being conducted by a student researcher Ms. Elizabeth Richardson as part of a PhD study at Victoria University under the supervision of Associate Professors Shelley Gillis and Tarquam McKenna, Victoria University.

Project explanation

The research project aims to validate a developmental framework for assessing and reporting communication and reading skills of young learners with an Autism Spectrum Disorder (ASD). The study will be based on a strong theoretical framework for developing learning profiles that will enable an assessment tool to be developed to monitor student progress, as well as target intervention for student learning in the area of communication and reading that matches the learning style of students with ASD. Research participants will be drawn from schools that employ teachers who work with students between 4 and 18 years of age in specialist autism specific settings. For educators working with students with ASD the validated questionnaire will provide an accessible assessment that enables targeted intervention that matches the learning style of students with ASD.

What will you be asked to do?

Your School Principal has consented to your school participating in this study and now we would like to invite you to volunteer to participate. Interested teachers will attend an information session in their workplace and receive a research pack including:

- Plain Language Statement
- Consent form
- 4 copies of the Communication and Reading Questionnaires
- Self-addressed envelope to return consent form and questionnaires to the researcher

If you agree to participate you will provide information about your teaching experience, special education qualifications and access to professional learning related to the needs of students with ASD as well as questionnaire information related to student skills.

Ideally each participant will complete separate questionnaires on 2-3 students, focusing on what you currently know about each student's literacy development and simple background information to respond to the survey. The background data recorded for students will be age, gender, years of schooling and whether they have additional needs. When you have completed the questionnaires you will be requested to use a self-addressed envelope provided to return their consent form and completed questionnaires to the researcher.

What will I gain from participating?

For teachers engaged in the difficult task of individualising programs to meet the learning needs of students with Autism Spectrum Disorder this research provides a comprehensive assessment within a developmental framework that can be used to inform the development of Individual Learning Plans and educational programs for students. Once established teachers can utilise the questionnaire to identify a student's current competence and target their teaching and support to move a student towards a sophisticated skills in relation to their developing communication and reading skills.

How will the information given be used?

Confidentiality of your responses will be preserved through the use of non-identifiable teacher and student codes. Each participant will complete separate questionnaires on 2-3 students, focusing on what they currently know about each student's literacy development and simple background information to respond to the survey. The questionnaire contains no identifying information for individual respondents. The background data recorded for students will be age, gender, years of schooling and whether they have additional needs. Students do not take part in this research. Student anonymity is protected because only the teacher who selects students for observation will know who they have observed and this information is not recorded or submitted for research purposes. Schools and participants will not be named in any report arising from this research.

What are the potential risks of participating in this project?

To avoid any psychological risk associated with coercion teacher participation in this study must be completely voluntary and the sole choice of each participant. If individuals do not wish to engage with the project there should be no penalty to staff in any way. Staff may elect to withdraw from the research at any time. Students of teachers who do not participate will not be restricted in their access to educational experience as a result of their teacher's exercise of choice. If any participant experiences stress and/or anxiety associated with completing the questionnaires he/she can access counselling, free of charge provided by Anne Graham, a registered psychologist at Victoria University by calling 9919 2159.

How will this project be conducted?

If you agree to participate in this research please sign the attached consent form and return to the research team with your completed questionnaires in the self-addressed envelope provided with your information pack. You will be requested to complete 2-3 questionnaires (that take about 30 minutes each to complete) and return them to the research team within 4 weeks of the information briefing.

Who is conducting the study?

Principal Researcher: Assoc. Prof. Shelley Gillis	PH:	99197157
	Email:	shelley.gillis@vu.edu.au
Student Researcher: Ms. Elizabeth Richardson	PH:	0400480357
	Email:	richardson.elizabeth.e1@edumail.vic.gov.au

Any queries about your participation in this project may be directed to the Principal Researcher listed above. If you have any queries or complaints about the way you have been treated, you may contact the Ethics and Biosafety Coordinator, Victoria University Human Research Ethics Committee, Victoria University, PO Box 14428, Melbourne, VIC, 8001 phone (03) 9919 4148.

CONSENT FORM FOR SCHOOLS INVOLVED IN RESEARCH

INFORMATION TO SCHOOLS:

We would like to invite your school to be a part of a study into *"Monitoring the Development of Communication and Reading Skills among Learners with an Autism Spectrum Disorder".* The research project aims to validate a formative assessment tool for identifying the communication and reading skills of young learners with an Autism Spectrum Disorder. The project focuses on the development of an assessment tool for learners with an ASD. The study will be based on a strong theoretical framework for developing learning profiles and assessment and reporting tools that will enable targeted intervention for student learning in the area of communication and reading that match the learning style of students with ASD.

Teachers will be invited to voluntarily participate in the study by completing 2-3 questionnaires so that we can find out what students with an Autism Spectrum Disorder do well and what they find challenging in the area of communication and reading. Ideally teachers will choose 2-3 past or current students and focus on what they know about their learning to respond to the survey. Each questionnaire will take about 20 minutes to complete. Teachers will be asked to include information about their: teaching experience, special education qualifications and access to professional learning related to the needs of students with ASD.

Students do not take part in this research. Student confidentiality is protected because only the teacher who selects students will know who they have considered and this information is not recorded or submitted for research purposes. Participation in this study is completely voluntary and the anonymity and confidentiality of teacher responses will be protected. Participants will not be named in any report arising from this research.

CERTIFICATION BY SUBJECT

I .....certify that I am at least 18 years old and that I am voluntarily giving consent for teachers within my school to be invited to volunteer to participate in the study: "Monitoring the Development of Communication and Reading Skills among Learners with an Autism Spectrum Disorder" being conducted at Victoria University as part of a PhD study by student researcher, Elizabeth Richardson at Victoria University under the supervision of Associate Professors Shelley Gillis & Tarquam McKenna.

I certify that I have read and understood the objectives of the study, together with any risks and safeguards associated with the procedures to be carried out in the research and that I freely consent to the research being undertaken at my school. I have been informed that my participation and the participation of my teaching staff in this research study is voluntary and that I can withdraw from this study at any time including any identifiable, unprocessed data previously supplied. Data collected will be stored securely in a locked filing cabinet at Victoria University for at least five years post publication.

I certify that I have had the opportunity to have any questions answered and that the information provided by my school and teachers will be kept confidential.

Signed:
Date:

Any queries about your participation in this project may be directed to the researcher:

Principal Researcher: Assoc. Prof. Shelley Gillis PH: 99197157
Email: shelley.gillis@vu.edu.au
Student Researcher: Ms. Elizabeth Richardson PH: 0400480357
Email: richardson.elizabeth.e1@edumail.vic.gov.au

If you have any queries or complaints about the way you have been treated, you may contact the Ethics & Biosafety Coordinator, Victoria University Human Research Ethics Committee, Victoria University, PO Box 14428, Melbourne, VIC, 8001 phone (03) 9919 4148.

APPENDIX I: CONSENT FORM FOR PARTICIPANTS

CONSENT FORM FOR PARTICIPANTS INVOLVED IN RESEARCH

INFORMATION TO PARTICIPANTS:

We would like to invite you to be a part of a study into *"Monitoring the Development of Communication and Reading Skills among Learners with an Autism Spectrum Disorder".* The research project aims to validate a formative assessment tool for identifying the communication and reading skills of young learners with an Autism Spectrum Disorder. The project focuses on the development of an assessment tool for learners with an ASD. The study will be based on a strong theoretical framework for developing learning profiles and assessment and reporting tools that will enable targeted intervention for student learning in the area of communication and reading that match the learning style of students with ASD.

By filling out questionnaires we can find out what students with an Autism Spectrum Disorder do well and what they find challenging in the areas of communication and reading. Ideally you will choose 2-3 past or current students and focus on what you know about their learning to respond to the survey. Each questionnaire will take about 20 minutes to complete. You will be asked to include information about your: teaching experience, special education qualifications and access to professional learning related to the needs of students with ASD.

Students do not take part in this research. Student confidentiality is protected because only the teacher who selects students will know who they have considered and this information is not recorded or submitted for research purposes. Participation in this study is completely voluntary and the anonymity and confidentiality of teacher responses will be protected. Participants will not be named in any report arising from this research.

CERTIFICATION BY SUBJECT

I .....certify that I am at least 18 years old and that I am voluntarily giving my consent to participate in the study: "Monitoring the Development of Communication and Reading Skills among Learners with an Autism Spectrum Disorder" being conducted at Victoria University as part of a PhD study by student researcher, Elizabeth Richardson at Victoria University under the supervision of Associate Professor Shelley Gillis.

I certify that I have read and understood the objectives of the study, together with any risks and safeguards associated with the procedures to be carried out in the research and that I freely consent to participating in the research being undertaken by completing questionnaires based on my existing knowledge of students' communication and reading skills.

I certify that I have had the opportunity to have any questions answered and that I understand that I can withdraw from this study at any time and that this withdrawal will not jeopardise me in any way. I have been informed that the information I provide will be kept confidential.

Signed:

Date:

Any queries about your participation in this project may be directed to the researcher

Principal Researcher:	Assoc. Prof. Shelley Gillis	PH:	99197157
		Email:	shelley.gillis@vu.edu.au
Student Researcher	Ms. Elizabeth Richardson	PH:	0400480357
		Email:	richardson.elizabeth.e1@edumail.vic.gov.au

If you have any queries or complaints about the way you have been treated, you may contact the Ethics & Biosafety Coordinator, Victoria University Human Research Ethics Committee, Victoria University, PO Box 14428, Melbourne, VIC, 8001 phone (03) 9919 4148.

APPENDIX J: ETHICS APPLICATION

MEMO

TO	A/Prof Shelley Gillis Work Base Education Research Centre Footscray Nicholson Campus	DATE	8/2/2011
FROM	Dr Harriet Speed Chair Victoria University Human Research Ethics Committee		
SUBJECT	Ethics Application – HRETH 10/221		

Dear A/Prof Gillis,

Thank you for submitting this application for ethical approval of the project:

HRETH 10/221 Monitoring the Development of Communication and Literacy Skills among Learners with an Autism Spectrum Disorder

The proposed research project has been accepted and deemed to meet the requirements of the National Health and Medical Research Council (NHMRC) 'National Statement on Ethical Conduct in Human Research (2007)' by the Victoria University Human Research Ethics Committee. Approval has been granted from 8th February 2011 to 31st December 2012.

Continued approval of this research project by the Victoria University Human Research Ethics Committee (VUHREC) is conditional upon the provision of a report within 12 months of the above approval date (by 8th February 2012) or upon the completion of the project (if earlier). A report proforma may be downloaded from the VUHREC web site at: http://research.vu.edu.au/hrec.php.

Please note that the Human Research Ethics Committee must be informed of the following: any changes to the approved research protocol, project timelines, any serious events or adverse and/or unforeseen events that may affect continued ethical acceptability of the project. In these unlikely events, researchers must immediately cease all data collection until the Committee has approved the changes. Researchers are also reminded of the need to notify the approving HREC of changes to personnel in research projects via a request for a minor amendment.

On behalf of the Committee, I wish you all the best for the conduct of the project.

Dr Harriet Speed

Chair

Victoria University Human Research Ethics Committee

APPENDIX K: CONQUEST OUTPUT FILES – FUNCTIONS DRAFT INSTRUMENT

```
================================================================================
ConQuest: Generalised Item Response Modelling Software     Mon Mar 28 22:35 2016
SUMMARY OF THE ESTIMATION
================================================================================

Estimation method was: Gauss-Hermite Quadrature with 15 nodes
Assumed population distribution was: Gaussian
Constraint was: CASES
The Data File: allcommwith3s.dat
The format:  responses 1-158
The regression model:
Grouping Variables:
The item model: items
Slopes are fixed
Sample size: 298
Final Deviance:    12089.44797
Total number of estimated parameters: 159
The number of iterations: 14
Termination criteria:  Max iterations=1000, Parameter Change= 0.00010
                       Deviance Change= 0.00010
Iterations terminated because the convergence criteria were reached
At termination the solution was not the best attained solution
The reported results are for the earlier better solution
Rerunning this analysis using the current estimates as initial values is strongly advised.
Random number generation seed:    1.00000
Number of nodes used when drawing PVs: 2000
Number of nodes used when computing fit: 200
Number of plausible values to draw: 5
Maximum number of iterations without a deviance improvement: 100
Maximum number of Newton steps in M-step: 10
Value for obtaining finite MLEs for zero/perfects:    0.30000

================================================================================
================================================================================
ConQuest: Generalised Item Response Modelling Software     Mon Mar 28 22:35 2016
TABLES OF RESPONSE MODEL PARAMETER ESTIMATES
================================================================================
TERM 1: items
```

VARIABLES				UNWEIGHTED FIT			WEIGHTED FIT		
	item	ESTIMATE	ERROR^	MNSQ	CI	T	MNSQ	CI	T
1	CL_1	-2.318	0.292	36.21	(0.75, 1.25)	53.5	2.92	(0.71, 1.29)	8.6
2	CL_2	-3.701	0.329	26.68	(0.75, 1.25)	46.1	1.37	(0.67, 1.33)	2.0
3	CL_3	-2.863	0.299	11.74	(0.75, 1.25)	29.7	1.46	(0.70, 1.30)	2.7
4	CL_4	-1.322	0.285	2.57	(0.76, 1.25)	8.9	1.22	(0.70, 1.30)	1.4
5	CL_5	-0.907	0.283	1.78	(0.76, 1.25)	5.1	1.26	(0.70, 1.30)	1.6
6	CL_6	-0.716	0.284	10.17	(0.75, 1.25)	27.9	1.08	(0.69, 1.31)	0.6
7	CL2_1	-6.276	0.574	1.98	(0.74, 1.26)	5.8	1.70	(0.01, 1.99)	1.3
8	CL2_2	-4.280	0.365	8.55	(0.74, 1.26)	23.6	1.82	(0.61, 1.39)	3.4
9	CL2_3	-3.098	0.308	2.71	(0.74, 1.26)	8.9	1.28	(0.70, 1.30)	1.7
10	CL2_4	-2.336	0.297	1.17	(0.74, 1.26)	1.3	0.79	(0.70, 1.30)	-1.5
11	CL2_5	-1.796	0.297	0.53	(0.74, 1.26)	-4.3	0.71	(0.70, 1.30)	-2.1
12	CL2_6	-1.436	0.298	0.38	(0.74, 1.26)	-6.2	0.69	(0.69, 1.31)	-2.1
13	CL2_7	-1.095	0.296	0.99	(0.74, 1.26)	-0.0	0.90	(0.68, 1.32)	-0.6
14	CL2_8	-0.941	0.293	0.40	(0.74, 1.26)	-6.0	0.76	(0.69, 1.31)	-1.6
15	CL2_9	-1.361	0.291	2.89	(0.74, 1.26)	9.8	0.81	(0.70, 1.30)	-1.3
16	CL2_10	-0.292	0.284	0.33	(0.75, 1.25)	-7.2	0.61	(0.69, 1.31)	-2.7
17	CL2_11	0.313	0.280	0.45	(0.75, 1.25)	-5.6	0.79	(0.68, 1.32)	-1.3
18	CL2_12	1.557	0.276	0.48	(0.76, 1.24)	-5.2	0.69	(0.69, 1.31)	-2.1
19	CL2_13	2.896	0.289	0.32	(0.76, 1.24)	-7.7	0.74	(0.72, 1.28)	-2.0
20	CL2_14	2.896	0.289	0.48	(0.76, 1.24)	-5.2	0.92	(0.72, 1.28)	-0.5
21	CL2_15	5.205	0.408	0.39	(0.76, 1.24)	-6.4	0.86	(0.47, 1.53)	-0.5
22	CL3_1	-4.100	0.361	50.25	(0.74, 1.26)	59.9	1.84	(0.63, 1.37)	3.6
23	CL3_2	-3.965	0.353	38.03	(0.74, 1.26)	52.6	1.43	(0.64, 1.36)	2.1
24	CL3_3	-3.242	0.319	18.81	(0.74, 1.26)	37.0	1.32	(0.69, 1.31)	1.9
25	CL3_4	-1.768	0.302	0.45	(0.74, 1.26)	-5.2	0.73	(0.68, 1.32)	-1.8

26	CL3_5	-1.206	0.302	0.60	(0.74, 1.26)	-3.4	0.73	(0.68, 1.32)	-1.8
27	CL3_6	-1.017	0.302	0.82	(0.74, 1.26)	-1.4	0.94	(0.67, 1.33)	-0.3
28	CL3_7	-0.735	0.301	1.59	(0.74, 1.26)	3.8	0.98	(0.67, 1.33)	-0.0
29	CL3_8	-0.556	0.295	0.60	(0.74, 1.26)	-3.5	0.86	(0.68, 1.32)	-0.8
30	CL3_9	-0.750	0.291	0.35	(0.74, 1.26)	-6.6	0.68	(0.69, 1.31)	-2.2
31	CL3_10	0.356	0.289	0.51	(0.75, 1.25)	-4.6	0.84	(0.66, 1.34)	-0.9
32	CL3_11	1.470	0.287	0.43	(0.75, 1.25)	-5.7	0.81	(0.68, 1.32)	-1.2
33	CL3_12	2.166	0.277	0.59	(0.76, 1.24)	-3.8	0.88	(0.72, 1.28)	-0.8
34	CL3_13	3.433	0.310	0.37	(0.76, 1.24)	-6.7	0.88	(0.69, 1.31)	-0.8
35	CL3_14	3.433	0.310	0.41	(0.76, 1.24)	-6.2	0.95	(0.69, 1.31)	-0.3
36	CL3_15	2.642	0.283	0.40	(0.76, 1.24)	-6.4	0.86	(0.72, 1.28)	-1.0
37	CL4_1	-4.406	0.378	569.22	(0.74, 1.26)	164.4	1.80	(0.59, 1.41)	3.1
38	CL4_2	-5.256	0.448	0.36	(0.74, 1.26)	-6.4	1.08	(0.39, 1.61)	0.4
39	CL4_3	-2.012	0.299	43.80	(0.74, 1.26)	57.0	1.42	(0.69, 1.31)	2.4
40	CL4_4	-2.967	0.308	13.24	(0.74, 1.26)	31.1	1.16	(0.69, 1.31)	1.0
41	CL4_5	-0.575	0.285	0.26	(0.75, 1.25)	-8.5	0.54	(0.69, 1.31)	-3.4
42	CL4_6	0.421	0.282	0.41	(0.75, 1.25)	-6.0	0.78	(0.67, 1.33)	-1.4
43	CL4_7	1.551	0.278	1.61	(0.76, 1.25)	4.2	1.17	(0.69, 1.31)	1.0
44	CL4_8	0.302	0.278	0.38	(0.76, 1.24)	-6.6	0.60	(0.68, 1.32)	-2.8
45	CL4_9	1.409	0.277	0.33	(0.76, 1.24)	-7.3	0.61	(0.69, 1.31)	-2.8
46	CL4_10	3.091	0.298	0.43	(0.76, 1.24)	-5.8	0.97	(0.71, 1.29)	-0.2
47	CL4_11	1.565	0.277	0.26	(0.76, 1.24)	-8.7	0.53	(0.69, 1.31)	-3.6
48	CL4_12	1.943	0.275	0.39	(0.76, 1.24)	-6.4	0.78	(0.71, 1.29)	-1.5
49	CL5_1	-5.077	0.428	0.21	(0.74, 1.26)	-9.1	0.85	(0.44, 1.56)	-0.5
50	CL5_2	-4.733	0.398	0.29	(0.74, 1.26)	-7.7	0.90	(0.53, 1.47)	-0.3
51	CL5_3	-4.445	0.373	6.16	(0.75, 1.25)	19.6	1.16	(0.58, 1.42)	0.8
52	CL5_4	-2.141	0.290	0.46	(0.75, 1.25)	-5.3	0.80	(0.70, 1.30)	-1.4
53	CL5_5	-2.490	0.292	1.17	(0.75, 1.25)	1.3	0.80	(0.71, 1.29)	-1.4
54	CL5_6	-2.055	0.290	0.32	(0.75, 1.25)	-7.5	0.64	(0.70, 1.30)	-2.7
55	CL5_7	-1.178	0.292	0.49	(0.75, 1.25)	-5.0	0.63	(0.69, 1.31)	-2.7
56	CL5_8	1.255	0.285	0.89	(0.75, 1.25)	-0.9	1.27	(0.68, 1.32)	1.6
57	CL5_9	0.886	0.282	0.90	(0.75, 1.25)	-0.8	1.26	(0.68, 1.32)	1.5
58	CL5_10	2.589	0.289	0.64	(0.75, 1.25)	-3.3	1.12	(0.71, 1.29)	0.8
59	CL5_11	3.757	0.331	1.04	(0.76, 1.25)	0.4	0.96	(0.65, 1.35)	-0.2
60	CL5_12	3.002	0.294	1.20	(0.76, 1.24)	1.5	1.27	(0.71, 1.29)	1.8
61	CL5_13	4.128	0.348	0.75	(0.76, 1.24)	-2.2	1.38	(0.61, 1.39)	1.8
62	CL5_14	4.321	0.354	3.16	(0.76, 1.24)	11.4	1.30	(0.60, 1.40)	1.4
63	CL6_1	-0.053	0.287	1.33	(0.75, 1.25)	2.4	1.25	(0.68, 1.32)	1.4
64	CL6_2	-0.144	0.286	0.52	(0.75, 1.25)	-4.6	0.70	(0.68, 1.32)	-2.0
65	CL6_3	-0.318	0.286	0.85	(0.75, 1.25)	-1.2	0.80	(0.68, 1.32)	-1.3
66	CL6_4	1.071	0.282	0.43	(0.75, 1.25)	-5.8	0.68	(0.68, 1.32)	-2.1
67	CL6_5	0.174	0.283	0.41	(0.75, 1.25)	-6.1	0.68	(0.67, 1.33)	-2.1
68	CL6_6	0.908	0.282	0.43	(0.75, 1.25)	-5.8	0.73	(0.67, 1.33)	-1.8
69	CL6_7	1.070	0.281	0.52	(0.75, 1.25)	-4.6	0.72	(0.68, 1.32)	-1.8
70	CL6_8	2.494	0.282	0.47	(0.75, 1.25)	-5.2	0.89	(0.72, 1.28)	-0.8
71	CL6_9	2.996	0.295	0.51	(0.75, 1.25)	-4.7	0.89	(0.71, 1.29)	-0.7
72	CL6_10	1.389	0.280	0.59	(0.75, 1.25)	-3.8	0.93	(0.69, 1.31)	-0.4
73	CL6_11	3.630	0.319	1.04	(0.75, 1.25)	0.3	0.97	(0.68, 1.32)	-0.1
74	CL7_1	1.122	0.287	0.41	(0.75, 1.25)	-6.0	0.74	(0.67, 1.33)	-1.7
75	CL7_2	2.897	0.301	2.51	(0.75, 1.25)	8.5	1.14	(0.70, 1.30)	0.9
76	CL7_3	2.717	0.296	0.74	(0.75, 1.25)	-2.2	1.06	(0.71, 1.29)	0.5
77	CL7_4	2.166	0.284	0.48	(0.75, 1.25)	-5.1	0.80	(0.71, 1.29)	-1.4
78	CL7_5	3.537	0.320	0.42	(0.75, 1.25)	-5.9	0.83	(0.67, 1.33)	-1.0
79	CL7_6	4.313	0.353	0.50	(0.75, 1.25)	-4.9	1.01	(0.60, 1.40)	0.1
80	CL7_7	5.746	0.447	0.46	(0.75, 1.25)	-5.5	1.08	(0.43, 1.57)	0.4
81	CL7_8	5.547	0.431	1.06	(0.75, 1.25)	0.5	1.36	(0.44, 1.56)	1.2
82	CL7_9	5.746	0.447	0.35	(0.75, 1.25)	-7.1	1.10	(0.43, 1.57)	0.4
83	CL7_10	6.456	0.516	0.74	(0.75, 1.25)	-2.2	1.06	(0.37, 1.63)	0.3
84	CE1_1	-6.660	0.645	1.29	(0.75, 1.25)	2.1	1.52	(0.00, 2.19)	0.9
85	CE1_2	-3.766	0.334	140.33	(0.75, 1.25)	97.2	1.68	(0.66, 1.34)	3.3
86	CE1_3	-4.284	0.365	11.13	(0.75, 1.25)	28.6	1.45	(0.60, 1.40)	2.0
87	CE1_4	-3.888	0.340	143.56	(0.75, 1.25)	98.1	1.52	(0.65, 1.35)	2.6
88	CE1_5	-1.552	0.288	13.86	(0.75, 1.25)	32.9	0.96	(0.70, 1.30)	-0.2
89	CE1_6	-0.967	0.286	1.05	(0.75, 1.25)	0.4	0.98	(0.70, 1.30)	-0.1
90	CE1_7	1.495	0.280	1.48	(0.75, 1.25)	3.4	1.48	(0.68, 1.32)	2.6
91	CE1_8	1.588	0.279	0.68	(0.76, 1.25)	-2.8	1.10	(0.69, 1.31)	0.7
92	CE1_9	1.642	0.276	1.06	(0.76, 1.24)	0.5	1.07	(0.70, 1.30)	0.5
93	CE1_10	2.264	0.278	0.83	(0.76, 1.24)	-1.4	1.26	(0.72, 1.28)	1.7
94	CE1_11	3.091	0.298	0.90	(0.76, 1.24)	-0.8	1.02	(0.71, 1.29)	0.2
95	CE1_12	4.071	0.340	0.51	(0.76, 1.24)	-4.8	1.10	(0.63, 1.37)	0.6
96	CE1_13	5.547	0.431	4.67	(0.76, 1.24)	16.4	1.47	(0.44, 1.56)	1.6
97	CE2_1	-3.995	0.349	0.78	(0.74, 1.26)	-1.8	1.10	(0.64, 1.36)	0.6
98	CE2_2	-3.995	0.349	5.25	(0.74, 1.26)	17.0	1.33	(0.64, 1.36)	1.7
99	CE2_3	-3.396	0.319	0.45	(0.74, 1.26)	-5.3	1.00	(0.68, 1.32)	0.1
100	CE2_4	-2.541	0.294	1.38	(0.74, 1.26)	2.6	0.92	(0.70, 1.30)	-0.5
101	CE2_5	-1.488	0.291	0.70	(0.74, 1.26)	-2.6	0.83	(0.69, 1.31)	-1.1

102	CE2_6	-0.115	0.288	0.59	(0.75, 1.25)	-3.6	0.90	(0.68, 1.32)	-0.6
103	CE2_7	0.189	0.284	2.70	(0.75, 1.25)	9.4	0.86	(0.67, 1.33)	-0.8
104	CE2_8	1.641	0.277	0.85	(0.76, 1.25)	-1.2	1.20	(0.70, 1.30)	1.3
105	CE2_9	2.107	0.277	1.56	(0.76, 1.25)	3.9	1.38	(0.71, 1.29)	2.4
106	CE2_10	3.090	0.298	0.95	(0.76, 1.25)	-0.4	1.00	(0.71, 1.29)	0.0
107	CE2_11	4.817	0.388	2.20	(0.76, 1.25)	7.3	0.93	(0.52, 1.48)	-0.2
108	CE2_12	4.128	0.348	1.63	(0.76, 1.25)	4.3	1.13	(0.61, 1.39)	0.7
109	CE2_13	4.817	0.388	0.35	(0.76, 1.25)	-7.1	0.79	(0.52, 1.48)	-0.8
110	CE2_14	3.956	0.334	1.50	(0.76, 1.24)	3.6	1.35	(0.64, 1.36)	1.8
111	CE3_1	-5.076	0.428	2.15	(0.74, 1.26)	6.6	1.11	(0.44, 1.56)	0.5
112	CE3_2	-5.967	0.527	32.98	(0.74, 1.26)	49.8	1.20	(0.14, 1.86)	0.6
113	CE3_3	-5.277	0.444	22.37	(0.74, 1.26)	41.2	1.25	(0.39, 1.61)	0.8
114	CE3_4	-4.589	0.385	10.08	(0.74, 1.26)	26.3	1.32	(0.56, 1.44)	1.4
115	CE3_5	-4.165	0.354	6.73	(0.75, 1.25)	20.7	1.26	(0.62, 1.38)	1.3
116	CE3_6	-2.756	0.296	1.07	(0.75, 1.25)	0.6	1.18	(0.70, 1.30)	1.2
117	CE3_7	-1.269	0.291	1.97	(0.75, 1.25)	6.1	1.61	(0.69, 1.31)	3.3
118	CE3_8	-1.139	0.286	0.96	(0.76, 1.24)	-0.2	1.37	(0.69, 1.31)	2.2
119	CE3_9	1.070	0.279	1.15	(0.76, 1.24)	1.2	1.24	(0.68, 1.32)	1.4
120	CE4_1	-4.888	0.414	82.89	(0.74, 1.26)	77.5	1.24	(0.49, 1.51)	0.9
121	CE4_2	-3.178	0.312	2.41	(0.75, 1.25)	8.0	1.30	(0.69, 1.31)	1.7
122	CE4_3	-0.714	0.290	0.43	(0.75, 1.25)	-5.8	0.82	(0.69, 1.31)	-1.1
123	CE4_4	-1.026	0.286	1.78	(0.75, 1.25)	5.1	1.24	(0.69, 1.31)	1.5
124	CE4_5	-0.357	0.281	1.47	(0.75, 1.25)	3.3	1.17	(0.69, 1.31)	1.1
125	CE4_6	1.640	0.277	1.94	(0.75, 1.25)	6.0	1.35	(0.70, 1.30)	2.1
126	CE4_7	3.338	0.305	1.94	(0.76, 1.24)	6.0	1.53	(0.70, 1.30)	3.0
127	CE4_8	2.018	0.276	0.69	(0.76, 1.24)	-2.8	1.07	(0.71, 1.29)	0.5
128	CE4_9	3.066	0.295	0.60	(0.76, 1.24)	-3.8	1.03	(0.71, 1.29)	0.2
129	CE4_10	3.633	0.318	0.35	(0.76, 1.24)	-7.1	0.86	(0.68, 1.32)	-0.8
130	CE4_11	3.633	0.318	1.11	(0.76, 1.24)	0.9	1.03	(0.68, 1.32)	0.2
131	CE4_12	5.023	0.393	0.23	(0.76, 1.24)	-9.2	0.75	(0.50, 1.50)	-1.0
132	CE4_13	3.956	0.334	0.40	(0.76, 1.24)	-6.3	0.83	(0.64, 1.36)	-0.9
133	CE4_14	4.579	0.367	0.34	(0.76, 1.24)	-7.2	0.84	(0.56, 1.44)	-0.7
134	CE4_15	4.579	0.367	0.37	(0.76, 1.24)	-6.7	0.88	(0.56, 1.44)	-0.5
135	CE5_1	0.399	0.298	0.53	(0.74, 1.26)	-4.4	0.73	(0.65, 1.35)	-1.6
136	CE5_2	1.381	0.297	1.23	(0.74, 1.26)	1.7	1.12	(0.66, 1.34)	0.7
137	CE5_3	0.616	0.292	0.52	(0.75, 1.25)	-4.5	0.83	(0.66, 1.34)	-1.0
138	CE5_4	1.542	0.286	0.48	(0.75, 1.25)	-5.0	0.88	(0.69, 1.31)	-0.7
139	CE5_5	1.950	0.284	0.52	(0.75, 1.25)	-4.5	0.78	(0.70, 1.30)	-1.5
140	CE5_6	2.592	0.288	0.30	(0.75, 1.25)	-7.8	0.66	(0.72, 1.28)	-2.7
141	CE5_7	3.304	0.308	0.40	(0.75, 1.25)	-6.2	0.76	(0.70, 1.30)	-1.7
142	CE5_8	3.818	0.331	0.32	(0.75, 1.25)	-7.5	0.78	(0.65, 1.35)	-1.3
143	CE5_9	5.010	0.395	2.77	(0.75, 1.25)	9.6	0.99	(0.50, 1.50)	0.0
144	CE6_1	0.748	0.294	3.04	(0.75, 1.25)	10.4	1.87	(0.65, 1.35)	3.9
145	CE6_2	0.660	0.294	0.45	(0.75, 1.25)	-5.3	0.77	(0.65, 1.35)	-1.4
146	CE6_3	-0.048	0.294	0.98	(0.75, 1.25)	-0.1	1.14	(0.66, 1.34)	0.8
147	CE6_4	0.296	0.293	1.54	(0.75, 1.25)	3.6	0.91	(0.66, 1.34)	-0.5
148	CE6_5	0.559	0.293	1.06	(0.75, 1.25)	0.5	0.76	(0.66, 1.34)	-1.4
149	CE6_6	1.254	0.291	0.81	(0.75, 1.25)	-1.6	0.93	(0.66, 1.34)	-0.3
150	CE6_7	1.695	0.288	0.67	(0.75, 1.25)	-2.9	0.79	(0.68, 1.32)	-1.3
151	CE6_8	1.334	0.286	0.36	(0.75, 1.25)	-6.7	0.67	(0.67, 1.33)	-2.2
152	CE6_9	1.167	0.287	0.57	(0.75, 1.25)	-4.0	0.83	(0.67, 1.33)	-1.0
153	CE6_10	2.392	0.286	1.96	(0.75, 1.25)	6.0	0.73	(0.71, 1.29)	-1.9
154	CE6_11	2.272	0.282	0.43	(0.75, 1.25)	-5.8	0.84	(0.72, 1.28)	-1.1
155	CE6_12	2.516	0.285	0.43	(0.75, 1.25)	-5.8	0.82	(0.72, 1.28)	-1.3
156	CE6_13	3.935	0.337	0.36	(0.75, 1.25)	-6.8	0.88	(0.64, 1.36)	-0.7
157	CE6_14	3.712	0.326	0.30	(0.75, 1.25)	-7.8	0.78	(0.66, 1.34)	-1.4
158	CE6_15	5.010	0.395	0.41	(0.75, 1.25)	-6.0	0.90	(0.50, 1.50)	-0.3

An asterisk next to a parameter estimate indicates that it is constrained
Separation Reliability = 0.988
Chi-square test of parameter equality = 11579.99, df = 158, Sig Level = 0.000
^ Quick standard errors have been used

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================================================================================
ConQuest: Generalised Item Response Modelling Software     Mon Mar 28 22:35 2016
MAP OF WLE ESTIMATES AND RESPONSE MODEL PARAMETER ESTIMATES
================================================================================
                                             Terms in the Model (excl Step terms)

                                                               +items
---------------------------------------------------------------------------------------
  13                                          |                                       |
                                              |                                       |
  12                                          |                                       |
                                              |                                       |
  11                                          |                                       |
                                              |                                       |
                                              |                                       |
  10                                          |                                       |
                                              |                                       |
   9                                          |                                       |
                                              |                                       |
                                              |                                       |
   8                                          |                                       |
                                              |                                       |
   7                                 XXXXXXXXX|                                       |
                                           XXX|83                                     |
   6                                    XXXXXX|                                       |
                                        XXXXXX|80 81 82 96                            |
                                           XXX|21                                     |
   5                                       XXX|107 109 131 143 158                    |
                                        XXXXXX|62 79 133 134                          |
   4                              XXXXXXXXXXXX|61 95 108 110 132 156                  |
                                     XXXXXXXXX|59 73 78 129 130 142 157               |
      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|34 35 46 94 106 126 128 141            |
   3                                 XXXXXXXXX|19 20 36 60 71 75 76                   |
                            XXXXXXXXXXXXXXXXXX|58 70 93 140 153 154 155               |
   2                 XXXXXXXXXXXXXXXXXXXXXXXXX|33 48 77 105 125 127 139 150           |
                            XXXXXXXXXXXXXXXXXX|18 32 43 45 47 72 90 91 92 104         |
   1                                    XXXXXX|56 66 69 74 119 136 138 149 151        |
                                  XXXXXXXXXXXX|57 68 137 144 145 148 152              |
                               XXXXXXXXXXXXXXX|17 31 42 44 67 103 135 147             |
   0                        XXXXXXXXXXXXXXXXXX|16 63 64 102 146                       |
                     XXXXXXXXXXXXXXXXXXXXXXXXX|29 41 65 122 124                       |
  -1                              XXXXXXXXXXXX|5 6 13 14 27 28 30 89 123              |
                            XXXXXXXXXXXXXXXXXX|4 12 15 26 55 101 117 118              |
                                  XXXXXXXXXXXX|11 25 88                               |
  -2                        XXXXXXXXXXXXXXXXXX|1 10 39 52 54                          |
                     XXXXXXXXXXXXXXXXXXXXXXXXX|53 100 116                             |
  -3                              XXXXXXXXXXXX|3 9 40 121                             |
                            XXXXXXXXXXXXXXXXXX|24 99                                  |
  -4                                 XXXXXXXXX|2 23 85 87 97 98                       |
                            XXXXXXXXXXXXXXXXXX|8 22 37 51 86 115                      |
                                        XXXXXX|50 114 120                             |
  -5                                       XXX|38 49 111 113                          |
                                              |                                       |
  -6                                          |112                                    |
                                           XXX|7                                      |
                                              |84                                     |
  -7                                          |                                       |
                                              |                                       |
  -8                                          |                                       |
                                              |                                       |
  -9                                          |                                       |
                                              |                                       |
                                              |                                       |
 -10                                          |                                       |
                                              |                                       |
 -11                                          |                                       |
                                              |                                       |
                                              |                                       |
=======================================================================================
Each 'X' represents   0.3 cases

=======================================================================================
```

APPENDIX L: CONQUEST OUTPUT FILES - VOCABULARY DRAFT INSTRUMENT

```
============================================================================
ConQuest: Generalised Item Response Modelling Software     Sun Mar 27 17:26 2016
SUMMARY OF THE ESTIMATION
============================================================================

Estimation method was: Gauss-Hermite Quadrature with 15 nodes
Assumed population distribution was: Gaussian
Constraint was: CASES
The Data File: EOLwith3s.dat
The format:  responses 1-107
The regression model:
Grouping Variables:
The item model: items
Slopes are fixed
Sample size: 298
Final Deviance:     8028.78344
Total number of estimated parameters: 108
The number of iterations: 14
Termination criteria:  Max iterations=1000, Parameter Change= 0.00010
                       Deviance Change= 0.00010
Iterations terminated because the convergence criteria were reached
At termination the solution was not the best attained solution
The reported results are for the earlier better solution
Rerunning this analysis using the current estimates as initial values is strongly advised.
Random number generation seed:    1.00000
Number of nodes used when drawing PVs: 2000
Number of nodes used when computing fit: 200
Number of plausible values to draw: 5
Maximum number of iterations without a deviance improvement: 100
Maximum number of Newton steps in M-step: 10
Value for obtaining finite MLEs for zero/perfects:    0.30000

============================================================================
```

```
============================================================================
ConQuest: Generalised Item Response Modelling Software     Sun Mar 27 17:26 2016
TABLES OF RESPONSE MODEL PARAMETER ESTIMATES
============================================================================
TERM 1: items
```

VARIABLES				UNWEIGHTED FIT			WEIGHTED FIT		
	item	ESTIMATE	ERROR^	MNSQ	CI	T	MNSQ	CI	T
1	CL_7	-2.945	0.301	11.56	(0.75, 1.25)	30.1	0.97	(0.67, 1.33)	-0.1
2	CL_8	-2.945	0.301	1.35	(0.75, 1.25)	2.6	0.92	(0.67, 1.33)	-0.4
3	CL_9	-0.497	0.294	0.47	(0.75, 1.25)	-5.2	0.86	(0.70, 1.30)	-0.9
4	CL_10	1.024	0.321	1.36	(0.76, 1.25)	2.6	1.17	(0.69, 1.31)	1.1
5	CL_11	0.239	0.297	0.47	(0.76, 1.25)	-5.3	0.94	(0.71, 1.29)	-0.4
6	CL_12	2.293	0.347	0.66	(0.76, 1.25)	-3.0	1.11	(0.64, 1.36)	0.6
7	CL_13	3.157	0.365	0.53	(0.76, 1.25)	-4.5	1.18	(0.57, 1.43)	0.8
8	CL_14	2.410	0.348	1.05	(0.76, 1.25)	0.4	1.28	(0.63, 1.37)	1.4
9	CL_15	1.519	0.336	3.73	(0.76, 1.25)	13.3	1.32	(0.68, 1.32)	1.8
10	CL_16	1.624	0.339	0.61	(0.76, 1.25)	-3.6	1.14	(0.67, 1.33)	0.9
11	CL_17	2.773	0.353	1.12	(0.76, 1.25)	1.0	1.51	(0.61, 1.39)	2.3
12	CL8_1	-2.520	0.307	2.24	(0.75, 1.25)	7.3	1.45	(0.66, 1.34)	2.3
13	CL8_2	-1.781	0.315	0.43	(0.75, 1.25)	-5.6	0.82	(0.66, 1.34)	-1.0
14	CL8_3	-1.046	0.310	0.53	(0.75, 1.25)	-4.4	0.90	(0.67, 1.33)	-0.6
15	CL8_4	-0.014	0.301	0.40	(0.75, 1.25)	-6.1	0.76	(0.70, 1.30)	-1.6
16	CL8_5	0.499	0.309	0.41	(0.75, 1.25)	-6.0	0.80	(0.70, 1.30)	-1.3
17	CL8_6	2.584	0.347	0.43	(0.75, 1.25)	-5.7	0.83	(0.63, 1.37)	-0.9
18	CL8_7	2.592	0.346	0.44	(0.75, 1.25)	-5.7	0.84	(0.63, 1.37)	-0.8
19	CL9_1	-1.690	0.315	0.65	(0.75, 1.25)	-3.2	1.11	(0.65, 1.35)	0.7
20	CL9_2	-0.785	0.305	1.95	(0.75, 1.25)	5.9	1.00	(0.68, 1.32)	0.0
21	CL9_3	0.238	0.303	1.06	(0.75, 1.25)	0.5	1.11	(0.70, 1.30)	0.8
22	CL9_4	0.192	0.299	0.84	(0.75, 1.25)	-1.3	0.84	(0.71, 1.29)	-1.1
23	CL9_5	1.276	0.330	0.41	(0.75, 1.25)	-6.1	0.79	(0.70, 1.30)	-1.4
24	CL9_6	1.706	0.337	0.47	(0.75, 1.25)	-5.3	0.86	(0.68, 1.32)	-0.9
25	CL9_7	3.476	0.373	0.50	(0.76, 1.25)	-4.8	0.90	(0.55, 1.45)	-0.4
26	CL9_8	3.925	0.404	0.41	(0.76, 1.25)	-6.2	0.87	(0.50, 1.50)	-0.4
27	CL10_1	-2.569	0.305	4.18	(0.75, 1.25)	14.5	1.30	(0.66, 1.34)	1.7
28	CL10_2	-1.014	0.310	1.11	(0.75, 1.25)	0.8	0.74	(0.66, 1.34)	-1.6
29	CL10_3	-2.749	0.303	1.60	(0.75, 1.25)	4.1	1.68	(0.66, 1.34)	3.4
30	CL10_4	-0.178	0.299	0.63	(0.75, 1.25)	-3.4	0.92	(0.70, 1.30)	-0.5
31	CL10_5	-1.594	0.311	0.43	(0.75, 1.25)	-5.8	0.75	(0.65, 1.35)	-1.5
32	CL10_6	-1.955	0.309	1.51	(0.75, 1.25)	3.6	1.00	(0.65, 1.35)	0.0
33	CL10_7	-0.887	0.303	0.48	(0.75, 1.25)	-5.1	0.78	(0.67, 1.33)	-1.4
34	CL10_8	-0.334	0.293	0.51	(0.75, 1.25)	-4.7	0.80	(0.70, 1.30)	-1.3
35	CL10_9	0.739	0.310	0.55	(0.76, 1.25)	-4.3	0.85	(0.71, 1.29)	-1.0
36	CL10_10	0.481	0.302	0.41	(0.76, 1.25)	-6.2	0.82	(0.71, 1.29)	-1.2
37	CL10_11	-0.499	0.294	0.69	(0.76, 1.25)	-2.7	0.91	(0.69, 1.31)	-0.5
38	CL10_12	2.031	0.340	0.79	(0.76, 1.25)	-1.8	1.26	(0.67, 1.33)	1.5
39	CL10_13	1.397	0.331	0.96	(0.76, 1.25)	-0.3	1.40	(0.69, 1.31)	2.3
40	CL10_14	2.719	0.347	0.51	(0.76, 1.25)	-4.8	1.07	(0.62, 1.38)	0.4
41	CL10_15	3.340	0.366	1.17	(0.76, 1.24)	1.3	1.12	(0.57, 1.43)	0.6
42	CL10_16	4.470	0.458	8.67	(0.76, 1.24)	25.5	1.34	(0.43, 1.57)	1.2
43	CL11_1	-6.103	0.402	0.59	(0.75, 1.25)	-3.8	0.92	(0.54, 1.46)	-0.3
44	CL11_2	-4.228	0.336	5.42	(0.75, 1.25)	17.8	1.36	(0.64, 1.36)	1.9
45	CL11_3	-3.402	0.307	2.60	(0.75, 1.25)	8.9	1.54	(0.67, 1.33)	2.8
46	CL11_4	-3.311	0.305	1.04	(0.75, 1.25)	0.4	0.97	(0.67, 1.33)	-0.1
47	CL11_5	-3.217	0.304	2.58	(0.75, 1.25)	8.9	1.04	(0.67, 1.33)	0.3
48	CL11_6	-3.038	0.302	1.24	(0.75, 1.25)	1.8	1.12	(0.67, 1.33)	0.7
49	CL11_7	-1.715	0.307	0.90	(0.76, 1.24)	-0.8	1.18	(0.66, 1.34)	1.0
50	CL11_8	0.681	0.305	1.15	(0.76, 1.24)	1.2	1.35	(0.71, 1.29)	2.2
51	CL11_9	2.962	0.351	0.79	(0.76, 1.24)	-1.8	1.26	(0.60, 1.40)	1.3
52	CL12_1	-5.515	0.387	0.68	(0.75, 1.25)	-2.9	1.08	(0.57, 1.43)	0.4
53	CL12_2	-4.232	0.336	0.88	(0.75, 1.25)	-1.0	1.03	(0.64, 1.36)	0.2
54	CL12_3	-3.221	0.303	2.52	(0.75, 1.25)	8.7	1.30	(0.67, 1.33)	1.7
55	CL12_4	-1.701	0.309	0.88	(0.75, 1.25)	-0.9	1.19	(0.66, 1.34)	1.1
56	CL12_5	-1.539	0.306	0.56	(0.76, 1.25)	-4.2	0.91	(0.67, 1.33)	-0.5
57	CL12_6	-0.211	0.289	0.40	(0.76, 1.25)	-6.3	0.77	(0.71, 1.29)	-1.6
58	CL12_7	0.512	0.300	0.40	(0.76, 1.25)	-6.3	0.74	(0.71, 1.29)	-1.9
59	CL12_8	1.723	0.335	0.37	(0.76, 1.25)	-6.7	0.85	(0.68, 1.32)	-0.9
60	CL12_9	2.375	0.341	0.38	(0.76, 1.24)	-6.6	0.94	(0.65, 1.35)	-0.3
61	CL12_10	4.276	0.436	0.23	(0.76, 1.24)	-9.3	0.71	(0.46, 1.54)	-1.1
62	CL12_11	4.096	0.419	1.60	(0.76, 1.24)	4.1	0.85	(0.48, 1.52)	-0.5
63	CL12_12	4.928	0.510	0.92	(0.76, 1.24)	-0.6	1.24	(0.36, 1.64)	0.8
64	CL12_13	4.928	0.510	0.71	(0.76, 1.24)	-2.6	1.15	(0.36, 1.64)	0.5

65	CL13_1	-5.740	0.386	2.90	(0.75, 1.25)	10.0	1.94	(0.58, 1.42)	3.5
66	CL13_2	-3.113	0.303	1.90	(0.75, 1.25)	5.6	1.07	(0.68, 1.32)	0.5
67	CL13_3	-2.750	0.303	0.59	(0.75, 1.25)	-3.8	0.89	(0.67, 1.33)	-0.6
68	CL13_4	-2.390	0.307	1.08	(0.75, 1.25)	0.7	0.93	(0.66, 1.34)	-0.4
69	CL13_5	-1.489	0.312	0.76	(0.75, 1.25)	-2.0	0.95	(0.65, 1.35)	-0.2
70	CL13_6	-2.810	0.298	0.60	(0.75, 1.25)	-3.7	0.82	(0.67, 1.33)	-1.1
71	CL13_7	-1.137	0.305	1.52	(0.75, 1.25)	3.7	1.20	(0.67, 1.33)	1.2
72	CL13_8	-0.133	0.295	1.11	(0.76, 1.25)	0.9	1.39	(0.70, 1.30)	2.3
73	CL13_9	0.857	0.310	1.15	(0.76, 1.24)	1.2	1.28	(0.71, 1.29)	1.8
74	CL14_1	-2.704	0.306	1.13	(0.75, 1.25)	1.0	1.18	(0.66, 1.34)	1.0
75	CL14_2	-2.163	0.310	0.82	(0.75, 1.25)	-1.4	1.22	(0.66, 1.34)	1.2
76	CL14_3	-0.013	0.294	0.80	(0.75, 1.25)	-1.7	1.03	(0.71, 1.29)	0.2
77	CL14_4	1.296	0.328	0.37	(0.76, 1.25)	-6.8	0.78	(0.69, 1.31)	-1.4
78	CL14_5	2.714	0.346	0.57	(0.76, 1.25)	-4.1	0.74	(0.62, 1.38)	-1.4
79	CL14_6	3.618	0.381	0.25	(0.76, 1.25)	-8.8	0.81	(0.54, 1.46)	-0.8
80	CL14_7	4.926	0.510	0.11	(0.76, 1.25)	-12.4	0.69	(0.36, 1.64)	-1.0
81	CL14_8	4.686	0.482	2.81	(0.76, 1.25)	9.9	0.88	(0.40, 1.60)	-0.3
82	CL15_1	-6.778	0.434	0.50	(0.75, 1.25)	-4.8	0.88	(0.48, 1.52)	-0.4
83	CL15_2	-4.853	0.362	0.70	(0.75, 1.25)	-2.6	0.88	(0.62, 1.38)	-0.6
84	CL15_3	-3.353	0.302	70.01	(0.75, 1.25)	74.7	0.94	(0.67, 1.33)	-0.4
85	CL15_4	-0.045	0.290	0.84	(0.76, 1.25)	-1.3	1.27	(0.71, 1.29)	1.7
86	CL15_5	0.109	0.291	0.53	(0.76, 1.24)	-4.5	0.95	(0.71, 1.29)	-0.3
87	CL15_6	2.493	0.343	1.56	(0.76, 1.24)	3.9	1.38	(0.64, 1.36)	1.9
88	CL15_7	2.043	0.338	0.54	(0.76, 1.24)	-4.5	0.93	(0.66, 1.34)	-0.4
89	CL16_1	-1.084	0.308	1.15	(0.75, 1.25)	1.2	0.87	(0.67, 1.33)	-0.8
90	CL16_2	0.714	0.314	0.71	(0.75, 1.25)	-2.6	1.03	(0.70, 1.30)	0.2
91	CL16_3	1.932	0.345	0.71	(0.75, 1.25)	-2.5	1.20	(0.66, 1.34)	1.1
92	CL16_4	0.993	0.323	1.27	(0.75, 1.25)	2.0	1.15	(0.69, 1.31)	1.0
93	CL16_5	-0.933	0.303	0.63	(0.75, 1.25)	-3.4	1.01	(0.67, 1.33)	0.1
94	CL16_6	2.251	0.342	0.72	(0.75, 1.25)	-2.4	0.96	(0.66, 1.34)	-0.2
95	CL16_7	3.618	0.381	1.14	(0.75, 1.25)	1.1	1.01	(0.54, 1.46)	0.1
96	CL16_8	4.686	0.482	2.88	(0.75, 1.25)	10.2	1.14	(0.40, 1.60)	0.5
97	CL16_9	5.194	0.541	4.68	(0.75, 1.25)	16.1	1.21	(0.32, 1.68)	0.7
98	CL17_1	-0.918	0.315	1.59	(0.74, 1.26)	3.9	1.02	(0.65, 1.35)	0.2
99	CL17_2	1.435	0.345	22.07	(0.75, 1.25)	42.0	1.06	(0.68, 1.32)	0.4
100	CL17_3	2.334	0.346	0.71	(0.75, 1.25)	-2.4	1.02	(0.65, 1.35)	0.2
101	CL17_4	3.463	0.374	1.52	(0.75, 1.25)	3.5	1.39	(0.56, 1.44)	1.6
102	CL17_5	4.680	0.483	3.02	(0.75, 1.25)	10.5	1.19	(0.40, 1.60)	0.7
103	CL18_1	-6.656	0.419	5.13	(0.75, 1.25)	17.0	1.37	(0.51, 1.49)	1.4
104	CL18_2	-6.839	0.430	16.94	(0.75, 1.25)	37.4	1.23	(0.49, 1.51)	0.9
105	CL18_3	-1.789	0.309	0.55	(0.76, 1.25)	-4.3	0.73	(0.66, 1.34)	-1.6
106	CL18_4	-0.449	0.291	0.40	(0.76, 1.24)	-6.3	0.76	(0.70, 1.30)	-1.6
107	CL18_5	1.933	0.337	0.85	(0.76, 1.24)	-1.2	1.24	(0.67, 1.33)	1.4

An asterisk next to a parameter estimate indicates that it is constrained
Separation Reliability = 0.986
Chi-square test of parameter equality = 6375.42, df = 107, Sig Level = 0.000
^ Quick standard errors have been used

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============================================================================
EOL
================================================================================
ConQuest: Generalised Item Response Modelling Software     Sun Mar 27 17:26 2016
MAP OF WLE ESTIMATES AND RESPONSE MODEL PARAMETER ESTIMATES
================================================================================
                                             Terms in the Model (excl Step terms)

                                                              +items
--------------------------------------------------------------------------------------
  11                                          |                                       |
                                              |                                       |
  10                                          |                                       |
   9                                          |                                       |
                                              |                                       |
   8                                   XXXXXXX|                                       |
                                              |                                       |
   7                                          |                                       |
                                          XXXX|                                       |
   6                                          |                                       |
                                          XXXX|                                       |
   5                               XXXXXXXXXXX|63 64 80 97                            |
                                              |42 61 81 96 102                        |
   4                           XXXXXXXXXXXXXXX|26 62                                  |
                                       XXXXXXX|7 25 41 79 95 101                      |
   3                            XXXXXXXXXXXXXXXXXX|11 40 51 78                        |
                        XXXXXXXXXXXXXXXXXXXXXX|6 8 17 18 60 87 94 100                 |
   2             XXXXXXXXXXXXXXXXXXXXXXXXXXXXX|10 24 38 59 88 91 107                  |
   1                    XXXXXXXXXXXXXXXXXXXXXX|4 9 23 39 77 99                        |
                     XXXXXXXXXXXXXXXXXXXXXXXXX|16 35 36 50 58 73 90 92                |
   0                 XXXXXXXXXXXXXXXXXXXXXXXXX|5 15 21 22 76 85 86                    |
      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|3 30 34 37 57 72 106                   |
  -1                    XXXXXXXXXXXXXXXXXXXXXX|14 20 28 33 71 89 93 98                |
                               XXXXXXXXXXXXXXX|31 56 69                               |
  -2                        XXXXXXXXXXXXXXXXXX|13 19 32 49 55 75 105                  |
                     XXXXXXXXXXXXXXXXXXXXXXXXX|12 27 68 74                            |
  -3                 XXXXXXXXXXXXXXXXXXXXXXXXX|1 2 29 47 48 54 66 67 70               |
                     XXXXXXXXXXXXXXXXXXXXXXXXX|45 46 84                               |
  -4                    XXXXXXXXXXXXXXXXXXXXXX|44 53                                  |
                               XXXXXXXXXXXXXXX|83                                     |
  -5                               XXXXXXXXXXX|                                       |
                            XXXXXXXXXXXXXXXXXX|52 65                                  |
  -6                               XXXXXXXXXXX|43                                     |
  -7                        XXXXXXXXXXXXXXXXXX|82 103 104                             |
                                              |                                       |
  -8                               XXXXXXXXXXX|                                       |
                                              |                                       |
  -9                               XXXXXXXXXXX|                                       |
                                              |                                       |
  -10                                         |                                       |
                                              |                                       |
  -11                                         |                                       |
                                              |                                       |
  -12                                         |                                       |
                                              |                                       |
  -13                                         |                                       |
                                              |                                       |
|
======================================================================================
Each 'X' represents   0.3 cases

======================================================================================
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APPENDIX M: CONQUEST OUTPUT FILES – READING DRAFT INSTRUMENT

```
================================================================================
ConQuest: Generalised Item Response Modelling Software     Wed Mar 30 14:19 2016
SUMMARY OF THE ESTIMATION
================================================================================

Estimation method was: Gauss-Hermite Quadrature with 15 nodes
Assumed population distribution was: Gaussian
Constraint was: CASES
The Data File: readwith3s.dat
The format:  responses 1-183
The regression model:
Grouping Variables:
The item model: items
Slopes are fixed
Sample size: 298
Final Deviance:    13182.61650
Total number of estimated parameters: 184
The number of iterations: 22
Termination criteria:  Max iterations=1000, Parameter Change= 0.00010
                       Deviance Change= 0.00010
Iterations terminated because the convergence criteria were reached
At termination the solution was not the best attained solution
The reported results are for the earlier better solution
Rerunning this analysis using the current estimates as initial values is strongly advised.
Random number generation seed:    1.00000
Number of nodes used when drawing PVs: 2000
Number of nodes used when computing fit: 200
Number of plausible values to draw: 5
Maximum number of iterations without a deviance improvement: 100
Maximum number of Newton steps in M-step: 10
Value for obtaining finite MLEs for zero/perfects:    0.30000

================================================================================
```

Read

```
============================================================================
ConQuest: Generalised Item Response Modelling Software     Wed Mar 30 14:19 2016
TABLES OF RESPONSE MODEL PARAMETER ESTIMATES
============================================================================
TERM 1: items
```

	VARIABLES			UNWEIGHTED FIT			WEIGHTED FIT		
	item	ESTIMATE	ERROR^	MNSQ	CI	T	MNSQ	CI	T
1	RT1_1	-5.347	0.353	33.01	(0.75, 1.25)	52.4	1.19	(0.60, 1.40)	0.9
2	RT1_2	-4.291	0.306	26.31	(0.75, 1.25)	46.9	1.27	(0.68, 1.32)	1.5
3	RT1_3	-3.522	0.282	15.15	(0.75, 1.25)	35.0	1.10	(0.71, 1.29)	0.7
4	RT1_4	-2.863	0.265	4.66	(0.76, 1.25)	16.1	1.07	(0.72, 1.28)	0.6
5	RT1_5	-2.867	0.264	1.59	(0.76, 1.24)	4.1	1.02	(0.72, 1.28)	0.2
6	RT1_6	-1.204	0.262	2.18	(0.76, 1.24)	7.2	1.22	(0.73, 1.27)	1.6
7	RT1_7	-1.539	0.259	0.75	(0.76, 1.24)	-2.2	0.88	(0.73, 1.27)	-0.9
8	RT1_8	-0.374	0.268	0.46	(0.76, 1.24)	-5.5	0.75	(0.72, 1.28)	-1.9
9	RT1_9	0.213	0.278	0.51	(0.76, 1.24)	-4.8	0.86	(0.71, 1.29)	-0.9
10	RT1_10	0.447	0.284	1.64	(0.76, 1.24)	4.4	1.00	(0.70, 1.30)	0.0
11	RT2_1	-5.411	0.360	0.63	(0.75, 1.25)	-3.3	0.68	(0.58, 1.42)	-1.6
12	RT2_2	-4.934	0.335	2.38	(0.75, 1.25)	7.9	1.00	(0.63, 1.37)	0.0
13	RT2_3	-4.227	0.307	4.66	(0.75, 1.25)	15.7	1.07	(0.68, 1.32)	0.5
14	RT2_4	-2.387	0.260	0.84	(0.75, 1.25)	-1.3	0.93	(0.73, 1.27)	-0.4
15	RT2_5	-1.446	0.263	0.62	(0.75, 1.25)	-3.5	0.82	(0.73, 1.27)	-1.4
16	RT2_6	-1.528	0.261	0.66	(0.75, 1.25)	-3.0	0.82	(0.73, 1.27)	-1.3
17	RT2_7	-0.297	0.270	0.84	(0.75, 1.25)	-1.3	0.89	(0.72, 1.28)	-0.8
18	RT2_8	-0.229	0.270	0.60	(0.76, 1.25)	-3.7	0.72	(0.72, 1.28)	-2.2
19	RT2_9	0.864	0.298	0.75	(0.76, 1.24)	-2.2	1.19	(0.68, 1.32)	1.1
20	RT2_10	1.324	0.317	0.88	(0.76, 1.24)	-1.0	1.24	(0.65, 1.35)	1.3
21	RT2_11	1.960	0.344	0.60	(0.76, 1.24)	-3.8	1.28	(0.61, 1.39)	1.3
22	RT3_1	-5.568	0.386	1.33	(0.74, 1.26)	2.3	1.16	(0.55, 1.45)	0.8
23	RT3_2	-3.592	0.302	0.67	(0.74, 1.26)	-2.8	1.09	(0.68, 1.32)	0.6
24	RT3_3	-3.661	0.302	1.47	(0.74, 1.26)	3.1	1.26	(0.69, 1.31)	1.6
25	RT3_4	-4.252	0.321	20.71	(0.74, 1.26)	39.6	1.23	(0.66, 1.34)	1.3
26	RT3_5	-3.508	0.294	9.68	(0.74, 1.26)	26.0	0.96	(0.69, 1.31)	-0.2
27	RT3_6	-3.036	0.277	9.34	(0.75, 1.25)	25.7	1.53	(0.71, 1.29)	3.1
28	RT3_7	-1.942	0.263	0.79	(0.75, 1.25)	-1.7	1.11	(0.72, 1.28)	0.8
29	RT3_8	-2.877	0.267	0.98	(0.75, 1.25)	-0.1	1.20	(0.72, 1.28)	1.4
30	RT3_9	-1.723	0.261	0.91	(0.75, 1.25)	-0.7	0.99	(0.73, 1.27)	0.0
31	RT3_10	-0.389	0.273	0.48	(0.75, 1.25)	-5.2	0.82	(0.72, 1.28)	-1.3
32	RT3_11	1.016	0.307	1.02	(0.76, 1.25)	0.2	1.02	(0.67, 1.33)	0.2
33	RT3_12	2.442	0.370	8.45	(0.76, 1.25)	24.9	1.39	(0.58, 1.42)	1.7
34	RT4_1	-1.321	0.280	0.93	(0.74, 1.26)	-0.5	0.92	(0.70, 1.30)	-0.5
35	RT4_2	-0.871	0.283	0.48	(0.74, 1.26)	-4.8	0.70	(0.70, 1.30)	-2.2
36	RT4_3	-0.342	0.287	0.50	(0.74, 1.26)	-4.7	0.77	(0.70, 1.30)	-1.6
37	RT4_4	-0.058	0.288	1.03	(0.74, 1.26)	0.3	0.75	(0.70, 1.30)	-1.7
38	RT4_5	0.129	0.287	0.37	(0.75, 1.25)	-6.5	0.66	(0.70, 1.30)	-2.5
39	RT4_6	1.013	0.317	0.54	(0.75, 1.25)	-4.3	1.03	(0.65, 1.35)	0.2
40	RT4_7	0.550	0.299	1.71	(0.75, 1.25)	4.6	0.94	(0.68, 1.32)	-0.3
41	RT4_8	3.062	0.427	0.80	(0.75, 1.25)	-1.6	1.34	(0.52, 1.48)	1.3
42	RT4_9	3.879	0.493	1.09	(0.75, 1.25)	0.7	1.09	(0.44, 1.56)	0.4
43	RT5_1	0.435	0.301	0.46	(0.74, 1.26)	-5.1	0.86	(0.68, 1.32)	-0.9
44	RT5_2	1.929	0.369	0.47	(0.74, 1.26)	-5.0	0.91	(0.57, 1.43)	-0.3
45	RT5_3	0.815	0.309	0.87	(0.75, 1.25)	-1.0	0.86	(0.67, 1.33)	-0.8
46	RT5_4	2.425	0.386	0.51	(0.75, 1.25)	-4.6	1.05	(0.56, 1.44)	0.3
47	RT5_5	5.042	0.612	2.59	(0.75, 1.25)	8.7	1.07	(0.22, 1.78)	0.3
48	RT5_6	5.042	0.612	2.59	(0.75, 1.25)	8.7	1.07	(0.22, 1.78)	0.3
49	RT5_7	4.394	0.541	1.52	(0.75, 1.25)	3.5	1.19	(0.36, 1.64)	0.7
50	RT6_1	-6.716	0.468	0.90	(0.74, 1.26)	-0.7	0.94	(0.44, 1.56)	-0.1
51	RT6_2	-4.805	0.332	1.34	(0.74, 1.26)	2.4	1.03	(0.64, 1.36)	0.2
52	RT6_3	-4.805	0.332	0.49	(0.74, 1.26)	-4.8	0.79	(0.64, 1.36)	-1.2
53	RT6_4	-4.118	0.305	0.33	(0.75, 1.25)	-7.1	0.64	(0.68, 1.32)	-2.5
54	RT6_5	-2.764	0.267	0.85	(0.75, 1.25)	-1.2	0.82	(0.72, 1.28)	-1.3
55	RT6_6	-1.330	0.266	0.66	(0.75, 1.25)	-3.1	0.92	(0.73, 1.27)	-0.6
56	RT6_7	-0.470	0.273	0.91	(0.75, 1.25)	-0.7	1.15	(0.72, 1.28)	1.0
57	RT6_8	-0.279	0.273	0.63	(0.75, 1.25)	-3.3	0.97	(0.72, 1.28)	-0.1
58	RT6_9	0.173	0.281	1.57	(0.75, 1.25)	3.9	1.08	(0.71, 1.29)	0.6
59	RT6_10	2.734	0.389	0.84	(0.75, 1.25)	-1.3	1.06	(0.56, 1.44)	0.3
60	RT6_11	2.185	0.357	0.62	(0.76, 1.25)	-3.5	0.86	(0.60, 1.40)	-0.6
61	RT7_1	-5.158	0.347	0.47	(0.75, 1.25)	-5.3	0.92	(0.61, 1.39)	-0.4
62	RT7_2	-4.310	0.311	2.10	(0.75, 1.25)	6.7	1.14	(0.67, 1.33)	0.9

63	RT7_3	-3.604	0.288	0.42	(0.75, 1.25)	-5.9	0.61	(0.70, 1.30)	-2.9
64	RT7_4	-2.988	0.271	0.48	(0.75, 1.25)	-5.2	0.73	(0.72, 1.28)	-2.0
65	RT7_5	-1.290	0.266	0.55	(0.75, 1.25)	-4.3	0.83	(0.72, 1.28)	-1.2
66	RT7_6	-1.064	0.266	0.52	(0.75, 1.25)	-4.6	0.81	(0.73, 1.27)	-1.4
67	RT7_7	-1.134	0.266	0.68	(0.75, 1.25)	-2.8	0.99	(0.73, 1.27)	-0.0
68	RT7_8	-1.752	0.262	0.57	(0.75, 1.25)	-4.0	0.80	(0.73, 1.27)	-1.5
69	RT7_9	-0.642	0.269	0.60	(0.75, 1.25)	-3.7	0.96	(0.72, 1.28)	-0.2
70	RT7_10	-1.820	0.261	0.65	(0.75, 1.25)	-3.1	0.88	(0.72, 1.28)	-0.9
71	RT7_11	-0.785	0.268	0.54	(0.75, 1.25)	-4.5	0.89	(0.72, 1.28)	-0.8
72	RT7_12	1.830	0.341	0.85	(0.76, 1.25)	-1.2	1.26	(0.62, 1.38)	1.3
73	RT7_13	1.830	0.341	0.57	(0.76, 1.25)	-4.0	0.89	(0.62, 1.38)	-0.5
74	RT8_1	-1.350	0.271	0.68	(0.75, 1.25)	-2.8	0.96	(0.72, 1.28)	-0.2
75	RT8_2	-0.060	0.285	1.24	(0.75, 1.25)	1.8	0.94	(0.70, 1.30)	-0.4
76	RT8_3	-0.060	0.285	0.52	(0.75, 1.25)	-4.5	0.93	(0.70, 1.30)	-0.4
77	RT8_4	0.815	0.306	0.58	(0.75, 1.25)	-3.8	0.93	(0.67, 1.33)	-0.4
78	RT8_5	0.958	0.305	0.43	(0.75, 1.25)	-5.8	0.76	(0.67, 1.33)	-1.5
79	RT8_6	1.736	0.336	0.56	(0.75, 1.25)	-4.1	0.85	(0.62, 1.38)	-0.8
80	RT8_7	1.627	0.331	0.60	(0.75, 1.25)	-3.6	0.86	(0.63, 1.37)	-0.7
81	RT8_8	1.222	0.314	0.54	(0.75, 1.25)	-4.3	0.79	(0.65, 1.35)	-1.3
82	RT8_9	1.847	0.341	0.53	(0.75, 1.25)	-4.5	0.80	(0.62, 1.38)	-1.0
83	RT8_10	2.203	0.358	0.58	(0.75, 1.25)	-3.9	0.72	(0.59, 1.41)	-1.4
84	RT8_11	2.450	0.369	1.08	(0.75, 1.25)	0.7	0.96	(0.58, 1.42)	-0.1
85	RT8_12	1.956	0.345	0.21	(0.75, 1.25)	-9.7	0.57	(0.61, 1.39)	-2.5
86	RT8_13	1.731	0.335	0.56	(0.75, 1.25)	-4.1	0.88	(0.62, 1.38)	-0.6
87	RT9_1	0.608	0.301	2.83	(0.75, 1.25)	9.8	0.85	(0.68, 1.32)	-0.9
88	RT9_2	0.884	0.311	3.64	(0.75, 1.25)	12.7	0.80	(0.66, 1.34)	-1.2
89	RT9_3	1.202	0.321	0.46	(0.75, 1.25)	-5.3	0.78	(0.64, 1.36)	-1.2
90	RT9_4	2.237	0.369	0.18	(0.75, 1.25)	-10.3	0.55	(0.58, 1.42)	-2.4
91	RT9_5	1.860	0.351	0.23	(0.75, 1.25)	-9.0	0.61	(0.60, 1.40)	-2.1
92	RT9_6	1.982	0.357	0.17	(0.75, 1.25)	-10.5	0.49	(0.59, 1.41)	-3.0
93	RT9_7	2.099	0.361	0.55	(0.75, 1.25)	-4.3	0.73	(0.58, 1.42)	-1.3
94	RT9_8	1.737	0.344	0.48	(0.75, 1.25)	-5.1	0.89	(0.61, 1.39)	-0.5
95	RT9_9	2.362	0.374	7.69	(0.75, 1.25)	23.0	0.87	(0.57, 1.43)	-0.5
96	RT9_10	3.696	0.469	0.37	(0.75, 1.25)	-6.6	0.96	(0.47, 1.53)	-0.1
97	RT9_11	4.161	0.511	0.19	(0.75, 1.25)	-9.9	1.00	(0.40, 1.60)	0.1
98	RT9_12	3.696	0.469	62.47	(0.75, 1.25)	70.1	1.34	(0.47, 1.53)	1.2
99	RT9_13	1.298	0.319	2.74	(0.75, 1.25)	9.5	0.63	(0.65, 1.35)	-2.3
100	RT9_14	2.061	0.352	0.23	(0.75, 1.25)	-9.1	0.64	(0.60, 1.40)	-2.0
101	RT9_15	4.202	0.506	0.20	(0.75, 1.25)	-9.9	0.87	(0.40, 1.60)	-0.3
102	RT9_16	3.545	0.447	0.12	(0.75, 1.25)	-12.0	0.55	(0.49, 1.51)	-2.0
103	RT9_17	3.963	0.484	0.16	(0.75, 1.25)	-10.7	0.86	(0.43, 1.57)	-0.4
104	RT9_18	5.494	0.668	0.26	(0.75, 1.25)	-8.6	1.43	(0.06, 1.94)	1.0
105	SM1_1	-5.271	0.354	1.82	(0.75, 1.25)	5.2	1.04	(0.60, 1.40)	0.2
106	SM1_2	-4.493	0.320	0.77	(0.75, 1.25)	-1.9	0.85	(0.65, 1.35)	-0.9
107	SM1_3	-3.754	0.295	0.66	(0.75, 1.25)	-3.1	0.85	(0.69, 1.31)	-1.0
108	SM1_4	-2.532	0.265	0.62	(0.75, 1.25)	-3.4	0.96	(0.72, 1.28)	-0.2
109	SM1_5	-3.287	0.278	1.16	(0.75, 1.25)	1.2	1.12	(0.71, 1.29)	0.8
110	SM1_6	-2.565	0.263	1.08	(0.75, 1.25)	0.7	1.27	(0.72, 1.28)	1.8
111	SM1_7	-0.785	0.268	0.57	(0.75, 1.25)	-4.0	0.82	(0.72, 1.28)	-1.4
112	SM1_8	-0.926	0.267	0.41	(0.76, 1.25)	-6.2	0.70	(0.73, 1.27)	-2.3
113	SM1_9	-0.499	0.271	1.28	(0.76, 1.25)	2.1	0.98	(0.72, 1.28)	-0.1
114	SM1_10	0.251	0.282	0.96	(0.76, 1.25)	-0.3	1.11	(0.70, 1.30)	0.7
115	SM1_11	1.609	0.332	1.08	(0.76, 1.25)	0.7	1.30	(0.63, 1.37)	1.5
116	SM1_12	2.441	0.370	0.93	(0.76, 1.25)	-0.5	1.11	(0.58, 1.42)	0.6
117	SM1_13	1.718	0.336	0.75	(0.76, 1.25)	-2.2	1.02	(0.62, 1.38)	0.1
118	SM1_14	1.609	0.332	1.13	(0.76, 1.25)	1.0	1.03	(0.63, 1.37)	0.2
119	SM2_1	-0.861	0.273	0.93	(0.75, 1.25)	-0.5	0.95	(0.72, 1.28)	-0.3
120	SM2_2	-0.297	0.275	0.35	(0.75, 1.25)	-6.9	0.62	(0.72, 1.28)	-3.0
121	SM2_3	1.424	0.328	0.43	(0.75, 1.25)	-5.7	0.94	(0.63, 1.37)	-0.3
122	SM2_4	1.026	0.311	0.58	(0.75, 1.25)	-3.9	0.84	(0.66, 1.34)	-1.0
123	SM2_5	0.825	0.301	0.71	(0.75, 1.25)	-2.6	0.93	(0.68, 1.32)	-0.4
124	SM2_6	1.826	0.341	0.44	(0.75, 1.25)	-5.7	1.00	(0.62, 1.38)	0.1
125	SM2_7	2.864	0.395	0.63	(0.75, 1.25)	-3.3	1.15	(0.55, 1.45)	0.7
126	SM2_8	3.019	0.406	0.43	(0.75, 1.25)	-5.8	0.94	(0.54, 1.46)	-0.2
127	SM2_9	3.019	0.406	0.25	(0.75, 1.25)	-8.8	0.77	(0.54, 1.46)	-1.0
128	SM2_10	3.745	0.464	0.76	(0.75, 1.25)	-2.1	1.24	(0.47, 1.53)	0.9
129	SM2_11	4.464	0.531	1.56	(0.75, 1.25)	3.8	1.26	(0.35, 1.65)	0.8
130	SM2_12	4.464	0.531	0.23	(0.75, 1.25)	-9.1	1.02	(0.35, 1.65)	0.2
131	SM3_1	2.918	0.448	2.39	(0.74, 1.26)	7.6	1.34	(0.50, 1.50)	1.3
132	SM3_2	5.221	0.691	20.54	(0.74, 1.26)	39.1	1.31	(0.10, 1.90)	0.8
133	SM3_3	5.766	0.798	29.90	(0.74, 1.26)	47.3	1.09	(0.00, 2.14)	0.3
134	SM3_4	4.792	0.630	13.42	(0.74, 1.26)	30.9	1.35	(0.23, 1.77)	0.9
135	SM3_5	5.221	0.691	17.40	(0.74, 1.26)	35.8	1.18	(0.10, 1.90)	0.5
136	LK1_1	-4.121	0.305	1.19	(0.75, 1.25)	1.5	1.43	(0.68, 1.32)	2.4
137	LK1_2	-1.798	0.264	1.22	(0.75, 1.25)	1.7	1.13	(0.73, 1.27)	1.0
138	LK1_3	-2.623	0.265	0.56	(0.75, 1.25)	-4.1	0.91	(0.72, 1.28)	-0.6

139	LK1_4	-2.346	0.263	0.43	(0.75, 1.25)	-5.8	0.68	(0.72, 1.28)	-2.5
140	LK1_5	-2.005	0.263	0.41	(0.75, 1.25)	-6.0	0.62	(0.73, 1.27)	-3.1
141	LK1_6	-1.604	0.264	0.66	(0.75, 1.25)	-3.0	0.72	(0.73, 1.27)	-2.2
142	LK1_7	-0.902	0.270	0.56	(0.75, 1.25)	-4.1	0.83	(0.73, 1.27)	-1.3
143	LK1_8	-0.010	0.281	1.43	(0.75, 1.25)	3.1	1.21	(0.71, 1.29)	1.4
144	LK1_9	-0.391	0.275	0.44	(0.75, 1.25)	-5.7	0.82	(0.72, 1.28)	-1.3
145	LK1_10	-0.019	0.280	0.41	(0.75, 1.25)	-6.1	0.79	(0.71, 1.29)	-1.5
146	LK1_11	0.576	0.291	0.63	(0.75, 1.25)	-3.4	1.06	(0.69, 1.31)	0.4
147	LK1_12	0.096	0.279	0.50	(0.75, 1.25)	-4.8	0.93	(0.71, 1.29)	-0.4
148	LK1_13	0.252	0.282	1.19	(0.75, 1.25)	1.5	1.30	(0.70, 1.30)	1.9
149	LK1_14	1.723	0.337	0.87	(0.75, 1.25)	-1.0	1.16	(0.62, 1.38)	0.8
150	LK1_15	0.922	0.303	1.36	(0.76, 1.25)	2.6	1.01	(0.67, 1.33)	0.1
151	LK1_16	1.830	0.341	0.94	(0.76, 1.25)	-0.4	1.18	(0.62, 1.38)	0.9
152	LK2_1	0.271	0.293	3.17	(0.75, 1.25)	10.9	1.29	(0.69, 1.31)	1.7
153	LK2_2	0.357	0.295	1.05	(0.75, 1.25)	0.5	1.07	(0.69, 1.31)	0.5
154	LK2_3	1.104	0.323	0.77	(0.75, 1.25)	-1.9	1.23	(0.64, 1.36)	1.2
155	LK2_4	-0.907	0.275	0.48	(0.75, 1.25)	-5.0	0.80	(0.72, 1.28)	-1.4
156	LK2_5	0.552	0.297	0.45	(0.75, 1.25)	-5.4	0.87	(0.68, 1.32)	-0.8
157	LK2_6	1.009	0.314	0.46	(0.75, 1.25)	-5.2	0.92	(0.66, 1.34)	-0.4
158	LK2_7	1.719	0.338	0.56	(0.75, 1.25)	-4.1	0.99	(0.62, 1.38)	0.0
159	LK2_8	2.067	0.353	0.46	(0.75, 1.25)	-5.3	0.86	(0.60, 1.40)	-0.6
160	LK2_9	2.318	0.366	0.39	(0.75, 1.25)	-6.4	0.93	(0.59, 1.41)	-0.3
161	LK2_10	1.033	0.306	0.48	(0.75, 1.25)	-5.2	0.85	(0.67, 1.33)	-0.9
162	LK2_11	2.081	0.352	0.36	(0.75, 1.25)	-6.9	0.80	(0.60, 1.40)	-1.0
163	LK2_12	3.550	0.446	1.06	(0.75, 1.25)	0.5	1.08	(0.49, 1.51)	0.4
164	PK1_1	-3.560	0.292	12.27	(0.75, 1.25)	30.4	1.73	(0.70, 1.30)	3.9
165	PK1_2	-3.564	0.291	2.20	(0.75, 1.25)	7.1	1.50	(0.70, 1.30)	2.8
166	PK1_3	-4.289	0.315	3.97	(0.75, 1.25)	13.7	1.52	(0.67, 1.33)	2.7
167	PK1_4	-2.249	0.264	0.99	(0.75, 1.25)	-0.1	1.13	(0.72, 1.28)	0.9
168	PK1_5	-1.982	0.263	2.45	(0.75, 1.25)	8.3	1.36	(0.72, 1.28)	2.3
169	PK1_6	-1.432	0.265	0.98	(0.75, 1.25)	-0.1	1.15	(0.72, 1.28)	1.1
170	PK1_7	-1.570	0.264	0.71	(0.75, 1.25)	-2.5	0.90	(0.72, 1.28)	-0.7
171	PK1_8	-1.222	0.267	1.72	(0.75, 1.25)	4.7	1.07	(0.72, 1.28)	0.5
172	PK1_9	-0.508	0.272	0.81	(0.75, 1.25)	-1.6	1.06	(0.72, 1.28)	0.4
173	PK1_10	0.013	0.278	0.78	(0.75, 1.25)	-1.8	0.99	(0.71, 1.29)	-0.0
174	PK1_11	0.090	0.280	1.16	(0.75, 1.25)	1.2	1.08	(0.71, 1.29)	0.6
175	PK1_12	1.721	0.337	1.05	(0.75, 1.25)	0.4	1.42	(0.62, 1.38)	2.0
176	PK1_13	1.833	0.342	0.51	(0.75, 1.25)	-4.8	1.01	(0.62, 1.38)	0.1
177	PK1_14	3.393	0.440	0.68	(0.75, 1.25)	-2.8	1.02	(0.49, 1.51)	0.2
178	PK1_15	3.043	0.411	0.53	(0.75, 1.25)	-4.5	0.88	(0.53, 1.47)	-0.5
179	PK1_16	3.393	0.440	1.64	(0.75, 1.25)	4.3	1.53	(0.49, 1.51)	1.8
180	PK1_17	4.035	0.503	1.17	(0.75, 1.25)	1.3	1.49	(0.40, 1.60)	1.5
181	PK1_18	5.856	0.787	0.19	(0.75, 1.25)	-9.9	1.01	(0.00, 2.18)	0.2
182	PK1_19	3.358	0.431	0.89	(0.75, 1.25)	-0.9	1.32	(0.51, 1.49)	1.2
183	PK1_20	4.464	0.531	1.49	(0.75, 1.25)	3.4	1.23	(0.35, 1.65)	0.8

An asterisk next to a parameter estimate indicates that it is constrained
Separation Reliability = 0.983
Chi-square test of parameter equality = 10090.48, df = 183, Sig Level = 0.000
^ Quick standard errors have been used

```
================================================================================
ConQuest: Generalised Item Response Modelling Software     Wed Mar 30 14:46 2016
MAP OF WLE ESTIMATES AND RESPONSE MODEL PARAMETER ESTIMATES
================================================================================
                                             Terms in the Model (excl Step terms)

                                                               +items
---------------------------------------------------------------------------------------
                                              |                                       |
                                              |                                       |
  10                                          |                                       |
                                              |                                       |
   9                                          |                                       |
                                              |                                       |
                                              |                                       |
   8                                      XXXX|                                       |
                                              |29 87 89 90 125 128 131 171            |
   7                                          |                                       |
                                              |53 56 88 124 126 127 130 133           |
   6                                          |                                       |
                                              |83 92 132 172                          |
                                              |50 57 86 91 123 160 162 169           |
   5                                          |51 52 54 55 82 84 85 122 161 170       |
                                              |119                                    |
   4                           XXXXXXXXXXXXXXX|44 48 81 121 158 159                   |
                                       XXXXXXX|16 45 46 80 166 168                    |
                                   XXXXXXXXXXX|15 27 28 41 43 79 120 142 144          |
   3                               XXXXXXXXXXX|25 30 42 47 49 153 157 165 167         |
                               XXXXXXXXXXXXXXX|13 14 17 40 77 154 156                 |
   2                        XXXXXXXXXXXXXXXXXX|24 37 39 72 74 78 116 118 143          |
                                       XXXXXXX|12 23 26 69 75 117 152 164             |
                                   XXXXXXXXXXX|33 34 35 36 38 68 71 73 76 140         |
   1                           XXXXXXXXXXXXXXX|141 155                                |
                            XXXXXXXXXXXXXXXXXX|10 11 22 102 139 149                   |
   0                        XXXXXXXXXXXXXXXXXX|32 67 115                              |
                 XXXXXXXXXXXXXXXXXXXXXXXXXXXXX|31 70 151                              |
  -1                 XXXXXXXXXXXXXXXXXXXXXXXXX|114 163                                |
                 XXXXXXXXXXXXXXXXXXXXXXXXXXXXX|9 18 20 66 113 137 138 147 148         |
                        XXXXXXXXXXXXXXXXXXXXXX|21 150                                 |
  -2  XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|8 64 101 112                           |
                     XXXXXXXXXXXXXXXXXXXXXXXXX|19 63 65 136                           |
  -3                               XXXXXXXXXXX|108 110 135                            |
                            XXXXXXXXXXXXXXXXXX|61 62 99 106 109 111 146               |
                                   XXXXXXXXXXX|6 7 59 134                             |
  -4                        XXXXXXXXXXXXXXXXXX|60 98 100 107                          |
                            XXXXXXXXXXXXXXXXXX|145                                    |
  -5                    XXXXXXXXXXXXXXXXXXXXXX|96 97 104 105                          |
                                              |5                                      |
  -6         XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|3 94                                   |
                                       XXXXXXX|2 58                                   |
                                          XXXX|1 4                                    |
  -7                                      XXXX|95 103                                 |
                                              |                                       |
  -8                                          |                                       |
                                          XXXX|93                                     |
                                          XXXX|                                       |
  -9                                          |                                       |
                                              |                                       |
  -10                                         |                                       |
                                              |                                       |
  -11                                         |                                       |
                                              |                                       |
                                              |                                       |
  -12                                         |                                       |
                                              |                                       |
  -13                                         |                                       |
                                              |                                       |
                                              |                                       |
=======================================================================================
Each 'X' represents   0.3 cases

=======================================================================================
```

APPENDIX N: CONQUEST OUTPUT FILES – WRITING DRAFT INSTRUMENT

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============================================================================
ConQuest: Generalised Item Response Modelling Software     Wed Mar 30 14:46 2016
SUMMARY OF THE ESTIMATION
============================================================================

Estimation method was: Gauss-Hermite Quadrature with 15 nodes
Assumed population distribution was: Gaussian
Constraint was: CASES
The Data File: writwith3s.dat
The format:  responses 1-172
The regression model:
Grouping Variables:
The item model: items
Slopes are fixed
Sample size: 298
Final Deviance:    10185.37695
Total number of estimated parameters: 172
The number of iterations: 38
Termination criteria:  Max iterations=1000, Parameter Change= 0.00010
                       Deviance Change= 0.00010
Iterations terminated because the convergence criteria were reached
At termination the solution was not the best attained solution
The reported results are for the earlier better solution
Rerunning this analysis using the current estimates as initial values is strongly advised.
Random number generation seed:    1.00000
Number of nodes used when drawing PVs: 2000
Number of nodes used when computing fit: 200
Number of plausible values to draw: 5
Maximum number of iterations without a deviance improvement: 100
Maximum number of Newton steps in M-step: 10
Value for obtaining finite MLEs for zero/perfects:    0.30000

============================================================================
```

ConQuest: Generalised Item Response Modelling Software   Wed Mar 30 14:46 2016
TABLES OF RESPONSE MODEL PARAMETER ESTIMATES

TERM 1: items

VARIABLES				UNWEIGHTED FIT			WEIGHTED FIT		
	item	ESTIMATE	ERROR^	MNSQ	CI	T	MNSQ	CI	T
1	CI1_1	-6.684	0.436	11.69	(0.74, 1.26)	29.0	1.40	(0.49, 1.51)	1.5
2	CI1_2	-6.316	0.397	53.72	(0.74, 1.26)	63.4	1.30	(0.55, 1.45)	1.3
3	CI1_3	-6.007	0.370	38.47	(0.74, 1.26)	54.6	0.89	(0.59, 1.41)	-0.5
4	CI1_4	-6.643	0.423	5.34	(0.75, 1.25)	17.6	1.32	(0.51, 1.49)	1.2
5	CI1_5	-5.485	0.333	22.17	(0.75, 1.25)	42.4	0.97	(0.63, 1.37)	-0.1
6	CI1_6	-3.859	0.288	9.89	(0.75, 1.25)	26.9	1.07	(0.66, 1.34)	0.4
7	CI1_7	-3.859	0.288	10.05	(0.75, 1.25)	27.2	1.07	(0.66, 1.34)	0.5
8	CI1_8	-1.940	0.269	1.97	(0.75, 1.25)	6.0	1.02	(0.74, 1.26)	0.2
9	CI1_9	-1.369	0.273	0.88	(0.75, 1.25)	-1.0	1.04	(0.74, 1.26)	0.3
10	CI1_10	0.554	0.303	0.85	(0.75, 1.25)	-1.2	1.12	(0.66, 1.34)	0.7
11	CI1_11	0.202	0.293	0.63	(0.75, 1.25)	-3.4	0.98	(0.68, 1.32)	-0.1
12	CI1_12	1.431	0.333	0.79	(0.75, 1.25)	-1.8	1.02	(0.62, 1.38)	0.2
13	CI1_13	2.544	0.378	0.54	(0.75, 1.25)	-4.4	0.95	(0.59, 1.41)	-0.2
14	CI1_14	2.405	0.371	0.43	(0.75, 1.25)	-5.8	0.76	(0.60, 1.40)	-1.2
15	CI1_15	3.340	0.429	0.50	(0.75, 1.25)	-4.9	1.10	(0.55, 1.45)	0.5
16	CI1_16	3.577	0.440	0.26	(0.76, 1.25)	-8.6	1.07	(0.55, 1.45)	0.4
17	CI1_17	2.341	0.362	1.26	(0.76, 1.25)	2.0	0.99	(0.60, 1.40)	0.0
18	CI2_1	-1.196	0.285	2.24	(0.75, 1.25)	7.2	1.42	(0.72, 1.28)	2.7
19	CI2_2	-2.367	0.278	1.83	(0.75, 1.25)	5.2	1.05	(0.72, 1.28)	0.4
20	CI2_3	-1.430	0.279	1.51	(0.75, 1.25)	3.5	1.27	(0.73, 1.27)	1.8
21	CI2_4	-1.501	0.275	0.77	(0.75, 1.25)	-1.9	1.17	(0.74, 1.26)	1.2
22	CI2_5	0.220	0.291	0.77	(0.75, 1.25)	-2.0	1.16	(0.69, 1.31)	1.0
23	CI2_6	1.557	0.335	0.48	(0.75, 1.25)	-5.1	0.79	(0.62, 1.38)	-1.1
24	CI2_7	1.978	0.347	0.73	(0.75, 1.25)	-2.4	1.05	(0.61, 1.39)	0.3
25	CI2_8	2.906	0.390	0.74	(0.75, 1.25)	-2.2	1.03	(0.59, 1.41)	0.2
26	CI3_1	1.698	0.367	0.72	(0.74, 1.26)	-2.3	1.04	(0.60, 1.40)	0.3
27	CI3_2	3.272	0.447	0.60	(0.74, 1.26)	-3.5	0.97	(0.53, 1.47)	-0.1
28	CI3_3	3.089	0.432	0.81	(0.74, 1.26)	-1.5	1.34	(0.55, 1.45)	1.4
29	CI3_4	7.438	1.187	1.40	(0.74, 1.26)	2.8	2.20	(0.00, 2.94)	1.2
30	CI3_5	2.975	0.415	1.20	(0.74, 1.26)	1.5	1.25	(0.57, 1.43)	1.1
31	CI4_1	-0.374	0.291	1.89	(0.75, 1.25)	5.5	1.34	(0.70, 1.30)	2.0
32	CI4_2	-0.158	0.291	0.47	(0.75, 1.25)	-5.2	0.86	(0.70, 1.30)	-0.9
33	CI4_3	1.019	0.322	0.53	(0.75, 1.25)	-4.4	0.90	(0.63, 1.37)	-0.5
34	CI4_4	1.123	0.326	0.80	(0.75, 1.25)	-1.7	0.96	(0.63, 1.37)	-0.2
35	CI4_5	1.338	0.334	0.93	(0.75, 1.25)	-0.6	1.28	(0.61, 1.39)	1.4
36	CI4_6	1.361	0.332	0.72	(0.75, 1.25)	-2.4	1.17	(0.62, 1.38)	0.9
37	CI4_7	1.899	0.349	0.49	(0.75, 1.25)	-4.9	1.08	(0.61, 1.39)	0.4
38	CI4_8	1.007	0.314	0.63	(0.75, 1.25)	-3.4	0.85	(0.64, 1.36)	-0.8
39	CI4_9	1.974	0.347	0.66	(0.75, 1.25)	-3.1	1.26	(0.61, 1.39)	1.3
40	CI4_10	2.479	0.368	0.33	(0.75, 1.25)	-7.3	0.92	(0.60, 1.40)	-0.3
41	CI4_11	3.395	0.425	1.40	(0.75, 1.25)	2.8	0.65	(0.56, 1.44)	-1.7
42	CI4_12	3.059	0.400	0.16	(0.75, 1.25)	-10.9	0.59	(0.59, 1.41)	-2.2
43	CI4_13	3.222	0.412	0.31	(0.75, 1.25)	-7.6	0.83	(0.58, 1.42)	-0.8
44	CI4_14	4.229	0.499	0.16	(0.75, 1.25)	-10.8	0.80	(0.44, 1.56)	-0.7
45	CI4_15	3.580	0.440	0.30	(0.75, 1.25)	-7.9	0.90	(0.55, 1.45)	-0.4
46	CI4_16	3.778	0.457	0.48	(0.75, 1.25)	-5.1	1.05	(0.52, 1.48)	0.3
47	CI4_17	2.904	0.390	0.29	(0.75, 1.25)	-7.9	1.03	(0.59, 1.41)	0.2
48	CI4_18	4.229	0.499	0.20	(0.75, 1.25)	-9.8	0.96	(0.44, 1.56)	-0.0
49	CI4_19	2.756	0.382	0.49	(0.75, 1.25)	-5.0	1.25	(0.60, 1.40)	1.2
50	CI4_20	5.484	0.647	0.11	(0.75, 1.25)	-12.2	0.97	(0.00, 2.03)	0.1
51	CI4_21	4.777	0.556	0.45	(0.75, 1.25)	-5.5	1.22	(0.27, 1.73)	0.7
52	CI4_22	4.777	0.556	0.38	(0.75, 1.25)	-6.4	1.38	(0.27, 1.73)	1.0
53	CI4_23	6.572	0.868	0.13	(0.75, 1.25)	-11.6	1.03	(0.00, 2.54)	0.3
54	CI4_24	5.103	0.594	0.29	(0.75, 1.25)	-7.9	1.22	(0.15, 1.85)	0.6
55	CI4_25	4.777	0.556	0.28	(0.75, 1.25)	-8.1	1.12	(0.27, 1.73)	0.4
56	CI4_26	6.572	0.868	0.11	(0.75, 1.25)	-12.4	1.00	(0.00, 2.54)	0.3
57	CI4_27	5.484	0.647	0.39	(0.75, 1.25)	-6.3	1.89	(0.00, 2.03)	1.5
58	CW1_1	-6.182	0.381	1.26	(0.74, 1.26)	1.9	1.46	(0.57, 1.43)	1.9
59	CW1_2	-3.960	0.294	0.52	(0.74, 1.26)	-4.4	0.91	(0.66, 1.34)	-0.5
60	CW1_3	-4.212	0.299	0.36	(0.74, 1.26)	-6.5	0.69	(0.66, 1.34)	-1.9
61	CW1_4	-3.536	0.287	0.41	(0.74, 1.26)	-5.9	0.62	(0.67, 1.33)	-2.5
62	CW1_5	-3.477	0.284	0.50	(0.75, 1.25)	-4.8	0.54	(0.67, 1.33)	-3.3
63	CW1_6	-2.403	0.268	0.37	(0.75, 1.25)	-6.6	0.66	(0.73, 1.27)	-2.7
64	CW1_7	-2.260	0.268	2.49	(0.75, 1.25)	8.4	0.91	(0.73, 1.27)	-0.6

65	CW1_8	-2.475	0.268	0.43	(0.75, 1.25)	-5.8	0.69	(0.72, 1.28)	-2.4
66	CW1_9	-1.386	0.275	1.27	(0.75, 1.25)	2.0	0.89	(0.74, 1.26)	-0.8
67	CW1_10	0.061	0.287	0.93	(0.75, 1.25)	-0.5	1.08	(0.70, 1.30)	0.6
68	CW1_11	1.238	0.323	0.39	(0.75, 1.25)	-6.4	0.82	(0.63, 1.37)	-0.9
69	CW1_12	1.559	0.335	0.53	(0.75, 1.25)	-4.5	0.86	(0.62, 1.38)	-0.7
70	CW2_1	-0.617	0.287	0.59	(0.75, 1.25)	-3.7	0.94	(0.71, 1.29)	-0.4
71	CW2_2	1.207	0.332	0.64	(0.75, 1.25)	-3.2	0.97	(0.62, 1.38)	-0.1
72	CW2_3	2.192	0.369	0.49	(0.75, 1.25)	-4.9	0.99	(0.59, 1.41)	0.0
73	CW2_4	1.288	0.326	0.54	(0.75, 1.25)	-4.3	0.98	(0.63, 1.37)	-0.0
74	CW2_5	2.208	0.358	0.55	(0.75, 1.25)	-4.2	1.03	(0.61, 1.39)	0.2
75	CW2_6	1.726	0.341	0.37	(0.75, 1.25)	-6.6	0.88	(0.61, 1.39)	-0.6
76	CW2_7	1.185	0.322	0.88	(0.75, 1.25)	-1.0	1.15	(0.63, 1.37)	0.8
77	CW2_8	2.606	0.375	0.43	(0.75, 1.25)	-5.7	1.02	(0.60, 1.40)	0.2
78	CW2_9	2.208	0.358	0.42	(0.75, 1.25)	-6.0	0.91	(0.61, 1.39)	-0.4
79	CW2_10	3.389	0.426	0.23	(0.75, 1.25)	-9.0	0.91	(0.56, 1.44)	-0.3
80	CW2_11	3.774	0.458	0.98	(0.75, 1.25)	-0.1	1.25	(0.52, 1.48)	1.0
81	CW2_12	3.990	0.477	0.30	(0.75, 1.25)	-7.8	1.11	(0.49, 1.51)	0.5
82	CW2_13	4.774	0.556	0.33	(0.75, 1.25)	-7.2	1.09	(0.28, 1.72)	0.3
83	CW2_14	5.948	0.728	0.16	(0.75, 1.25)	-10.8	1.16	(0.00, 2.26)	0.4
84	CW2_15	5.101	0.594	0.21	(0.75, 1.25)	-9.5	1.04	(0.15, 1.85)	0.2
85	CW2_16	4.774	0.556	0.18	(0.75, 1.25)	-10.3	0.94	(0.28, 1.72)	-0.0
86	CW2_17	5.482	0.647	0.53	(0.75, 1.25)	-4.5	1.45	(0.00, 2.03)	0.9
87	CW2_18	7.556	1.163	0.02	(0.75, 1.25)	-17.6	0.73	(0.00, 2.97)	0.0
88	CW2_19	6.571	0.868	0.48	(0.75, 1.25)	-5.0	1.13	(0.00, 2.54)	0.4
89	CW2_20	7.556	1.163	0.02	(0.75, 1.25)	-17.6	0.73	(0.00, 2.97)	0.0
90	CW2_21	7.556	1.163	0.02	(0.75, 1.25)	-17.6	0.73	(0.00, 2.97)	0.0
91	CW2_22	5.482	0.647	0.29	(0.75, 1.25)	-7.9	1.18	(0.00, 2.03)	0.5
92	CW2_23	5.948	0.728	0.31	(0.75, 1.25)	-7.7	1.15	(0.00, 2.26)	0.4
93	WS1_1	-8.145	0.657	13.74	(0.75, 1.25)	33.0	1.11	(0.01, 1.99)	0.4
94	WS1_2	-5.656	0.340	2.75	(0.75, 1.25)	9.5	1.33	(0.62, 1.38)	1.6
95	WS1_3	-6.928	0.457	5.89	(0.75, 1.25)	19.1	1.11	(0.43, 1.57)	0.4
96	WS1_4	-5.208	0.318	4.56	(0.75, 1.25)	15.6	1.70	(0.65, 1.35)	3.3
97	WS1_5	-5.005	0.310	31.92	(0.75, 1.25)	51.6	1.52	(0.66, 1.34)	2.6
98	WS1_6	-4.268	0.293	1.72	(0.75, 1.25)	4.8	1.14	(0.67, 1.33)	0.8
99	WS1_7	-3.465	0.277	1.20	(0.75, 1.25)	1.5	0.98	(0.68, 1.32)	-0.1
100	WS1_8	-4.194	0.290	0.76	(0.75, 1.25)	-2.1	0.94	(0.67, 1.33)	-0.3
101	WS1_9	-2.166	0.265	9.08	(0.75, 1.25)	26.0	1.65	(0.73, 1.27)	4.0
102	WS1_10	0.240	0.291	1.89	(0.75, 1.25)	5.7	1.55	(0.68, 1.32)	3.0
103	WS2_1	-6.924	0.457	10.23	(0.75, 1.25)	27.5	1.27	(0.44, 1.56)	1.0
104	WS2_2	-5.092	0.315	2.60	(0.75, 1.25)	8.8	1.34	(0.65, 1.35)	1.8
105	WS2_3	-4.991	0.312	3.27	(0.75, 1.25)	11.4	1.13	(0.66, 1.34)	0.8
106	WS2_4	-3.420	0.281	1.68	(0.75, 1.25)	4.5	1.09	(0.68, 1.32)	0.6
107	WS2_5	-4.081	0.292	1.33	(0.75, 1.25)	2.4	0.94	(0.67, 1.33)	-0.3
108	WS2_6	-2.837	0.270	0.90	(0.75, 1.25)	-0.7	1.13	(0.71, 1.29)	0.8
109	WS2_7	-3.364	0.278	3.15	(0.75, 1.25)	11.0	0.98	(0.68, 1.32)	-0.1
110	WS2_8	-2.837	0.270	0.73	(0.75, 1.25)	-2.3	0.85	(0.71, 1.29)	-1.0
111	WS2_9	-3.234	0.273	2.78	(0.75, 1.25)	9.7	0.88	(0.69, 1.31)	-0.7
112	WS2_10	-2.088	0.267	1.48	(0.75, 1.25)	3.4	0.88	(0.74, 1.26)	-0.9
113	WS2_11	-1.293	0.274	1.20	(0.75, 1.25)	1.5	1.02	(0.74, 1.26)	0.2
114	WS2_12	-0.840	0.278	1.51	(0.75, 1.25)	3.5	1.24	(0.73, 1.27)	1.6
115	WS2_13	0.027	0.288	0.96	(0.75, 1.25)	-0.3	1.21	(0.69, 1.31)	1.3
116	WS2_14	1.891	0.350	0.72	(0.75, 1.25)	-2.4	1.26	(0.60, 1.40)	1.2
117	WS2_15	1.431	0.333	0.63	(0.75, 1.25)	-3.4	1.25	(0.61, 1.39)	1.2
118	WS2_16	2.212	0.357	0.84	(0.76, 1.25)	-1.3	1.44	(0.61, 1.39)	2.0
119	WS2_17	4.486	0.525	2.15	(0.76, 1.25)	7.0	1.28	(0.37, 1.63)	0.9
120	WS2_18	3.218	0.412	1.62	(0.76, 1.25)	4.3	1.43	(0.58, 1.42)	1.8
121	WS2_19	4.227	0.500	1.65	(0.76, 1.25)	4.4	1.38	(0.44, 1.56)	1.3
122	WS2_20	4.778	0.555	0.19	(0.76, 1.24)	-10.2	0.98	(0.27, 1.73)	0.1
123	WS2_21	5.485	0.647	0.17	(0.76, 1.24)	-10.8	1.17	(0.00, 2.03)	0.5
124	WS2_22	6.573	0.868	0.15	(0.76, 1.24)	-11.2	1.05	(0.00, 2.54)	0.3
125	WS2_23	7.557	1.162	0.02	(0.76, 1.24)	-18.0	0.73	(0.00, 2.97)	0.0
126	WS2_24	6.573	0.868	0.54	(0.76, 1.24)	-4.4	1.13	(0.00, 2.54)	0.4
127	WS2_25	6.573	0.868	0.54	(0.76, 1.24)	-4.4	1.13	(0.00, 2.54)	0.4
128	WS2_26	7.557	1.162	0.02	(0.76, 1.24)	-18.0	0.73	(0.00, 2.97)	0.0
130	WS2_28	6.573	0.868	0.54	(0.76, 1.24)	-4.4	1.13	(0.00, 2.54)	0.4
131	WS2_29	7.557	1.162	0.02	(0.76, 1.24)	-18.0	0.73	(0.00, 2.97)	0.0
132	WS2_30	5.950	0.728	0.46	(0.76, 1.24)	-5.4	1.33	(0.00, 2.26)	0.7
133	WS2_31	6.573	0.868	0.54	(0.76, 1.24)	-4.4	1.13	(0.00, 2.54)	0.4
134	WS3_1	-3.891	0.291	3.61	(0.75, 1.25)	12.4	1.43	(0.67, 1.33)	2.3
135	WS3_2	-3.025	0.276	1.94	(0.75, 1.25)	5.8	1.26	(0.69, 1.31)	1.6
136	WS3_3	-2.398	0.269	0.82	(0.75, 1.25)	-1.4	1.04	(0.72, 1.28)	0.3
137	WS3_4	-1.463	0.274	0.79	(0.75, 1.25)	-1.8	1.18	(0.73, 1.27)	1.3
138	WS3_5	-1.388	0.275	1.24	(0.75, 1.25)	1.8	1.30	(0.73, 1.27)	2.1
139	WS3_6	0.311	0.292	0.91	(0.75, 1.25)	-0.7	0.96	(0.68, 1.32)	-0.2
140	WS3_7	1.037	0.315	0.57	(0.75, 1.25)	-4.1	0.79	(0.64, 1.36)	-1.2
141	WS3_8	1.343	0.327	0.50	(0.75, 1.25)	-4.9	0.74	(0.63, 1.37)	-1.5

142	WS3_9	3.345	0.428	2.04	(0.75, 1.25)	6.5	1.28 (0.55, 1.45)	1.2
143	WS3_10	2.027	0.353	0.53	(0.75, 1.25)	-4.5	1.13 (0.61, 1.39)	0.7
144	WS3_11	3.224	0.411	2.46	(0.76, 1.25)	8.4	1.28 (0.58, 1.42)	1.3
145	CS1_1	-4.672	0.303	0.51	(0.75, 1.25)	-4.7	0.70 (0.65, 1.35)	-1.9
146	CS1_2	-3.394	0.278	0.49	(0.75, 1.25)	-4.9	0.82 (0.68, 1.32)	-1.2
147	CS1_3	-1.337	0.277	1.03	(0.75, 1.25)	0.2	0.98 (0.73, 1.27)	-0.1
148	CS1_4	-1.106	0.280	0.57	(0.75, 1.25)	-3.9	0.84 (0.73, 1.27)	-1.2
149	CS1_5	0.497	0.309	1.34	(0.75, 1.25)	2.4	1.41 (0.66, 1.34)	2.1
150	CS1_6	-1.202	0.277	0.49	(0.75, 1.25)	-4.9	0.79 (0.73, 1.27)	-1.6
151	CS1_7	-0.416	0.286	1.03	(0.75, 1.25)	0.2	0.83 (0.71, 1.29)	-1.2
152	CS1_8	1.589	0.350	0.58	(0.75, 1.25)	-3.8	1.14 (0.60, 1.40)	0.7
153	CS1_9	2.927	0.409	0.23	(0.75, 1.25)	-9.1	0.87 (0.57, 1.43)	-0.6
154	CS1_10	2.393	0.373	0.41	(0.75, 1.25)	-6.1	1.14 (0.60, 1.40)	0.7
155	CS1_11	1.409	0.335	0.32	(0.75, 1.25)	-7.5	0.71 (0.62, 1.38)	-1.6
156	CS1_12	2.200	0.359	0.24	(0.75, 1.25)	-8.9	0.65 (0.61, 1.39)	-1.9
157	CS1_13	2.899	0.391	0.50	(0.75, 1.25)	-4.9	0.90 (0.59, 1.41)	-0.4
158	CS1_14	3.991	0.477	0.61	(0.75, 1.25)	-3.6	1.39 (0.49, 1.51)	1.4
159	CS1_15	3.991	0.477	0.40	(0.75, 1.25)	-6.2	1.22 (0.49, 1.51)	0.9
160	CS1_16	5.483	0.647	0.35	(0.75, 1.25)	-7.0	1.24 (0.00, 2.03)	0.6
161	CS1_17	4.775	0.556	0.25	(0.75, 1.25)	-8.7	1.15 (0.27, 1.73)	0.5
162	CS1_18	5.483	0.647	0.51	(0.75, 1.25)	-4.8	1.45 (0.00, 2.03)	0.9
163	CS2_1	-0.670	0.289	3.50	(0.75, 1.25)	12.1	1.57 (0.70, 1.30)	3.3
164	CS2_2	2.164	0.372	0.67	(0.75, 1.25)	-2.9	1.34 (0.59, 1.41)	1.5
165	CS2_3	2.819	0.397	0.45	(0.75, 1.25)	-5.5	0.99 (0.59, 1.41)	-0.0
166	CS2_4	3.521	0.445	0.59	(0.75, 1.25)	-3.8	0.94 (0.53, 1.47)	-0.2
167	CS2_5	2.897	0.391	0.52	(0.75, 1.25)	-4.6	1.05 (0.59, 1.41)	0.3
168	CS2_6	3.774	0.458	1.80	(0.75, 1.25)	5.2	1.05 (0.52, 1.48)	0.3
169	CS2_7	5.482	0.647	0.17	(0.75, 1.25)	-10.5	1.17 (0.00, 2.03)	0.5
170	CS2_8	5.101	0.594	0.16	(0.75, 1.25)	-10.8	1.11 (0.15, 1.85)	0.4
171	CS2_9	7.556	1.163	0.34	(0.75, 1.25)	-7.1	1.99 (0.00, 2.97)	1.1
172	CS2_10	5.948	0.728	0.37	(0.75, 1.25)	-6.6	1.25 (0.00, 2.26)	0.6

An asterisk next to a parameter estimate indicates that it is constrained
Separation Reliability = 0.983
Chi-square test of parameter equality = 12732.24, df = 171, Sig Level = 0.000
^ Quick standard errors have been used

```
Write
=================================================================================
ConQuest: Generalised Item Response Modelling Software     Wed Mar 30 14:19 2016
MAP OF WLE ESTIMATES AND RESPONSE MODEL PARAMETER ESTIMATES
=================================================================================
                                              Terms in the Model (excl Step terms)

                                                                +items
----------------------------------------------------------------------------------------
                                               |                                       |
  10                                           |                                       |
                                               |                                       |
                                               |                                       |
   9                                           |                                       |
                                               |                                       |
   8                                           |                                       |
                                               |                                       |
                                               |                                       |
   7                                           |                                       |
                                               |                                       |
   6                                           |181                                    |
                                               |104 133                                |
   5                                       XXXX|47 48 132 135                          |
                                           XXXX|134                                    |
                                       XXXXXXXX|49 101 129 130 183                     |
   4                                       XXXX|42 97 103 180                          |
                                       XXXXXXXX|96 98 102 128 163 177 179              |
   3                               XXXXXXXXXXXX|41 126 127 178 182                     |
                                       XXXXXXXX|59 125 131 160                         |
                                   XXXXXXXXXXXX|33 46 60 83 84 90 95 116 124 151       |
   2                   XXXXXXXXXXXXXXXXXXXXXXXX|21 44 72 73 79 82 85 86 91 92 93       |
                                       XXXXXXXX|20 80 94 100 115 117 118 121 149       |
   1                                       XXXX|32 39 78 81 89 99 122 150 154          |
           XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|19 40 45 77 87 88 123 146 153          |
                           XXXXXXXXXXXXXXXXXXXX|9 10 38 43 58 114 147 148 152          |
   0               XXXXXXXXXXXXXXXXXXXXXXXXXXXX|17 18 37 57 75 76 120 143 145          |
               XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|8 31 36 56 69 113 144 172 173          |
  -1                       XXXXXXXXXXXXXXXXXXXX|35 66 67 71 111 112 119 142 155        |
       XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|6 7 15 16 34 55 65 74 169 171          |
                                       XXXXXXXX|28 30 68 70 137 141 170                |
  -2           XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|139 140 167 168                        |
                           XXXXXXXXXXXXXXXXXXXX|14 54 108 110 138                      |
  -3       XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|4 5 27 29 64                           |
           XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|3 23 26 109 164 165                    |
  -4                               XXXXXXXXXXXX|24 63 107                              |
                                       XXXXXXXX|2 13 25 53 62 136 166                  |
                   XXXXXXXXXXXXXXXXXXXXXXXXXXXX|51 52 106                              |
  -5                       XXXXXXXXXXXXXXXXXXXX|12 61                                  |
                               XXXXXXXXXXXXXXXX|1 11 22 105                            |
  -6                                       XXXX|                                       |
                                           XXXX|                                       |
                                               |50                                     |
  -7                                       XXXX|                                       |
                                       XXXXXXXX|                                       |
  -8                                       XXXX|                                       |
                                               |                                       |
                                   XXXXXXXXXXXX|                                       |
  -9                                           |                                       |
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  -10                                          |                                       |
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  -11                                          |                                       |
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  -12                                          |                                       |
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  -13                                          |                                       |
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                                               |                                       |
========================================================================================
Each 'X' represents   0.3 cases
Some parameters could not be fitted on the display
========================================================================================
```

APPENDIX O: FINAL INSTRUMENT OUTPUT FILES - FUNCTIONS

```
Communication-Functions
================================================================================
ConQuest: Generalised Item Response Modelling Software     Fri Oct 05 09:23 2018
SUMMARY OF THE ESTIMATION
================================================================================

Estimation method was: Gauss-Hermite Quadrature with 15 nodes
Assumed population distribution was: Gaussian
Constraint was: CASES
The Data File: testSPSS\comb.txt
The format:  responses 1,109,110,112,114,116,117,119,121,123-125,127,129-133,137-
147,149,152,155,156,158,159,162-167,169-175,178,180,181,183-187,190,193-
197,199,202-207,209,212,232-234,238,240,242,244,246,248,253,254,257,260,261,263-
265
The regression model:
Grouping Variables:v
The item model: items
Slopes are fixed
Sample size: 298
Final Deviance:     6744.03005
Total number of estimated parameters: 89
The number of iterations: 16
Termination criteria:  Max iterations=1000, Parameter Change= 0.00010
                       Deviance Change= 0.00010
Iterations terminated because the convergence criteria were reached
At termination the solution was not the best attained solution
The reported results are for the earlier better solution
Rerunning this analysis using the current estimates as initial values is strongly
advised.
Random number generation seed:    1.00000
Number of nodes used when drawing PVs: 2000
Number of nodes used when computing fit: 200
Number of plausible values to draw: 5
Maximum number of iterations without a deviance improvement: 100
Maximum number of Newton steps in M-step: 10
Value for obtaining finite MLEs for zero/perfects:    0.30000

================================================================================
```

===
ConQuest: Generalised Item Response Modelling Software   Fri Oct 05 09:23 2018
TABLES OF RESPONSE MODEL PARAMETER ESTIMATES
===
TERM 1: items

VARIABLES				UNWEIGHTED FIT			WEIGHTED FIT		
	item	ESTIMATE	ERROR^	MNSQ	CI	T	MNSQ	CI	T
1	CL_7	-1.104	0.280	0.96	(0.75, 1.25)	-0.3	0.72	(0.70, 1.30)	-2.0
2	CL_2	-3.164	0.315	17.62	(0.75, 1.25)	37.3	1.29	(0.68, 1.32)	1.7
3	CL_3	-2.439	0.289	8.71	(0.75, 1.25)	24.8	1.27	(0.72, 1.28)	1.8
4	CL_5	-0.660	0.277	1.47	(0.76, 1.25)	3.4	1.27	(0.70, 1.30)	1.6
5	CL2_1	-5.582	0.570	0.71	(0.74, 1.26)	-2.4	1.24	(0.18, 1.82)	0.7
6	CL2_3	-2.647	0.300	2.34	(0.74, 1.26)	7.4	1.33	(0.72, 1.28)	2.1
7	CL2_4	-1.959	0.289	1.23	(0.74, 1.26)	1.6	0.82	(0.72, 1.28)	-1.3
8	CL2_6	-1.124	0.291	0.50	(0.74, 1.26)	-4.6	0.78	(0.69, 1.31)	-1.5
9	CL2_8	-0.673	0.287	0.40	(0.74, 1.26)	-6.0	0.73	(0.69, 1.31)	-1.8
10	CL2_10	-0.079	0.279	0.34	(0.75, 1.25)	-7.0	0.60	(0.68, 1.32)	-2.9
11	CL2_11	0.480	0.276	0.42	(0.75, 1.25)	-6.0	0.74	(0.68, 1.32)	-1.7
12	CL2_12	1.660	0.272	0.49	(0.76, 1.24)	-5.0	0.70	(0.70, 1.30)	-2.1
13	CL2_14	2.959	0.288	0.49	(0.76, 1.24)	-5.1	0.91	(0.72, 1.28)	-0.6
14	CL3_1	-3.507	0.348	35.80	(0.74, 1.26)	51.1	1.65	(0.64, 1.36)	3.0
15	CL3_2	-3.388	0.340	27.71	(0.74, 1.26)	45.1	1.30	(0.65, 1.35)	1.6
16	CL3_3	-2.756	0.310	15.29	(0.74, 1.26)	33.0	1.22	(0.70, 1.30)	1.4
17	CL3_4	-1.423	0.294	0.45	(0.74, 1.26)	-5.2	0.74	(0.70, 1.30)	-1.8
18	CL3_5	-0.903	0.295	0.60	(0.74, 1.26)	-3.4	0.77	(0.68, 1.32)	-1.5
19	CL3_9	-0.497	0.285	0.39	(0.74, 1.26)	-6.2	0.69	(0.69, 1.31)	-2.1
20	CL3_10	0.538	0.285	0.47	(0.75, 1.25)	-5.1	0.78	(0.67, 1.33)	-1.3
21	CL3_11	1.585	0.283	0.41	(0.75, 1.25)	-6.0	0.74	(0.69, 1.31)	-1.8
22	CL3_12	2.247	0.275	0.52	(0.76, 1.24)	-4.6	0.83	(0.72, 1.28)	-1.2
23	CL3_13	3.487	0.308	0.36	(0.76, 1.24)	-6.9	0.82	(0.70, 1.30)	-1.2
24	CL3_14	3.487	0.308	0.41	(0.76, 1.24)	-6.1	0.90	(0.70, 1.30)	-0.6
25	CL3_15	2.711	0.282	0.40	(0.76, 1.24)	-6.3	0.81	(0.72, 1.28)	-1.4
26	CL4_1	-3.789	0.364	238.41	(0.74, 1.26)	117.3	1.68	(0.60, 1.40)	2.8
27	CL4_2	-4.585	0.437	0.32	(0.74, 1.26)	-7.1	0.89	(0.45, 1.55)	-0.3
28	CL4_3	-1.652	0.292	20.65	(0.74, 1.26)	39.4	1.32	(0.71, 1.29)	2.0
29	CL4_4	-2.523	0.299	11.20	(0.74, 1.26)	28.2	1.04	(0.71, 1.29)	0.3
30	CL4_6	0.583	0.278	0.44	(0.75, 1.25)	-5.6	0.79	(0.68, 1.32)	-1.3
31	CL4_9	1.514	0.273	0.34	(0.76, 1.24)	-7.2	0.60	(0.70, 1.30)	-3.0
32	CL4_12	2.030	0.273	0.38	(0.76, 1.24)	-6.6	0.75	(0.71, 1.29)	-1.8
33	CL5_1	-4.425	0.416	0.19	(0.74, 1.26)	-9.8	0.62	(0.50, 1.50)	-1.7
34	CL5_3	-3.847	0.360	3.98	(0.75, 1.25)	13.8	0.96	(0.60, 1.40)	-0.1
35	CL5_4	-1.793	0.282	0.50	(0.75, 1.25)	-4.9	0.81	(0.71, 1.29)	-1.3
36	CL5_7	-0.897	0.285	0.47	(0.75, 1.25)	-5.2	0.63	(0.69, 1.31)	-2.6
37	CL5_8	1.376	0.281	0.81	(0.75, 1.25)	-1.6	1.16	(0.69, 1.31)	1.0
38	CL5_9	1.024	0.277	0.87	(0.75, 1.25)	-1.1	1.19	(0.69, 1.31)	1.2
39	CL5_10	2.657	0.287	0.56	(0.75, 1.25)	-4.1	1.01	(0.71, 1.29)	0.1
40	CL5_11	3.795	0.327	1.13	(0.76, 1.25)	1.0	0.91	(0.67, 1.33)	-0.5
41	CL5_12	3.057	0.293	1.03	(0.76, 1.24)	0.3	1.16	(0.71, 1.29)	1.1
42	CL5_14	4.344	0.348	1.91	(0.76, 1.24)	5.9	1.09	(0.63, 1.37)	0.5
43	CL6_1	0.130	0.283	1.21	(0.75, 1.25)	1.6	1.19	(0.68, 1.32)	1.2
44	CL6_2	0.043	0.282	0.47	(0.75, 1.25)	-5.1	0.65	(0.68, 1.32)	-2.4
45	CL6_3	-0.123	0.282	0.89	(0.75, 1.25)	-0.9	0.80	(0.68, 1.32)	-1.3
46	CL6_4	1.190	0.277	0.40	(0.75, 1.25)	-6.2	0.66	(0.69, 1.31)	-2.4
47	CL6_5	0.339	0.279	0.44	(0.75, 1.25)	-5.7	0.67	(0.68, 1.32)	-2.2
48	CL6_6	1.035	0.278	0.44	(0.75, 1.25)	-5.6	0.74	(0.68, 1.32)	-1.7
49	CL6_9	3.049	0.294	0.54	(0.75, 1.25)	-4.3	0.87	(0.71, 1.29)	-0.9
50	CL6_11	3.677	0.316	0.82	(0.75, 1.25)	-1.5	0.95	(0.68, 1.32)	-0.3
51	CL7_1	1.247	0.283	0.44	(0.75, 1.25)	-5.6	0.72	(0.68, 1.32)	-1.9
52	CL7_3	2.779	0.294	0.60	(0.75, 1.25)	-3.7	1.01	(0.71, 1.29)	0.1
53	CL7_4	2.239	0.282	0.45	(0.75, 1.25)	-5.5	0.81	(0.71, 1.29)	-1.4
54	CL7_5	3.572	0.317	0.38	(0.75, 1.25)	-6.6	0.78	(0.68, 1.32)	-1.4
55	CL7_6	4.334	0.347	0.51	(0.75, 1.25)	-4.7	0.96	(0.63, 1.37)	-0.1
56	CL7_7	5.670	0.437	0.33	(0.75, 1.25)	-7.4	0.97	(0.48, 1.52)	-0.0
57	CL7_10	6.326	0.502	0.64	(0.75, 1.25)	-3.3	1.01	(0.37, 1.63)	0.1
58	CE1_3	-3.693	0.352	7.58	(0.75, 1.25)	22.4	1.35	(0.62, 1.38)	1.7
59	CE1_4	-3.343	0.329	58.08	(0.75, 1.25)	66.5	1.46	(0.66, 1.34)	2.4
60	CE1_5	-1.249	0.281	7.27	(0.75, 1.25)	22.0	0.96	(0.71, 1.29)	-0.2
61	CE1_6	-0.712	0.279	1.11	(0.75, 1.25)	0.9	0.99	(0.69, 1.31)	-0.0
62	CE1_7	1.600	0.276	1.21	(0.75, 1.25)	1.6	1.38	(0.69, 1.31)	2.2
63	CE1_9	1.737	0.273	0.97	(0.76, 1.24)	-0.2	1.07	(0.70, 1.30)	0.5
64	CE1_12	4.104	0.335	0.46	(0.76, 1.24)	-5.5	1.00	(0.65, 1.35)	0.0
65	CE1_13	5.486	0.421	4.75	(0.76, 1.24)	16.6	1.32	(0.51, 1.49)	1.3
66	CE2_1	-3.436	0.337	0.62	(0.74, 1.26)	-3.3	0.98	(0.65, 1.35)	-0.0
67	CE2_2	-3.437	0.336	3.46	(0.74, 1.26)	11.8	1.21	(0.65, 1.35)	1.2
68	CE2_3	-2.914	0.309	0.41	(0.74, 1.26)	-5.9	0.89	(0.70, 1.30)	-0.7
69	CE2_4	-2.164	0.286	1.27	(0.74, 1.26)	2.0	0.87	(0.72, 1.28)	-0.9
70	CE2_6	0.082	0.284	0.54	(0.75, 1.25)	-4.3	0.85	(0.68, 1.32)	-0.9

```
 71  CE2_9            2.181   0.275    1.47 ( 0.76, 1.25)  3.3   1.33 ( 0.72, 1.28)  2.1
 72  CE4_6            1.735   0.273    1.72 ( 0.75, 1.25)  4.8   1.30 ( 0.70, 1.30)  1.9
 73  CE4_7            3.393   0.304    1.80 ( 0.76, 1.24)  5.3   1.42 ( 0.70, 1.30)  2.5
 74  CE4_8            2.102   0.273    0.75 ( 0.76, 1.24) -2.2   1.06 ( 0.71, 1.29)  0.4
 75  CE4_12           5.001   0.385    0.26 ( 0.76, 1.24) -8.7   0.73 ( 0.57, 1.43) -1.3
 76  CE4_14           4.585   0.360    0.34 ( 0.76, 1.24) -7.2   0.81 ( 0.61, 1.39) -1.0
 77  CE5_1            0.549   0.294    0.66 ( 0.74, 1.26) -3.0   0.74 ( 0.65, 1.35) -1.6
 78  CE5_3            0.746   0.287    0.58 ( 0.75, 1.25) -3.9   0.86 ( 0.66, 1.34) -0.8
 79  CE5_5            2.027   0.281    0.53 ( 0.75, 1.25) -4.5   0.78 ( 0.71, 1.29) -1.6
 80  CE5_7            3.359   0.307    0.42 ( 0.75, 1.25) -5.9   0.73 ( 0.70, 1.30) -1.9
 81  CE6_3            0.153   0.289    1.05 ( 0.75, 1.25)  0.4   1.18 ( 0.66, 1.34)  1.0
 82  CE6_4            0.471   0.288    1.76 ( 0.75, 1.25)  4.9   0.92 ( 0.66, 1.34) -0.4
 83  CE6_7            1.796   0.284    0.75 ( 0.75, 1.25) -2.0   0.82 ( 0.69, 1.31) -1.2
 84  CE6_10           2.470   0.285    1.48 ( 0.75, 1.25)  3.3   0.74 ( 0.71, 1.29) -1.9
 85  CE6_11           2.351   0.280    0.47 ( 0.75, 1.25) -5.2   0.85 ( 0.71, 1.29) -1.0
 86  CE6_13           3.975   0.333    0.39 ( 0.75, 1.25) -6.4   0.88 ( 0.66, 1.34) -0.6
 87  CE6_14           3.760   0.323    0.32 ( 0.75, 1.25) -7.4   0.78 ( 0.68, 1.32) -1.4
 88  CE6_15           4.988   0.386    0.42 ( 0.75, 1.25) -5.9   0.88 ( 0.57, 1.43) -0.5
-------------------------------------------------------------------------------
An asterisk next to a parameter estimate indicates that it is constrained
Separation Reliability =  0.987 Chi-square test of parameter equality =    6037.12,  df = 88,
Sig Level = 0.000
^ Quick standard errors have been used



================================================================================
ConQuest: Generalised Item Response Modelling Software     Fri Oct 05 09:23 2018
TABLES OF POPULATION MODEL PARAMETER ESTIMATES
================================================================================
REGRESSION COEFFICIENTS



Regression Variable

CONSTANT                   0.000*
-----------------------------------------------
An asterisk next to a parameter estimate indicates that it is constrained
===============================================
COVARIANCE/CORRELATION MATRIX



Dimension

Dimension 1
-------------------------------------------
Variance                   8.656  ( 0.709)
-------------------------------------------
An asterisk next to a parameter estimate indicates that it is constrained

===========================================

RELIABILITY COEFFICIENTS
------------------------

Dimension: (Dimension 1)
------------------------
 MLE Person separation RELIABILITY:  Unavailable
 WLE Person separation RELIABILITY:   0.982
 EAP/PV RELIABILITY:                  0.442
------------------------
```

```
================================================================================
ConQuest: Generalised Item Response Modelling Software     Fri Oct 05 09:23 2018
MAP OF WLE ESTIMATES AND RESPONSE MODEL PARAMETER ESTIMATES
================================================================================
                                       Terms in the Model (excl Step terms)

                                                                    +items
--------------------------------------------------------------------------------
                                          |                                     |
  12                                      |                                     |
                                          |                                     |
  11                                      |                                     |
                                          |                                     |
                                          |                                     |
  10                                      |                                     |
                                          |                                     |
   9                                      |                                     |
                                          |                                     |
                                          |                                     |
   8                                      |                                     |
                                          |                                     |
   7                                  XXXX|                                     |
                                   XXXXXXXX|                                     |
                                   XXXXXXXX|57                                   |
   6                                   XXXX|                                     |
                                       XXXX|56 65                                |
   5                               XXXXXXXX|75 88                                |
                                   XXXXXXXX|76                                   |
                            XXXXXXXXXXXXXXX|42 55                                |
   4                     XXXXXXXXXXXXXXXXXX|40 64 86                             |
                                   XXXXXXXX|23 24 50 54 73 87                     |
   3  XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|41 49 80                             |
                         XXXXXXXXXXXXXXXXXX|13 25 39 52                          |
          XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|22 53 71 84 85                       |
   2                 XXXXXXXXXXXXXXXXXXXXX|32 74 79 83                          |
                         XXXXXXXXXXXXXXXXXX|12 21 31 62 63 72                    |
   1                               XXXXXXXX|37 38 46 48 51                       |
                         XXXXXXXXXXXXXXXXXX|78                                   |
                         XXXXXXXXXXXXXXXXXX|11 20 30 47 77 82                    |
   0                     XXXXXXXXXXXXXXXXXX|10 43 44 45 70 81                    |
                    XXXXXXXXXXXXXXXXXXXXXX|19                                   |
                    XXXXXXXXXXXXXXXXXXXXXX|4 9 18 36 61                         |
  -1                          XXXXXXXXXXXXX|1 8 60                              |
                         XXXXXXXXXXXXXXXXXX|17 28                                |
  -2              XXXXXXXXXXXXXXXXXXXXXXXXX|7 35 69                             |
                    XXXXXXXXXXXXXXXXXXXXXX|3 29                                |
                    XXXXXXXXXXXXXXXXXXXXXX|6 16 68                             |
  -3  XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|2 59                                 |
                                       XXXX|14 15 58 66 67                      |
  -4                          XXXXXXXXXXXXX|26 34                               |
                                          |33                                   |
                                   XXXXXXXX|27                                   |
  -5                                      |                                     |
                                       XXXX|5                                    |
  -6                                      |                                     |
                                          |                                     |
                                          |                                     |
  -7                                      |                                     |
                                          |                                     |
  -8                                      |                                     |
                                          |                                     |
                                          |                                     |
  -9                                      |                                     |
                                          |                                     |
  -10                                     |                                     |
                                          |                                     |
                                          |                                     |
  -11                                     |                                     |
================================================================================
Each 'X' represents   0.3 cases

================================================================================
```

```
================================================================================
ConQuest: Generalised Item Response Modelling Software     Fri Oct 05 09:23 2018
MAP OF WLE ESTIMATES AND THRESHOLDS
================================================================================
                              Generalised-Item Thresholds

--------------------------------------------------------------------------------
                |
  12            |
                |
  11            |
                |
                |
  10            |
                |
   9            |
                |
                |
   8            |
                |
   7           X|
              XX|
              XX|57
   6           X|
               X|56 65
   5          XX|75 88
              XX|76
            XXXX|42 55
   4       XXXXX|40 64 86
             XX|23 24 50 54 73 87
   3  XXXXXXXXXX|41 49 80
         XXXXX|13 25 39 52
      XXXXXXXXX|22 53 71 84 85
   2      XXXXXX|32 74 79 83
          XXXXX|12 21 31 62 63 72
   1           X|37 38 46 48 51
          XXXXX|78
          XXXXX|11 20 30 47 77 82
   0      XXXXX|10 43 44 45 70 81
         XXXXXX|19
         XXXXXX|4 9 18 36 61
  -1       XXXX|1 8 60
          XXXXX|17 28
  -2     XXXXXXX|7 35 69
         XXXXXX|3 29
         XXXXXX|6 16 68
  -3  XXXXXXXXXX|2 59
              X|14 15 58 66 67
  -4        XXXX|26 34
                |33
              XX|27
  -5            |
               X|5
  -6            |
                |
                |
  -7            |
                |
  -8            |
                |
                |
  -9            |
                |
  -10           |
                |
                |
  -11           |
================================================================================
Each 'X' represents   1.0 cases
The labels for thresholds show the levels of
    item, and category, respectively

================================================================================
```

Communication-Functions

ConQuest: Generalised Item Response Modelling Software Fri Oct 05 09:23 2018

GENERALISED ITEM ANALYSIS

Item 1

item:1 (CL_7)

Cases for this item 126 Discrimination 0.71
Item Threshold(s): -1.10 Weighted MNSQ 0.72
Item Delta(s): -1.10

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	43	34.13	-0.71	-11.21(.000)	-2.34	1.53
1	1.00	83	65.87	0.71	11.21(.000)	2.05	2.15

Item 2

item:2 (CL_2)

Cases for this item 120 Discrimination 0.34
Item Threshold(s): -3.16 Weighted MNSQ 1.29
Item Delta(s): -3.16

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	19	15.83	-0.34	-3.98(.000)	-2.30	2.51
1	1.00	101	84.17	0.34	3.98(.000)	0.84	2.71

Item 3

item:3 (CL_3)

Cases for this item 122 Discrimination 0.47
Item Threshold(s): -2.44 Weighted MNSQ 1.27
Item Delta(s): -2.44

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	27	22.13	-0.47	-5.83(.000)	-2.30	2.16
1	1.00	95	77.87	0.47	5.83(.000)	1.17	2.64

Item 4

item:4 (CL_5)

Cases for this item 128 Discrimination 0.64
Item Threshold(s): -0.66 Weighted MNSQ 1.27
Item Delta(s): -0.66

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	50	39.06	-0.64	-9.36(.000)	-1.89	1.82
1	1.00	78	60.94	0.64	9.36(.000)	2.02	2.40

Item 5

item:5 (CL2_1)

Cases for this item 114 Discrimination 0.22
Item Threshold(s): -5.58 Weighted MNSQ 1.24
Item Delta(s): -5.58

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	4	3.51	-0.22	-2.41(.018)	-3.56	1.83
1	1.00	110	96.49	0.22	2.41(.018)	0.41	2.86

Item 6

item:6 (CL2_3)

Cases for this item 113 Discrimination 0.45
Item Threshold(s): -2.65 Weighted MNSQ 1.33
Item Delta(s): -2.65

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	24	21.24	-0.45	-5.25(.000)	-2.39	1.89
1	1.00	89	78.76	0.45	5.25(.000)	0.97	2.75

Item 7

item:7 (CL2_4)

Cases for this item 113 Discrimination 0.63
Item Threshold(s): -1.96 Weighted MNSQ 0.82
Item Delta(s): -1.96

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	32	28.32	-0.63	-8.57(.000)	-2.69	1.38
1	1.00	81	71.68	0.63	8.57(.000)	1.42	2.53

Item 8

item:8 (CL2_6)

Cases for this item 113 Discrimination 0.74
Item Threshold(s): -1.12 Weighted MNSQ 0.78
Item Delta(s): -1.12

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	42	37.17	-0.74	-11.51(.000)	-2.51	1.41
1	1.00	71	62.83	0.74	11.51(.000)	1.89	2.29

Item 9
------
item:9 (CL2_8)
Cases for this item 115 Discrimination 0.77
Item Threshold(s): -0.67 Weighted MNSQ 0.73
Item Delta(s): -0.67

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	48	41.74	-0.77	-12.66(.000)	-2.37	1.43
1	1.00	67	58.26	0.77	12.66(.000)	2.13	2.13

Item 10
----
item:10 (CL2_10)
Cases for this item 122 Discrimination 0.83
Item Threshold(s): -0.08 Weighted MNSQ 0.60
Item Delta(s): -0.08

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	57	46.72	-0.83	-16.26(.000)	-2.14	1.43
1	1.00	65	53.28	0.83	16.26(.000)	2.50	1.86

Item 11
----
item:11 (CL2_11)
Cases for this item 126 Discrimination 0.79
Item Threshold(s): 0.48 Weighted MNSQ 0.74
Item Delta(s): 0.48

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	65	51.59	-0.79	-14.23(.000)	-1.80	1.69
1	1.00	61	48.41	0.79	14.23(.000)	2.78	1.77

Item 12
----
item:12 (CL2_12)
Cases for this item 130 Discrimination 0.78
Item Threshold(s): 1.66 Weighted MNSQ 0.70
Item Delta(s): 1.66

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	81	62.31	-0.78	-14.31(.000)	-1.21	2.03
1	1.00	49	37.69	0.78	14.31(.000)	3.44	1.49

Item 13
----
item:13 (CL2_14)
Cases for this item 130 Discrimination 0.66
Item Threshold(s): 2.96 Weighted MNSQ 0.91
Item Delta(s): 2.96

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	98	75.38	-0.66	-9.96(.000)	-0.56	2.38
1	1.00	32	24.62	0.66	9.96(.000)	3.92	1.43

Item 14
----
item:14 (CL3_1)
Cases for this item 110 Discrimination 0.21
Item Threshold(s): -3.51 Weighted MNSQ 1.65
Item Delta(s): -3.51

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	15	13.64	-0.21	-2.21(.029)	-1.41	2.96
1	1.00	95	86.36	0.21	2.21(.029)	0.54	2.80

Item 15
----
item:15 (CL3_2)
Cases for this item 110 Discrimination 0.34
Item Threshold(s): -3.39 Weighted MNSQ 1.30
Item Delta(s): -3.39

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	16	14.55	-0.34	-3.74(.000)	-2.23	2.63
1	1.00	94	85.45	0.34	3.74(.000)	0.70	2.72

Item 16
----
item:16 (CL3_3)
Cases for this item 110 Discrimination 0.43
Item Threshold(s): -2.76 Weighted MNSQ 1.22
Item Delta(s): -2.76

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	22	20.00	-0.43	-4.97(.000)	-2.33	2.49
1	1.00	88	80.00	0.43	4.97(.000)	0.92	2.61

Item 17
----
item:17 (CL3_4)
Cases for this item 110 Discrimination 0.71
Item Threshold(s): -1.42 Weighted MNSQ 0.74
Item Delta(s): -1.42

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	37	33.64	-0.71	-10.49(.000)	-2.62	1.44
1	1.00	73	66.36	0.71	10.49(.000)	1.74	2.26

Item 18
----
item:18 (CL3_5)
Cases for this item 110 Discrimination 0.74
Item Threshold(s): -0.90 Weighted MNSQ 0.77
Item Delta(s): -0.90

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	43	39.09	-0.74	-11.55(.000)	-2.38	1.61
1	1.00	67	60.91	0.74	11.55(.000)	1.98	2.14

Item 19
----
item:19 (CL3_9)
Cases for this item 116 Discrimination 0.77
Item Threshold(s): -0.50 Weighted MNSQ 0.69
Item Delta(s): -0.50

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	51	43.97	-0.77	-13.04(.000)	-2.31	1.40
1	1.00	65	56.03	0.77	13.04(.000)	2.26	2.04

Item 20
----
item:20 (CL3_10)
Cases for this item 119 Discrimination 0.80
Item Threshold(s): 0.54 Weighted MNSQ 0.78
Item Delta(s): 0.54

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	64	53.78	-0.80	-14.54(.000)	-1.77	1.81
1	1.00	55	46.22	0.80	14.54(.000)	2.74	1.80

Item 21
----
item:21 (CL3_11)
Cases for this item 121 Discrimination 0.79
Item Threshold(s): 1.58 Weighted MNSQ 0.74
Item Delta(s): 1.58

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	78	64.46	-0.79	-13.98(.000)	-1.29	2.00
1	1.00	43	35.54	0.79	13.98(.000)	3.25	1.58

Item 22
----
item:22 (CL3_12)
Cases for this item 129 Discrimination 0.72
Item Threshold(s): 2.25 Weighted MNSQ 0.83
Item Delta(s): 2.25

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	88	68.22	-0.72	-11.72(.000)	-0.91	2.18
1	1.00	41	31.78	0.72	11.72(.000)	3.67	1.54

Item 23
----
item:23 (CL3_13)
Cases for this item 129 Discrimination 0.64
Item Threshold(s): 3.49 Weighted MNSQ 0.82
Item Delta(s): 3.49

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	103	79.84	-0.64	-9.36(.000)	-0.41	2.40
1	1.00	26	20.16	0.64	9.36(.000)	4.34	1.26

Item 24
----
item:24 (CL3_14)
Cases for this item 129 Discrimination 0.61
Item Threshold(s): 3.49 Weighted MNSQ 0.90
Item Delta(s): 3.49

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	103	79.84	-0.61	-8.75(.000)	-0.38	2.46
1	1.00	26	20.16	0.61	8.75(.000)	4.21	1.30

Item 25
----
item:25 (CL3_15)
Cases for this item 129 Discrimination 0.67
Item Threshold(s): 2.71 Weighted MNSQ 0.81
Item Delta(s): 2.71

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	94	72.87	-0.67	-10.20(.000)	-0.72	2.27
1	1.00	35	27.13	0.67	10.20(.000)	3.94	1.34

Item 26
----
item:26 (CL4_1)
Cases for this item 113 Discrimination 0.06
Item Threshold(s): -3.79 Weighted MNSQ 1.68
Item Delta(s): -3.79

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	13	11.50	-0.06	-0.68(.496)	-0.26	3.85
1	1.00	100	88.50	0.06	0.68(.496)	0.43	2.82

Item 27
----
item:27 (CL4_2)
Cases for this item 113 Discrimination 0.36
Item Threshold(s): -4.58 Weighted MNSQ 0.89
Item Delta(s): -4.58

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	8	7.08	-0.36	-4.02(.000)	-3.86	1.17
1	1.00	105	92.92	0.36	4.02(.000)	0.67	2.78

Item 28
----
item:28 (CL4_3)
Cases for this item 113 Discrimination 0.50
Item Threshold(s): -1.65 Weighted MNSQ 1.32
Item Delta(s): -1.65

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	35	30.97	-0.50	-6.04(.000)	-1.88	2.70
1	1.00	78	69.03	0.50	6.04(.000)	1.35	2.47

Item 29
----
item:29 (CL4_4)
Cases for this item 115 Discrimination 0.52
Item Threshold(s): -2.52 Weighted MNSQ 1.04
Item Delta(s): -2.52

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	25	21.74	-0.52	-6.55(.000)	-2.53	1.96
1	1.00	90	78.26	0.52	6.55(.000)	1.17	2.62

Item 30
----
item:30 (CL4_6)
Cases for this item 126 Discrimination 0.80
Item Threshold(s): 0.58 Weighted MNSQ 0.79
Item Delta(s): 0.58

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	64	50.79	-0.80	-14.62(.000)	-1.65	1.82
1	1.00	62	49.21	0.80	14.62(.000)	2.86	1.84

Item 31
----
item:31 (CL4_9)
Cases for this item 129 Discrimination 0.82
Item Threshold(s): 1.51 Weighted MNSQ 0.60
Item Delta(s): 1.51

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	79	61.24	-0.82	-16.28(.000)	-1.31	1.94
1	1.00	50	38.76	0.82	16.28(.000)	3.39	1.50

Item 32
----
item:32 (CL4_12)
Cases for this item 130 Discrimination 0.78
Item Threshold(s): 2.03 Weighted MNSQ 0.75
Item Delta(s): 2.03

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	86	66.15	-0.78	-13.90(.000)	-1.03	2.11
1	1.00	44	33.85	0.78	13.90(.000)	3.61	1.47

Item 33
----
item:33 (CL5_1)
Cases for this item 116 Discrimination 0.39
Item Threshold(s): -4.42 Weighted MNSQ 0.62
Item Delta(s): -4.42

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	9	7.76	-0.39	-4.57(.000)	-4.31	0.95
1	1.00	107	92.24	0.39	4.57(.000)	0.70	2.69

Item 34
----
item:34 (CL5_3)
Cases for this item 123 Discrimination 0.37
Item Threshold(s): -3.85 Weighted MNSQ 0.96
Item Delta(s): -3.85

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	13	10.57	-0.37	-4.45(.000)	-3.09	2.17
1	1.00	110	89.43	0.37	4.45(.000)	0.84	2.71

Item 35
----
item:35 (CL5_4)
Cases for this item 124 Discrimination 0.67
Item Threshold(s): -1.79 Weighted MNSQ 0.81
Item Delta(s): -1.79

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	35	28.23	-0.67	-9.92(.000)	-2.75	1.40
1	1.00	89	71.77	0.67	9.92(.000)	1.69	2.33

Item 36
----
item:36 (CL5_7)
Cases for this item 124 Discrimination 0.76
Item Threshold(s): -0.90 Weighted MNSQ 0.63
Item Delta(s): -0.90

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	46	37.10	-0.76	-12.89(.000)	-2.48	1.45
1	1.00	78	62.90	0.76	12.89(.000)	2.22	2.07

Item 37
----
item:37 (CL5_8)
Cases for this item 125 Discrimination 0.70
Item Threshold(s): 1.38 Weighted MNSQ 1.16
Item Delta(s): 1.38

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	75	60.00	-0.70	-11.02(.000)	-1.24	2.17
1	1.00	50	40.00	0.70	11.02(.000)	3.04	1.85

Item 38
----
item:38 (CL5_9)
Cases for this item 127 Discrimination 0.69
Item Threshold(s): 1.02 Weighted MNSQ 1.19
Item Delta(s): 1.02

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	72	56.69	-0.69	-10.62(.000)	-1.33	2.14
1	1.00	55	43.31	0.69	10.62(.000)	2.83	1.94

Item 39
----
item:39 (CL5_10)
Cases for this item 127 Discrimination 0.66
Item Threshold(s): 2.66 Weighted MNSQ 1.01
Item Delta(s): 2.66

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	93	73.23	-0.66	-9.75(.000)	-0.71	2.30
1	1.00	34	26.77	0.66	9.75(.000)	3.69	1.72

Item 40
----
item:40 (CL5_11)
Cases for this item 128 Discrimination 0.57
Item Threshold(s): 3.80 Weighted MNSQ 0.91
Item Delta(s): 3.80

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	106	82.81	-0.57	-7.78(.000)	-0.28	2.48
1	1.00	22	17.19	0.57	7.78(.000)	4.23	1.71

Item 41
----
item:41 (CL5_12)
Cases for this item 129 Discrimination 0.54
Item Threshold(s): 3.06 Weighted MNSQ 1.16
Item Delta(s): 3.06

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	99	76.74	-0.54	-7.23(.000)	-0.45	2.47
1	1.00	30	23.26	0.54	7.23(.000)	3.67	1.78

Item 42
----
item:42 (CL5_14)
Cases for this item 130 Discrimination 0.49
Item Threshold(s): 4.34 Weighted MNSQ 1.09
Item Delta(s): 4.34

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	112	86.15	-0.49	-6.29(.000)	-0.05	2.62
1	1.00	18	13.85	0.49	6.29(.000)	4.22	1.70

Item 43
----
item:43 (CL6_1)
Cases for this item 121 Discrimination 0.72
Item Threshold(s): 0.13 Weighted MNSQ 1.19
Item Delta(s): 0.13

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	57	47.11	-0.72	-11.26(.000)	-1.64	1.96
1	1.00	64	52.89	0.72	11.26(.000)	2.49	2.44

Item 44
----
item:44 (CL6_2)
Cases for this item 122 Discrimination 0.79
Item Threshold(s): 0.04 Weighted MNSQ 0.65
Item Delta(s): 0.04

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	56	45.90	-0.79	-14.17(.000)	-2.01	1.64
1	1.00	66	54.10	0.79	14.17(.000)	2.74	2.07

Item 45
----
item:45 (CL6_3)
Cases for this item 124 Discrimination 0.75
Item Threshold(s): -0.12 Weighted MNSQ 0.80
Item Delta(s): -0.12

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	54	43.55	-0.75	-12.57(.000)	-1.95	1.71
1	1.00	70	56.45	0.75	12.57(.000)	2.58	2.24

Item 46
----
item:46 (CL6_4)
Cases for this item 125 Discrimination 0.81
Item Threshold(s): 1.19 Weighted MNSQ 0.66
Item Delta(s): 1.19

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	71	56.80	-0.81	-15.20(.000)	-1.44	1.88
1	1.00	54	43.20	0.81	15.20(.000)	3.34	1.84

Item 47
----
item:47 (CL6_5)
Cases for this item 126 Discrimination 0.81
Item Threshold(s): 0.34 Weighted MNSQ 0.67
Item Delta(s): 0.34

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	60	47.62	-0.81	-15.19(.000)	-1.86	1.66
1	1.00	66	52.38	0.81	15.19(.000)	2.94	2.00

Item 48
----
item:48 (CL6_6)
Cases for this item 126 Discrimination 0.82
Item Threshold(s): 1.04 Weighted MNSQ 0.74
Item Delta(s): 1.04

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	69	54.76	-0.82	-15.84(.000)	-1.50	1.86
1	1.00	57	45.24	0.82	15.84(.000)	3.26	1.90

Item 49
----
item:49 (CL6_9)
Cases for this item 126 Discrimination 0.67
Item Threshold(s): 3.05 Weighted MNSQ 0.87
Item Delta(s): 3.05

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	95	75.40	-0.67	-10.08(.000)	-0.49	2.38
1	1.00	31	24.60	0.67	10.08(.000)	4.15	1.93

Item 50
----
item:50 (CL6_11)
Cases for this item 127 Discrimination 0.57
Item Threshold(s): 3.68 Weighted MNSQ 0.95
Item Delta(s): 3.68

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	102	80.31	-0.57	-7.77(.000)	-0.24	2.49
1	1.00	25	19.69	0.57	7.77(.000)	4.44	1.97

Item 51
----
item:51 (CL7_1)
Cases for this item 123 Discrimination 0.80
Item Threshold(s): 1.25 Weighted MNSQ 0.72
Item Delta(s): 1.25

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	71	57.72	-0.80	-14.84(.000)	-1.40	1.90
1	1.00	52	42.28	0.80	14.84(.000)	3.32	1.97

Item 52
----
item:52 (CL7_3)
Cases for this item 123 Discrimination 0.67
Item Threshold(s): 2.78 Weighted MNSQ 1.01
Item Delta(s): 2.78

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	90	73.17	-0.67	-9.80(.000)	-0.62	2.36
1	1.00	33	26.83	0.67	9.80(.000)	3.89	2.04

Item 53
----
item:53 (CL7_4)
Cases for this item 124 Discrimination 0.74
Item Threshold(s): 2.24 Weighted MNSQ 0.81
Item Delta(s): 2.24

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	84	67.74	-0.74	-12.13(.000)	-0.91	2.17
1	1.00	40	32.26	0.74	12.13(.000)	3.77	1.87

Item 54
----
item:54 (CL7_5)
Cases for this item 125 Discrimination 0.65
Item Threshold(s): 3.57 Weighted MNSQ 0.78
Item Delta(s): 3.57

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	100	80.00	-0.65	-9.56(.000)	-0.37	2.39
1	1.00	25	20.00	0.65	9.56(.000)	4.58	1.74

Item 55
----
item:55 (CL7_6)
Cases for this item 127 Discrimination 0.52
Item Threshold(s): 4.33 Weighted MNSQ 0.96
Item Delta(s): 4.33

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	108	85.04	-0.52	-6.89(.000)	-0.01	2.63
1	1.00	19	14.96	0.52	6.89(.000)	4.63	1.97

Item 56
----
item:56 (CL7_7)
Cases for this item 127 Discrimination 0.41
Item Threshold(s): 5.67 Weighted MNSQ 0.97
Item Delta(s): 5.67

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	117	92.13	-0.41	-5.02(.000)	0.26	2.73
1	1.00	10	7.87	0.41	5.02(.000)	5.61	1.82

Item 57
----
item:57 (CL7_10)
Cases for this item 127 Discrimination 0.36
Item Threshold(s): 6.33 Weighted MNSQ 1.01
Item Delta(s): 6.33

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	120	94.49	-0.36	-4.31(.000)	0.38	2.80
1	1.00	7	5.51	0.36	4.31(.000)	5.87	2.21

Item 58
----
item:58 (CE1_3)
Cases for this item 119 Discrimination 0.27
Item Threshold(s): -3.69 Weighted MNSQ 1.35
Item Delta(s): -3.69

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	14	11.76	-0.27	-3.05(.003)	-1.92	2.53
1	1.00	105	88.24	0.27	3.05(.003)	0.70	2.84

Item 59
----
item:59 (CE1_4)
Cases for this item 119 Discrimination 0.27
Item Threshold(s): -3.34 Weighted MNSQ 1.46
Item Delta(s): -3.34

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	17	14.29	-0.27	-3.00(.003)	-1.58	2.69
1	1.00	102	85.71	0.27	3.00(.003)	0.72	2.84

Item 60
----
item:60 (CE1_5)
Cases for this item 122 Discrimination 0.63
Item Threshold(s): -1.25 Weighted MNSQ 0.96
Item Delta(s): -1.25

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	42	34.43	-0.63	-8.79(.000)	-2.24	2.07
1	1.00	80	65.57	0.63	8.79(.000)	1.75	2.28

Item 61
----
item:61 (CE1_6)
Cases for this item 127 Discrimination 0.70
Item Threshold(s): -0.71 Weighted MNSQ 0.99
Item Delta(s): -0.71

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	49	38.58	-0.70	-10.81(.000)	-2.11	1.79
1	1.00	78	61.42	0.70	10.81(.000)	2.11	2.23

Item 62
----
item:62 (CE1_7)
Cases for this item 127 Discrimination 0.63
Item Threshold(s): 1.60 Weighted MNSQ 1.38
Item Delta(s): 1.60

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	79	62.20	-0.63	-9.05(.000)	-1.00	2.35
1	1.00	48	37.80	0.63	9.05(.000)	2.91	1.98

Item 63
----
item:63 (CE1_9)
Cases for this item 129 Discrimination 0.71
Item Threshold(s): 1.74 Weighted MNSQ 1.07
Item Delta(s): 1.74

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	82	63.57	-0.71	-11.40(.000)	-1.01	2.28
1	1.00	47	36.43	0.71	11.40(.000)	3.16	1.74

Item 64
----
item:64 (CE1_12)
Cases for this item 131 Discrimination 0.54
Item Threshold(s): 4.10 Weighted MNSQ 1.00
Item Delta(s): 4.10

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	110	83.97	-0.54	-7.32(.000)	-0.13	2.59
1	1.00	21	16.03	0.54	7.32(.000)	4.54	1.91

Item 65
----
item:65 (CE1_13)
Cases for this item 131 Discrimination 0.36
Item Threshold(s): 5.49 Weighted MNSQ 1.32
Item Delta(s): 5.49

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	120	91.60	-0.36	-4.41(.000)	0.29	2.89
1	1.00	11	8.40	0.36	4.41(.000)	4.18	2.09

Item 66
----
item:66 (CE2_1)
Cases for this item 116 Discrimination 0.45
Item Threshold(s): -3.44 Weighted MNSQ 0.98
Item Delta(s): -3.44

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	16	13.79	-0.45	-5.39(.000)	-3.19	1.47
1	1.00	100	86.21	0.45	5.39(.000)	0.87	2.68

Item 67
----
item:67 (CE2_2)
Cases for this item 117 Discrimination 0.37
Item Threshold(s): -3.44 Weighted MNSQ 1.21
Item Delta(s): -3.44

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	16	13.68	-0.37	-4.28(.000)	-2.62	2.23
1	1.00	101	86.32	0.37	4.28(.000)	0.80	2.73

Item 68
----
item:68 (CE2_3)
Cases for this item 117 Discrimination 0.53
Item Threshold(s): -2.91 Weighted MNSQ 0.89
Item Delta(s): -2.91

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	21	17.95	-0.53	-6.62(.000)	-3.23	1.20
1	1.00	96	82.05	0.53	6.62(.000)	1.11	2.57

Item 69
----
item:69 (CE2_4)
Cases for this item 118 Discrimination 0.59
Item Threshold(s): -2.16 Weighted MNSQ 0.87
Item Delta(s): -2.16

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	30	25.42	-0.59	-7.80(.000)	-2.64	1.50
1	1.00	88	74.58	0.59	7.80(.000)	1.31	2.57

Item 70
----
item:70 (CE2_6)
Cases for this item 119 Discrimination 0.78
Item Threshold(s): 0.08 Weighted MNSQ 0.85
Item Delta(s): 0.08

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	58	48.74	-0.78	-13.51(.000)	-1.97	1.67
1	1.00	61	51.26	0.78	13.51(.000)	2.50	1.99

Item 71
----
item:71 (CE2_9)
Cases for this item 128 Discrimination 0.63
Item Threshold(s): 2.18 Weighted MNSQ 1.33
Item Delta(s): 2.18

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	87	67.97	-0.63	-9.13(.000)	-0.68	2.56
1	1.00	41	32.03	0.63	9.13(.000)	3.07	1.74

Item 72
----
item:72 (CE4_6)
Cases for this item 127 Discrimination 0.64
Item Threshold(s): 1.73 Weighted MNSQ 1.30
Item Delta(s): 1.73

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	80	62.99	-0.64	-9.26(.000)	-0.88	2.38
1	1.00	47	37.01	0.64	9.26(.000)	3.01	1.89

Item 73
----
item:73 (CE4_7)
Cases for this item 129 Discrimination 0.51
Item Threshold(s): 3.39 Weighted MNSQ 1.42
Item Delta(s): 3.39

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	101	78.29	-0.51	-6.62(.000)	-0.19	2.64
1	1.00	28	21.71	0.51	6.62(.000)	3.75	2.21

Item 74
----
item:74 (CE4_8)
Cases for this item 129 Discrimination 0.69
Item Threshold(s): 2.10 Weighted MNSQ 1.06
Item Delta(s): 2.10

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	85	65.89	-0.69	-10.82(.000)	-0.84	2.29
1	1.00	44	34.11	0.69	10.82(.000)	3.58	1.94

Item 75
----
item:75 (CE4_12)
Cases for this item 129 Discrimination 0.53
Item Threshold(s): 5.00 Weighted MNSQ 0.73
Item Delta(s): 5.00

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	115	89.15	-0.53	-7.01(.000)	0.08	2.59
1	1.00	14	10.85	0.53	7.01(.000)	5.48	1.70

Item 76
----
item:76 (CE4_14)
Cases for this item 129 Discrimination 0.55
Item Threshold(s): 4.58 Weighted MNSQ 0.81
Item Delta(s): 4.59

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	112	86.82	-0.55	-7.41(.000)	-0.02	2.55
1	1.00	17	13.18	0.55	7.41(.000)	5.17	1.74

Item 77
----
item:77 (CE5_1)
Cases for this item 118 Discrimination 0.82
Item Threshold(s): 0.55 Weighted MNSQ 0.74
Item Delta(s): 0.55

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	61	51.69	-0.82	-15.26(.000)	-1.82	1.74
1	1.00	57	48.31	0.82	15.26(.000)	2.92	1.86

Item 78
----
item:78 (CE5_3)
Cases for this item 122 Discrimination 0.79
Item Threshold(s): 0.75 Weighted MNSQ 0.86
Item Delta(s): 0.75

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	64	52.46	-0.79	-14.27(.000)	-1.65	1.93
1	1.00	58	47.54	0.79	14.27(.000)	2.96	1.78

Item 79
----
item:79 (CE5_5)
Cases for this item 122 Discrimination 0.77
Item Threshold(s): 2.03 Weighted MNSQ 0.78
Item Delta(s): 2.03

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	80	65.57	-0.77	-13.15(.000)	-1.03	2.19
1	1.00	42	34.43	0.77	13.15(.000)	3.54	1.60

Item 80
----
item:80 (CE5_7)
Cases for this item 125 Discrimination 0.65
Item Threshold(s): 3.36 Weighted MNSQ 0.73
Item Delta(s): 3.36

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	97	77.60	-0.65	-9.43(.000)	-0.44	2.42
1	1.00	28	22.40	0.65	9.43(.000)	4.48	1.71

Item 81
----
item:81 (CE6_3)
Cases for this item 119 Discrimination 0.73
Item Threshold(s): 0.15 Weighted MNSQ 1.18
Item Delta(s): 0.15

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	57	47.90	-0.73	-11.61(.000)	-1.77	1.98
1	1.00	62	52.10	0.73	11.61(.000)	2.49	2.14

Item 82
----
item:82 (CE6_4)
Cases for this item 120 Discrimination 0.75
Item Threshold(s): 0.47 Weighted MNSQ 0.92
Item Delta(s): 0.47

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	61	50.83	-0.75	-12.43(.000)	-1.71	1.94
1	1.00	59	49.17	0.75	12.43(.000)	2.70	1.98

Item 83
----
item:83 (CE6_7)
Cases for this item 121 Discrimination 0.77
Item Threshold(s): 1.80 Weighted MNSQ 0.82
Item Delta(s): 1.80

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	78	64.46	-0.77	-13.18(.000)	-1.18	2.04
1	1.00	43	35.54	0.77	13.18(.000)	3.46	1.70

Item 84
----
item:84 (CE6_10)
Cases for this item 125 Discrimination 0.74
Item Threshold(s): 2.47 Weighted MNSQ 0.74
Item Delta(s): 2.47

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	87	69.60	-0.74	-12.08(.000)	-0.80	2.29
1	1.00	38	30.40	0.74	12.08(.000)	3.91	1.88

Item 85
----
item:85 (CE6_11)
Cases for this item 125 Discrimination 0.74
Item Threshold(s): 2.35 Weighted MNSQ 0.85
Item Delta(s): 2.35

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	86	68.80	-0.74	-12.12(.000)	-0.84	2.32
1	1.00	39	31.20	0.74	12.12(.000)	3.66	1.41

Item 86
----
item:86 (CE6_13)
Cases for this item 125 Discrimination 0.60
Item Threshold(s): 3.98 Weighted MNSQ 0.88
Item Delta(s): 3.98

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	104	83.20	-0.60	-8.27(.000)	-0.21	2.56
1	1.00	21	16.80	0.60	8.27(.000)	4.37	1.43

Item 87
----
item:87 (CE6_14)
Cases for this item 125 Discrimination 0.62
Item Threshold(s): 3.76 Weighted MNSQ 0.78
Item Delta(s): 3.76

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	102	81.60	-0.62	-8.82(.000)	-0.32	2.46
1	1.00	23	18.40	0.62	8.82(.000)	4.48	1.23

Item 88
----
item:88 (CE6_15)
Cases for this item 126 Discrimination 0.51
Item Threshold(s): 4.99 Weighted MNSQ 0.88
Item Delta(s): 4.99

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	112	88.89	-0.51	-6.52(.000)	0.06	2.66
1	1.00	14	11.11	0.51	6.52(.000)	5.30	1.88

```
--------------------------------------------------------------------------------
The following traditional statistics are only meaningful for complete
designs and when the amount of missing data is minimal.
In this analysis  6.36%  of the data are missing.

The following results are scaled to assume that a single response
was provided for each item.

N                              131
Mean                         41.62
Standard Deviation           24.18
Variance                    584.69
Skewness                      0.18
Kurtosis                     -1.25
Standard error of mean        2.11
Standard error of measurement 3.34
Coefficient Alpha             0.98
================================================================================
```

APPENDIX P: FINAL INSTRUMENT OUTPUT FILES - VOCABULARY

```
Communication-Vocabulary
================================================================================
ConQuest: Generalised Item Response Modelling Software     Fri Jan 18 19:48 2019
SUMMARY OF THE ESTIMATION
================================================================================

Estimation method was: Gauss-Hermite Quadrature with 15 nodes
Assumed population distribution was: Gaussian
Constraint was: CASES
The Data File: testSPSS\comb.txt
The format:  responses 3, 4, 5, 8, 10, 11, 12, 14, 16, 17, 18, 21, 23, 24, 26, 27,
28, 30, 33, 34, 35, 39, 40, 41, 42, 43, 48, 49, 50, 52, 54, 55, 57, 58, 60, 61,
64, 65, 67, 70, 71, 72, 73, 75, 76, 77, 79, 80, 82, 83, 84, 85, 86, 87, 88, 90,
91, 92, 93, 94, 95, 97, 98, 99, 100, 101, 102, 103, 105, 106, 107, 113, 148, 151,
153, 154, 160
The regression model:
Grouping Variables:
The item model: items
Slopes are fixed
Sample size: 298
Final Deviance:     5866.58932
Total number of estimated parameters: 78
The number of iterations: 14
Termination criteria:  Max iterations=1000, Parameter Change= 0.00010
                       Deviance Change= 0.00010
Iterations terminated because the convergence criteria were reached
At termination the solution was not the best attained solution
The reported results are for the earlier better solution
Rerunning this analysis using the current estimates as initial values is strongly
advised.
Random number generation seed:    1.00000
Number of nodes used when drawing PVs: 2000
Number of nodes used when computing fit: 200
Number of plausible values to draw: 5
Maximum number of iterations without a deviance improvement: 100
Maximum number of Newton steps in M-step: 10
Value for obtaining finite MLEs for zero/perfects:    0.30000

================================================================================
```

==
ConQuest: Generalised Item Response Modelling Software   Fri Jan 18 19:48 2019
TABLES OF RESPONSE MODEL PARAMETER ESTIMATES
==
TERM 1: items

	VARIABLES item	ESTIMATE	ERROR^	UNWEIGHTED FIT MNSQ	UNWEIGHTED FIT CI	UNWEIGHTED FIT T	WEIGHTED FIT MNSQ	WEIGHTED FIT CI	WEIGHTED FIT T
1	CL_09	-0.398	0.292	0.46	(0.75, 1.25)	-5.4	0.84	(0.70, 1.30)	-1.1
2	CL_10	1.233	0.327	1.46	(0.76, 1.25)	3.3	1.16	(0.68, 1.32)	1.0
3	CL_11	0.385	0.298	0.47	(0.76, 1.25)	-5.3	0.91	(0.70, 1.30)	-0.6
4	CL_14	2.694	0.354	1.00	(0.76, 1.25)	0.0	1.34	(0.62, 1.38)	1.7
5	CL_16	1.877	0.345	0.69	(0.76, 1.25)	-2.8	1.22	(0.66, 1.34)	1.2
6	CL_17	3.064	0.362	1.20	(0.76, 1.25)	1.5	1.54	(0.60, 1.40)	2.3
7	CL08_1	-2.572	0.326	3.10	(0.75, 1.25)	10.7	1.58	(0.64, 1.36)	2.8
8	CL08_3	-0.972	0.308	0.66	(0.75, 1.25)	-3.0	0.96	(0.67, 1.33)	-0.2
9	CL08_5	0.674	0.312	0.42	(0.75, 1.25)	-6.0	0.82	(0.69, 1.31)	-1.2
10	CL08_6	2.868	0.354	0.42	(0.75, 1.25)	-5.9	0.86	(0.62, 1.38)	-0.7
11	CL08_7	2.875	0.353	0.50	(0.75, 1.25)	-4.8	0.90	(0.62, 1.38)	-0.5
12	CL09_3	0.346	0.301	1.33	(0.75, 1.25)	2.4	1.21	(0.70, 1.30)	1.3
13	CL09_5	1.507	0.337	0.39	(0.75, 1.25)	-6.3	0.78	(0.68, 1.32)	-1.4
14	CL09_6	1.961	0.343	0.46	(0.75, 1.25)	-5.4	0.88	(0.67, 1.33)	-0.7
15	CL09_8	4.249	0.423	0.49	(0.76, 1.25)	-5.0	0.97	(0.50, 1.50)	-0.0
16	CL10_01	-2.660	0.325	5.32	(0.75, 1.25)	17.7	1.47	(0.64, 1.36)	2.3
17	CL10_02	-0.946	0.310	1.21	(0.75, 1.25)	1.6	0.80	(0.66, 1.34)	-1.1
18	CL10_04	-0.055	0.298	0.69	(0.75, 1.25)	-2.7	0.97	(0.69, 1.31)	-0.1
19	CL10_07	-0.813	0.301	0.57	(0.75, 1.25)	-4.0	0.90	(0.67, 1.33)	-0.6
20	CL10_08	-0.225	0.291	0.55	(0.75, 1.25)	-4.3	0.87	(0.70, 1.30)	-0.9
21	CL10_09	0.923	0.314	0.62	(0.76, 1.25)	-3.4	0.90	(0.70, 1.30)	-0.6
22	CL10_13	1.633	0.337	1.05	(0.76, 1.25)	0.5	1.47	(0.68, 1.32)	2.6
23	CL10_14	3.002	0.354	0.52	(0.76, 1.25)	-4.7	1.09	(0.61, 1.39)	0.5
24	CL10_15	3.636	0.378	1.17	(0.76, 1.24)	1.3	1.14	(0.56, 1.44)	0.7
25	CL10_16	4.820	0.476	13.30	(0.76, 1.24)	33.0	1.32	(0.44, 1.56)	1.1
26	CL11_1	-6.342	0.391	0.85	(0.75, 1.25)	-1.2	1.01	(0.56, 1.44)	0.1
27	CL11_6	-3.180	0.321	1.31	(0.75, 1.25)	2.3	1.20	(0.64, 1.36)	1.1
28	CL11_7	-1.712	0.317	1.02	(0.76, 1.24)	0.2	1.29	(0.65, 1.35)	1.5
29	CL11_8	0.856	0.309	1.46	(0.76, 1.24)	3.3	1.35	(0.70, 1.30)	2.1
30	CL12_01	-5.727	0.388	0.76	(0.75, 1.25)	-2.1	1.08	(0.59, 1.41)	0.4
31	CL12_03	-3.333	0.321	3.43	(0.75, 1.25)	12.2	1.42	(0.64, 1.36)	2.1
32	CL12_04	-1.679	0.318	0.99	(0.75, 1.25)	-0.0	1.28	(0.65, 1.35)	1.5
33	CL12_06	-0.093	0.288	0.40	(0.76, 1.25)	-6.3	0.77	(0.70, 1.30)	-1.6
34	CL12_07	0.677	0.303	0.38	(0.76, 1.25)	-6.5	0.75	(0.70, 1.30)	-1.7
35	CL12_09	2.647	0.347	0.42	(0.76, 1.24)	-6.0	1.02	(0.64, 1.36)	0.2
36	CL12_10	4.617	0.457	0.24	(0.76, 1.24)	-9.1	0.73	(0.46, 1.54)	-1.0
37	CL12_13	5.279	0.516	0.88	(0.76, 1.24)	-1.0	1.12	(0.38, 1.62)	0.5
38	CL13_1	-5.997	0.381	4.78	(0.75, 1.25)	16.1	1.95	(0.60, 1.40)	3.7
39	CL13_3	-2.861	0.323	0.97	(0.75, 1.25)	-0.2	0.94	(0.65, 1.35)	-0.3
40	CL13_6	-2.923	0.317	0.75	(0.75, 1.25)	-2.1	0.94	(0.65, 1.35)	-0.3
41	CL13_7	-1.082	0.306	1.76	(0.75, 1.25)	5.0	1.30	(0.67, 1.33)	1.7
42	CL13_8	-0.010	0.294	1.21	(0.76, 1.25)	1.6	1.49	(0.70, 1.30)	2.8
43	CL13_9	1.047	0.316	1.27	(0.76, 1.24)	2.1	1.37	(0.69, 1.31)	2.2
44	CL14_2	-2.181	0.327	1.29	(0.75, 1.25)	2.2	1.36	(0.64, 1.36)	1.8
45	CL14_3	0.120	0.293	1.05	(0.75, 1.25)	0.4	1.11	(0.70, 1.30)	0.7
46	CL14_4	1.525	0.334	0.42	(0.76, 1.25)	-6.0	0.86	(0.68, 1.32)	-0.8
47	CL14_6	3.926	0.397	0.26	(0.76, 1.25)	-8.7	0.83	(0.54, 1.46)	-0.7
48	CL14_7	5.278	0.516	0.11	(0.76, 1.25)	-12.4	0.68	(0.38, 1.62)	-1.0
49	CL15_1	-6.967	0.415	0.79	(0.75, 1.25)	-1.7	0.93	(0.51, 1.49)	-0.2
50	CL15_2	-5.150	0.376	1.03	(0.75, 1.25)	0.3	0.95	(0.61, 1.39)	-0.2
51	CL15_3	-3.527	0.320	77.41	(0.75, 1.25)	78.0	1.02	(0.64, 1.36)	0.1
52	CL15_4	0.079	0.289	0.92	(0.76, 1.25)	-0.6	1.25	(0.71, 1.29)	1.6
53	CL15_5	0.243	0.291	0.53	(0.76, 1.24)	-4.6	0.91	(0.71, 1.29)	-0.6
54	CL15_6	2.770	0.349	1.40	(0.76, 1.24)	2.9	1.36	(0.63, 1.37)	1.8
55	CL15_7	2.305	0.344	0.54	(0.76, 1.24)	-4.5	0.96	(0.66, 1.34)	-0.2
56	CL16_2	0.903	0.318	0.70	(0.75, 1.25)	-2.6	1.05	(0.69, 1.31)	0.4
57	CL16_3	2.204	0.351	0.69	(0.75, 1.25)	-2.7	1.20	(0.65, 1.35)	1.1
58	CL16_4	1.205	0.330	1.26	(0.75, 1.25)	1.9	1.19	(0.68, 1.32)	1.1
59	CL16_5	-0.853	0.300	0.66	(0.75, 1.25)	-3.1	1.04	(0.67, 1.33)	0.3
60	CL16_6	2.523	0.347	0.70	(0.75, 1.25)	-2.6	0.93	(0.65, 1.35)	-0.4
61	CL16_7	3.926	0.397	1.17	(0.75, 1.25)	1.3	1.03	(0.54, 1.46)	0.2
62	CL16_9	5.535	0.535	4.98	(0.75, 1.25)	17.0	1.20	(0.34, 1.66)	0.7
63	CL17_1	-0.830	0.313	2.00	(0.74, 1.26)	6.0	1.04	(0.65, 1.35)	0.3
64	CL17_2	1.693	0.352	17.95	(0.75, 1.25)	37.6	1.12	(0.67, 1.33)	0.7
65	CL17_3	2.615	0.351	0.81	(0.75, 1.25)	-1.6	1.07	(0.64, 1.36)	0.5
66	CL17_4	3.768	0.388	1.59	(0.75, 1.25)	4.0	1.41	(0.55, 1.45)	1.7
67	CL17_5	5.035	0.497	3.24	(0.75, 1.25)	11.3	1.23	(0.41, 1.59)	0.8
68	CL18_1	-6.848	0.402	7.27	(0.75, 1.25)	22.0	1.42	(0.54, 1.46)	1.6
69	CL18_3	-1.794	0.320	0.60	(0.76, 1.25)	-3.7	0.77	(0.64, 1.36)	-1.4
70	CL18_4	-0.350	0.288	0.44	(0.76, 1.24)	-5.7	0.83	(0.70, 1.30)	-1.2

```
 71  CL18_5          2.193   0.343    0.94 ( 0.76, 1.24) -0.4   1.31 ( 0.66, 1.34)  1.7
 72  CL_6           -2.287   0.323   66.69 ( 0.75, 1.25) 73.1   1.43 ( 0.64, 1.36)  2.1
 73  CL4_05         -2.209   0.328    0.22 ( 0.75, 1.25) -9.4   0.51 ( 0.63, 1.37) -3.2
 74  CL4_08         -1.107   0.303    0.36 ( 0.76, 1.24) -7.0   0.73 ( 0.67, 1.33) -1.7
 75  CL4_10          2.186   0.345    0.90 ( 0.76, 1.24) -0.8   1.26 ( 0.66, 1.34)  1.4
 76  CL4_11          0.292   0.295    0.38 ( 0.76, 1.24) -6.6   0.79 ( 0.70, 1.30) -1.4
 77  CL5_05         -4.484   0.353    6.34 ( 0.75, 1.25) 20.1   0.85 ( 0.63, 1.37) -0.7
-------------------------------------------------------------------------------
An asterisk next to a parameter estimate indicates that it is constrained
Separation Reliability =  0.986
Chi-square test of parameter equality =    4630.77,  df = 77,  Sig Level = 0.000
^ Quick standard errors have been used
===============================================================================


================================================================================
ConQuest: Generalised Item Response Modelling Software     Fri Jan 18 19:48 2019
TABLES OF POPULATION MODEL PARAMETER ESTIMATES
================================================================================
REGRESSION COEFFICIENTS



Regression Variable

CONSTANT                    0.000*
-------------------------------------------------
An asterisk next to a parameter estimate indicates that it is constrained
=================================================
COVARIANCE/CORRELATION MATRIX



Dimension

Dimension 1
-------------------------------------------
Variance                  14.391  ( 1.179)
-------------------------------------------
An asterisk next to a parameter estimate indicates that it is constrained

===========================================

RELIABILITY COEFFICIENTS
------------------------

Dimension: (Dimension 1)
------------------------
 MLE Person separation RELIABILITY:  Unavailable
 WLE Person separation RELIABILITY:   0.978
 EAP/PV RELIABILITY:                  0.458
------------------------
```

```
================================================================================
ConQuest: Generalised Item Response Modelling Software     Fri Jan 18 19:48 2019
MAP OF WLE ESTIMATES AND RESPONSE MODEL PARAMETER ESTIMATES
================================================================================
                                     Terms in the Model (excl Step terms)

                                                                    +items
--------------------------------------------------------------------------------
  15                                        |                                   |
                                            |                                   |
  14                                        |                                   |
                                            |                                   |
  13                                        |                                   |
                                            |                                   |
  12                                        |                                   |
                                            |                                   |
  11                                        |                                   |
  10                                        |                                   |
                                            |                                   |
   9                                        |                                   |
                                            |                                   |
   8                                  XXXX  |                                   |
                                            |                                   |
   7                                  XXXX  |                                   |
                                      XXXX  |                                   |
   6                                        |                                   |
   5                              XXXXXXXX  |37 48 62 67                        |
                            XXXXXXXXXXXXXXXX|25 36                              |
   4                              XXXXXXXX  |15 47 61                           |
                                  XXXXXXXX  |24 66                              |
   3          XXXXXXXXXXXXXXXXXXXXXXXXXXXXX|6 10 11 23                         |
                                  XXXXXXXX  |4 35 54 55 60 65                   |
   2      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|5 14 57 71 75                      |
                     XXXXXXXXXXXXXXXXXXXXXX|2 13 22 46 58 64                   |
   1                 XXXXXXXXXXXXXXXXXXXXXX|9 21 29 34 43 56                   |
         XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|3 12 45 52 53 76                   |
   0  XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|1 18 20 33 42 70                    |
  -1              XXXXXXXXXXXXXXXXXXXXXXXX|8 17 19 59 63                     |
                         XXXXXXXXXXXXXXXX|41 74                              |
  -2                   XXXXXXXXXXXXXXXXXX|28 32 69                           |
                       XXXXXXXXXXXXXXXXXX|7 16 44 72 73                      |
  -3          XXXXXXXXXXXXXXXXXXXXXXXXXXX|27 39 40                           |
                  XXXXXXXXXXXXXXXXXXXXXXX|31 51                              |
  -4                           XXXXXXXXXX|                                   |
                                  XXXXXXXX|77                                 |
  -5                XXXXXXXXXXXXXXXXXXXXX|50                                 |
  -6              XXXXXXXXXXXXXXXXXXXXXXX|30 38                              |
                               XXXXXXXXXX|26                                 |
  -7                   XXXXXXXXXXXXXXXXXX|49 68                              |
                                         |                                   |
  -8                           XXXXXXXXXX|                                   |
                                         |                                   |
  -9                           XXXXXXXXXX|                                   |
                                         |                                   |
  -10                                    |                                   |
                                         |                                   |
  -11                                    |                                   |
  -12                                    |                                   |
                                         |                                   |
  -13                                    |                                   |
                                         |                                   |
  -14                                    |                                   |
                                         |                                   |
  -15                                    |                                   |
                                         |                                   |
  -16                                    |                                   |
  -17                                    |                                   |
                                         |                                   |
================================================================================
Each 'X' represents   0.3 cases

================================================================================
```

```
================================================================================
ConQuest: Generalised Item Response Modelling Software     Fri Jan 18 19:48 2019
MAP OF WLE ESTIMATES AND THRESHOLDS
================================================================================
                              Generalised-Item Thresholds

--------------------------------------------------------------------------------
  15            |
                |
  14            |
                |
  13            |
                |
  12            |
                |
  11            |
  10            |
                |
   9            |
                |
   8           X|
                |
   7           X|
               X|
   6            |
   5          XX|37 48 62 67
            XXXX|25 36
   4          XX|15 47 61
              XX|24 66
   3    XXXXXXXX|6 10 11 23
              XX|4 35 54 55 60 65
   2   XXXXXXXXX|5 14 57 71 75
         XXXXXX|2 13 22 46 58 64
   1      XXXXXX|9 21 29 34 43 56
      XXXXXXXXX|3 12 45 52 53 76
   0  XXXXXXXXXX|1 18 20 33 42 70
  -1     XXXXXXX|8 17 19 59 63
            XXXX|41 74
  -2        XXXXX|28 32 69
           XXXXX|7 16 44 72 73
  -3    XXXXXXXX|27 39 40
        XXXXXXX|31 51
  -4         XXX|
              XX|77
  -5       XXXXXX|50
  -6     XXXXXXX|30 38
             XXX|26
  -7       XXXXX|49 68
                |
  -8          XXX|
                |
  -9          XXX|
                |
  -10           |
                |
  -11           |
  -12           |
                |
  -13           |
                |
  -14           |
                |
  -15           |
                |
  -16           |
  -17           |
                |
================================================================================
Each 'X' represents   1.0 cases
The labels for thresholds show the levels of
    item, and category, respectively
```

```
================================================================================
ConQuest: Generalised Item Response Modelling Software     Fri Jan 18 19:48 2019
GENERALISED ITEM ANALYSIS
================================================================================
Item 1
------
item:1 (CL_09)
Cases for this item    126   Discrimination  0.79
Item Threshold(s):    -0.40   Weighted MNSQ   0.84
Item Delta(s):        -0.40
--------------------------------------------------------------------------------
 Label    Score     Count   % of tot  Pt Bis     t  (p)    PV1Avg:1 PV1 SD:1
--------------------------------------------------------------------------------
   0       0.00       71      56.35   -0.79   -14.55(.000) -3.73     2.75
   1       1.00       55      43.65    0.79    14.55(.000)  2.09     2.30
================================================================================

Item 2
------
item:2 (CL_10)
Cases for this item    128   Discrimination  0.68
Item Threshold(s):     1.23   Weighted MNSQ   1.16
Item Delta(s):         1.23
--------------------------------------------------------------------------------
 Label    Score     Count   % of tot  Pt Bis     t  (p)    PV1Avg:1 PV1 SD:1
--------------------------------------------------------------------------------
   0       0.00       91      71.09   -0.68   -10.50(.000) -2.85     3.23
   1       1.00       37      28.91    0.68    10.50(.000)  2.61     2.48
================================================================================

Item 3
------
item:3 (CL_11)
Cases for this item    128   Discrimination  0.77
Item Threshold(s):     0.38   Weighted MNSQ   0.91
Item Delta(s):         0.38
--------------------------------------------------------------------------------
 Label    Score     Count   % of tot  Pt Bis     t  (p)    PV1Avg:1 PV1 SD:1
--------------------------------------------------------------------------------
   0       0.00       82      64.06   -0.77   -13.65(.000) -3.38     2.94
   1       1.00       46      35.94    0.77    13.65(.000)  2.48     2.26
================================================================================

Item 4
------
item:4 (CL_14)
Cases for this item    128   Discrimination  0.60
Item Threshold(s):     2.69   Weighted MNSQ   1.34
Item Delta(s):         2.69
--------------------------------------------------------------------------------
 Label    Score     Count   % of tot  Pt Bis     t  (p)    PV1Avg:1 PV1 SD:1
--------------------------------------------------------------------------------
   0       0.00      104      81.25   -0.60    -8.33(.000) -2.34     3.39
   1       1.00       24      18.75    0.60     8.33(.000)  3.34     2.43
================================================================================

Item 5
------
item:5 (CL_16)
Cases for this item    128   Discrimination  0.66
Item Threshold(s):     1.88   Weighted MNSQ   1.22
Item Delta(s):         1.88
--------------------------------------------------------------------------------
 Label    Score     Count   % of tot  Pt Bis     t  (p)    PV1Avg:1 PV1 SD:1
--------------------------------------------------------------------------------
   0       0.00       97      75.78   -0.66    -9.89(.000) -2.63     3.28
   1       1.00       31      24.22    0.66     9.89(.000)  2.98     2.41
================================================================================

Item 6
------
item:6 (CL_17)
Cases for this item    128   Discrimination  0.54
Item Threshold(s):     3.06   Weighted MNSQ   1.54
Item Delta(s):         3.06
--------------------------------------------------------------------------------
 Label    Score     Count   % of tot  Pt Bis     t  (p)    PV1Avg:1 PV1 SD:1
--------------------------------------------------------------------------------
   0       0.00      107      83.59   -0.54    -7.12(.000) -2.16     3.49
   1       1.00       21      16.41    0.54     7.12(.000)  3.26     2.62
================================================================================

Item 7
------
item:7 (CL08_1)
Cases for this item    121   Discrimination  0.62
Item Threshold(s):    -2.57   Weighted MNSQ   1.58
Item Delta(s):        -2.57
--------------------------------------------------------------------------------
 Label    Score     Count   % of tot  Pt Bis     t  (p)    PV1Avg:1 PV1 SD:1
--------------------------------------------------------------------------------
   0       0.00       48      39.67   -0.62    -8.63(.000) -4.44     3.01
   1       1.00       73      60.33    0.62     8.63(.000)  0.58     3.00
================================================================================

Item 8
------
item:8 (CL08_3)
Cases for this item    121   Discrimination  0.77
Item Threshold(s):    -0.97   Weighted MNSQ   0.96
Item Delta(s):        -0.97
--------------------------------------------------------------------------------
 Label    Score     Count   % of tot  Pt Bis     t  (p)    PV1Avg:1 PV1 SD:1
--------------------------------------------------------------------------------
   0       0.00       64      52.89   -0.77   -13.18(.000) -4.09     2.84
   1       1.00       57      47.11    0.77    13.18(.000)  1.60     2.39
================================================================================
```

Item 9
------
item:9 (CL08_5)
Cases for this item 125 Discrimination 0.79
Item Threshold(s): 0.67 Weighted MNSQ 0.82
Item Delta(s): 0.67

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	82	65.60	-0.79	-14.50(.000)	-3.28	2.99
1	1.00	43	34.40	0.79	14.50(.000)	2.67	2.18

Item 10
----
item:10 (CL08_6)
Cases for this item 125 Discrimination 0.68
Item Threshold(s): 2.87 Weighted MNSQ 0.86
Item Delta(s): 2.87

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	102	81.60	-0.68	-10.21(.000)	-2.37	3.30
1	1.00	23	18.40	0.68	10.21(.000)	3.82	2.21

Item 11
----
item:11 (CL08_7)
Cases for this item 126 Discrimination 0.66
Item Threshold(s): 2.88 Weighted MNSQ 0.90
Item Delta(s): 2.87

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	103	81.75	-0.66	-9.70(.000)	-2.34	3.30
1	1.00	23	18.25	0.66	9.70(.000)	3.82	2.21

Item 12
----
item:12 (CL09_3)
Cases for this item 124 Discrimination 0.72
Item Threshold(s): 0.35 Weighted MNSQ 1.21
Item Delta(s): 0.35

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	79	63.71	-0.72	-11.36(.000)	-3.24	3.22
1	1.00	45	36.29	0.72	11.36(.000)	2.20	2.35

Item 13
----
item:13 (CL09_5)
Cases for this item 126 Discrimination 0.76
Item Threshold(s): 1.51 Weighted MNSQ 0.78
Item Delta(s): 1.51

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	91	72.22	-0.76	-12.86(.000)	-2.85	3.13
1	1.00	35	27.78	0.76	12.86(.000)	3.11	2.20

Item 14
----
item:14 (CL09_6)
Cases for this item 127 Discrimination 0.72
Item Threshold(s): 1.96 Weighted MNSQ 0.88
Item Delta(s): 1.96

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	96	75.59	-0.72	-11.60(.000)	-2.63	3.21
1	1.00	31	24.41	0.72	11.60(.000)	3.29	2.17

Item 15
----
item:15 (CL09_8)
Cases for this item 128 Discrimination 0.55
Item Threshold(s): 4.25 Weighted MNSQ 0.97
Item Delta(s): 4.25

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	114	89.06	-0.55	-7.40(.000)	-1.86	3.48
1	1.00	14	10.94	0.55	7.40(.000)	4.68	2.36

Item 16
----
item:16 (CL10_01)
Cases for this item 124 Discrimination 0.66
Item Threshold(s): -2.66 Weighted MNSQ 1.47
Item Delta(s): -2.66

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	48	38.71	-0.66	-9.64(.000)	-4.62	2.95
1	1.00	76	61.29	0.66	9.64(.000)	0.84	2.94

Item 17
----
item:17 (CL10_02)
Cases for this item 124 Discrimination 0.80
Item Threshold(s): -0.95 Weighted MNSQ 0.80
Item Delta(s): -0.95

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	65	52.42	-0.80	-14.56(.000)	-4.12	2.83
1	1.00	59	47.58	0.80	14.56(.000)	1.86	2.32

Item 18
----
item:18 (CL10_04)
Cases for this item 125 Discrimination 0.77
Item Threshold(s): -0.05 Weighted MNSQ 0.97
Item Delta(s): -0.05

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	75	60.00	-0.77	-13.55(.000)	-3.56	2.99
1	1.00	50	40.00	0.77	13.55(.000)	2.14	2.46

Item 19
----
item:19 (CL10_07)
Cases for this item 126 Discrimination 0.79
Item Threshold(s): -0.81 Weighted MNSQ 0.90
Item Delta(s): -0.81

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	67	53.17	-0.79	-14.20(.000)	-4.03	2.79
1	1.00	59	46.83	0.79	14.20(.000)	1.88	2.38

Item 20
----
item:20 (CL10_08)
Cases for this item 127 Discrimination 0.78
Item Threshold(s): -0.22 Weighted MNSQ 0.87
Item Delta(s): -0.22

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	74	58.27	-0.78	-14.13(.000)	-3.67	2.91
1	1.00	53	41.73	0.78	14.13(.000)	2.12	2.37

Item 21
----
item:21 (CL10_09)
Cases for this item 128 Discrimination 0.76
Item Threshold(s): 0.92 Weighted MNSQ 0.90
Item Delta(s): 0.92

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	87	67.97	-0.76	-13.05(.000)	-3.06	3.13
1	1.00	41	32.03	0.76	13.05(.000)	2.68	2.24

Item 22
----
item:22 (CL10_13)
Cases for this item 128 Discrimination 0.63
Item Threshold(s): 1.63 Weighted MNSQ 1.47
Item Delta(s): 1.63

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	94	73.44	-0.63	-9.17(.000)	-2.58	3.44
1	1.00	34	26.56	0.63	9.17(.000)	2.53	2.49

Item 23
----
item:23 (CL10_14)
Cases for this item 128 Discrimination 0.63
Item Threshold(s): 3.00 Weighted MNSQ 1.09
Item Delta(s): 3.00

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	106	82.81	-0.63	-9.18(.000)	-2.23	3.40
1	1.00	22	17.19	0.63	9.18(.000)	3.64	2.35

Item 24
----
item:24 (CL10_15)
Cases for this item 129 Discrimination 0.56
Item Threshold(s): 3.64 Weighted MNSQ 1.14
Item Delta(s): 3.64

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	111	86.05	-0.56	-7.62(.000)	-2.00	3.49
1	1.00	18	13.95	0.56	7.62(.000)	3.92	2.56

Item 25
----
item:25 (CL10_16)
Cases for this item 129 Discrimination 0.43
Item Threshold(s): 4.82 Weighted MNSQ 1.32
Item Delta(s): 4.82

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	118	91.47	-0.43	-5.42(.000)	-1.68	3.61
1	1.00	11	8.53	0.43	5.42(.000)	4.31	3.32

Item 26
----
item:26 (CL11_1)
Cases for this item 123 Discrimination 0.44
Item Threshold(s): -6.34 Weighted MNSQ 1.01
Item Delta(s): -6.34

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	16	13.01	-0.44	-5.40(.000)	-6.95	2.39
1	1.00	107	86.99	0.44	5.40(.000)	-0.37	3.38

Item 27
----
item:27 (CL11_6)
Cases for this item 127 Discrimination 0.65
Item Threshold(s): -3.18 Weighted MNSQ 1.20
Item Delta(s): -3.18

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	42	33.07	-0.65	-9.60(.000)	-5.15	2.69
1	1.00	85	66.93	0.65	9.60(.000)	0.79	2.78

Item 28
----
item:28 (CL11_7)
Cases for this item 129 Discrimination 0.72
Item Threshold(s): -1.71 Weighted MNSQ 1.29
Item Delta(s): -1.71

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	57	44.19	-0.72	-11.60(.000)	-4.32	2.82
1	1.00	72	55.81	0.72	11.60(.000)	1.41	2.57

Item 29
----
item:29 (CL11_8)
Cases for this item 129 Discrimination 0.66
Item Threshold(s): 0.86 Weighted MNSQ 1.35
Item Delta(s): 0.86

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	86	66.67	-0.66	-10.02(.000)	-2.86	3.27
1	1.00	43	33.33	0.66	10.02(.000)	2.34	2.55

Item 30
----
item:30 (CL12_01)
Cases for this item 127 Discrimination 0.49
Item Threshold(s): -5.73 Weighted MNSQ 1.08
Item Delta(s): -5.73

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	20	15.75	-0.49	-6.23(.000)	-6.65	2.27
1	1.00	107	84.25	0.49	6.23(.000)	-0.14	3.25

Item 31
----
item:31 (CL12_03)
Cases for this item 127 Discrimination 0.59
Item Threshold(s): -3.33 Weighted MNSQ 1.42
Item Delta(s): -3.33

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	40	31.50	-0.59	-8.26(.000)	-5.04	3.03
1	1.00	87	68.50	0.59	8.26(.000)	0.61	2.85

Item 32
----
item:32 (CL12_04)
Cases for this item 127 Discrimination 0.72
Item Threshold(s): -1.68 Weighted MNSQ 1.28
Item Delta(s): -1.68

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	57	44.88	-0.72	-11.55(.000)	-4.30	2.85
1	1.00	70	55.12	0.72	11.55(.000)	1.38	2.59

Item 33
----
item:33 (CL12_06)
Cases for this item 128 Discrimination 0.79
Item Threshold(s): -0.09 Weighted MNSQ 0.77
Item Delta(s): -0.09

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	75	58.59	-0.79	-14.61(.000)	-3.60	2.87
1	1.00	53	41.41	0.79	14.61(.000)	2.26	2.22

Item 34
----
item:34 (CL12_07)
Cases for this item 128 Discrimination 0.78
Item Threshold(s): 0.68 Weighted MNSQ 0.75
Item Delta(s): 0.68

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	84	65.63	-0.78	-14.06(.000)	-3.18	3.02
1	1.00	44	34.38	0.78	14.06(.000)	2.66	2.13

Item 35
----
item:35 (CL12_09)
Cases for this item 129 Discrimination 0.66
Item Threshold(s): 2.65 Weighted MNSQ 1.02
Item Delta(s): 2.65

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	103	79.84	-0.66	-9.87(.000)	-2.32	3.30
1	1.00	26	20.16	0.66	9.87(.000)	3.62	2.21

Item 36
----
item:36 (CL12_10)
Cases for this item 129 Discrimination 0.54
Item Threshold(s): 4.62 Weighted MNSQ 0.73
Item Delta(s): 4.62

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	117	90.70	-0.54	-7.31(.000)	-1.77	3.46
1	1.00	12	9.30	0.54	7.31(.000)	5.17	2.21

Item 37
----
item:37 (CL12_13)
Cases for this item 129 Discrimination 0.45
Item Threshold(s): 5.28 Weighted MNSQ 1.12
Item Delta(s): 5.28

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	120	93.02	-0.45	-5.72(.000)	-1.60	3.58
1	1.00	9	6.98	0.45	5.72(.000)	5.16	2.74

Item 38
----
item:38 (CL13_1)
Cases for this item 122 Discrimination 0.40
Item Threshold(s): -6.00 Weighted MNSQ 1.95
Item Delta(s): -6.00

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	19	15.57	-0.40	-4.71(.000)	-5.58	2.81
1	1.00	103	84.43	0.40	4.71(.000)	-0.67	3.46

Item 39
----
item:39 (CL13_3)
Cases for this item 124 Discrimination 0.71
Item Threshold(s): -2.86 Weighted MNSQ 0.94
Item Delta(s): -2.86

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	46	37.10	-0.71	-11.15(.000)	-5.16	2.54
1	1.00	78	62.90	0.71	11.15(.000)	0.99	2.67

Item 40
----
item:40 (CL13_6)
Cases for this item 127 Discrimination 0.71
Item Threshold(s): -2.92 Weighted MNSQ 0.94
Item Delta(s): -2.92

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	46	36.22	-0.71	-11.21(.000)	-5.20	2.42
1	1.00	81	63.78	0.71	11.21(.000)	0.93	2.67

Item 41
----
item:41 (CL13_7)
Cases for this item 127 Discrimination 0.70
Item Threshold(s): -1.08 Weighted MNSQ 1.30
Item Delta(s): -1.08

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	65	51.18	-0.70	-10.99(.000)	-3.96	3.06
1	1.00	62	48.82	0.70	10.99(.000)	1.51	2.52

Item 42
----
item:42 (CL13_8)
Cases for this item 128 Discrimination 0.68
Item Threshold(s): -0.01 Weighted MNSQ 1.49
Item Delta(s): -0.01

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	77	60.16	-0.68	-10.31(.000)	-3.32	3.23
1	1.00	51	39.84	0.68	10.31(.000)	1.86	2.60

Item 43
----
item:43 (CL13_9)
Cases for this item 130 Discrimination 0.65
Item Threshold(s): 1.05 Weighted MNSQ 1.37
Item Delta(s): 1.05

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	90	69.23	-0.65	-9.70(.000)	-2.82	3.26
1	1.00	40	30.77	0.65	9.70(.000)	2.35	2.65

Item 44
----
item:44 (CL14_2)
Cases for this item 124 Discrimination 0.70
Item Threshold(s): -2.18 Weighted MNSQ 1.36
Item Delta(s): -2.18

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	52	41.94	-0.70	-10.68(.000)	-4.56	2.84
1	1.00	72	58.06	0.70	10.68(.000)	0.96	2.47

Item 45
----
item:45 (CL14_3)
Cases for this item 125 Discrimination 0.72
Item Threshold(s): 0.12 Weighted MNSQ 1.11
Item Delta(s): 0.12

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	77	61.60	-0.72	-11.53(.000)	-3.35	3.11
1	1.00	48	38.40	0.72	11.53(.000)	1.90	2.16

Item 46
----
item:46 (CL14_4)
Cases for this item 128 Discrimination 0.75
Item Threshold(s): 1.52 Weighted MNSQ 0.86
Item Delta(s): 1.52

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	92	71.88	-0.75	-12.60(.000)	-2.83	3.13
1	1.00	36	28.13	0.75	12.60(.000)	3.11	2.16

Item 47
----
item:47 (CL14_6)
Cases for this item 128 Discrimination 0.61
Item Threshold(s): 3.93 Weighted MNSQ 0.83
Item Delta(s): 3.93

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	112	87.50	-0.61	-8.73(.000)	-1.98	3.42
1	1.00	16	12.50	0.61	8.73(.000)	4.60	2.13

Item 48
----
item:48 (CL14_7)
Cases for this item 128 Discrimination 0.51
Item Threshold(s): 5.28 Weighted MNSQ 0.68
Item Delta(s): 5.28

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	119	92.97	-0.51	-6.67(.000)	-1.68	3.53
1	1.00	9	7.03	0.51	6.67(.000)	5.79	2.09

Item 49
----
item:49 (CL15_1)
Cases for this item 120 Discrimination 0.39
Item Threshold(s): -6.97 Weighted MNSQ 0.93
Item Delta(s): -6.97

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	12	10.00	-0.39	-4.64(.000)	-7.58	1.82
1	1.00	108	90.00	0.39	4.64(.000)	-0.73	3.25

Item 50
----
item:50 (CL15_2)
Cases for this item 123 Discrimination 0.54
Item Threshold(s): -5.15 Weighted MNSQ 0.95
Item Delta(s): -5.15

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	25	20.33	-0.54	-7.13(.000)	-6.46	2.21
1	1.00	98	79.67	0.54	7.13(.000)	-0.03	2.90

Item 51
----
item:51 (CL15_3)
Cases for this item 127 Discrimination 0.59
Item Threshold(s): -3.53 Weighted MNSQ 1.02
Item Delta(s): -3.53

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	39	30.71	-0.59	-8.17(.000)	-5.19	3.16
1	1.00	88	69.29	0.59	8.17(.000)	0.51	2.72

Item 52
----
item:52 (CL15_4)
Cases for this item 128 Discrimination 0.71
Item Threshold(s): 0.08 Weighted MNSQ 1.25
Item Delta(s): 0.08

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	78	60.94	-0.71	-11.31(.000)	-3.31	3.04
1	1.00	50	39.06	0.71	11.31(.000)	2.04	2.57

Item 53
----
item:53 (CL15_5)
Cases for this item 129 Discrimination 0.78
Item Threshold(s): 0.24 Weighted MNSQ 0.91
Item Delta(s): 0.24

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	80	62.02	-0.78	-14.00(.000)	-3.34	2.94
1	1.00	49	37.98	0.78	14.00(.000)	2.33	2.35

Item 54
----
item:54 (CL15_6)
Cases for this item 129 Discrimination 0.57
Item Threshold(s): 2.77 Weighted MNSQ 1.36
Item Delta(s): 2.77

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	105	81.40	-0.57	-7.91(.000)	-2.18	3.40
1	1.00	24	18.60	0.57	7.91(.000)	3.18	2.65

Item 55
----
item:55 (CL15_7)
Cases for this item 130 Discrimination 0.70
Item Threshold(s): 2.31 Weighted MNSQ 0.96
Item Delta(s): 2.31

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	101	77.69	-0.70	-11.02(.000)	-2.44	3.24
1	1.00	29	22.31	0.70	11.02(.000)	3.39	2.28

Item 56
----
item:56 (CL16_2)
Cases for this item 125 Discrimination 0.74
Item Threshold(s): 0.90 Weighted MNSQ 1.05
Item Delta(s): 0.90

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	84	67.20	-0.74	-12.11(.000)	-3.07	3.19
1	1.00	41	32.80	0.74	12.11(.000)	2.66	2.26

Item 57
----
item:57 (CL16_3)
Cases for this item 125 Discrimination 0.67
Item Threshold(s): 2.20 Weighted MNSQ 1.20
Item Delta(s): 2.20

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	96	76.80	-0.67	-10.02(.000)	-2.52	3.35
1	1.00	29	23.20	0.67	10.02(.000)	3.22	2.33

Item 58
----
item:58 (CL16_4)
Cases for this item 125 Discrimination 0.70
Item Threshold(s): 1.21 Weighted MNSQ 1.19
Item Delta(s): 1.20

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	87	69.60	-0.70	-10.79(.000)	-2.89	3.24
1	1.00	38	30.40	0.70	10.79(.000)	2.70	2.45

Item 59
----
item:59 (CL16_5)
Cases for this item 127 Discrimination 0.77
Item Threshold(s): -0.85 Weighted MNSQ 1.04
Item Delta(s): -0.85

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	65	51.18	-0.77	-13.36(.000)	-3.98	2.91
1	1.00	62	48.82	0.77	13.36(.000)	1.84	2.42

Item 60
----
item:60 (CL16_6)
Cases for this item 127 Discrimination 0.66
Item Threshold(s): 2.52 Weighted MNSQ 0.93
Item Delta(s): 2.52

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	100	78.74	-0.66	-9.93(.000)	-2.39	3.31
1	1.00	27	21.26	0.66	9.93(.000)	3.50	2.42

Item 61
----
item:61 (CL16_7)
Cases for this item 127 Discrimination 0.56
Item Threshold(s): 3.93 Weighted MNSQ 1.03
Item Delta(s): 3.93

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	111	87.40	-0.56	-7.53(.000)	-1.92	3.50
1	1.00	16	12.60	0.56	7.53(.000)	4.28	2.48

Item 62
----
item:62 (CL16_9)
Cases for this item 127 Discrimination 0.39
Item Threshold(s): 5.54 Weighted MNSQ 1.20
Item Delta(s): 5.54

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	119	93.70	-0.39	-4.67(.000)	-1.53	3.69
1	1.00	8	6.30	0.39	4.67(.000)	4.63	3.50

Item 63
----
item:63 (CL17_1)
Cases for this item 118 Discrimination 0.76
Item Threshold(s): -0.83 Weighted MNSQ 1.04
Item Delta(s): -0.83

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	62	52.54	-0.76	-12.52(.000)	-3.92	2.95
1	1.00	56	47.46	0.76	12.52(.000)	1.83	2.35

Item 64
----
item:64 (CL17_2)
Cases for this item 120 Discrimination 0.68
Item Threshold(s): 1.69 Weighted MNSQ 1.12
Item Delta(s): 1.69

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	87	72.50	-0.68	-10.06(.000)	-2.57	3.27
1	1.00	33	27.50	0.68	10.06(.000)	2.78	2.90

Item 65
----
item:65 (CL17_3)
Cases for this item 122 Discrimination 0.64
Item Threshold(s): 2.61 Weighted MNSQ 1.07
Item Delta(s): 2.61

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	96	78.69	-0.64	-9.13(.000)	-2.27	3.37
1	1.00	26	21.31	0.64	9.13(.000)	3.39	2.45

Item 66
----
item:66 (CL17_4)
Cases for this item 122 Discrimination 0.52
Item Threshold(s): 3.77 Weighted MNSQ 1.41
Item Delta(s): 3.77

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	105	86.07	-0.52	-6.74(.000)	-1.82	3.62
1	1.00	17	13.93	0.52	6.74(.000)	3.57	2.54

Item 67
----
item:67 (CL17_5)
Cases for this item 122 Discrimination 0.43
Item Threshold(s): 5.04 Weighted MNSQ 1.23
Item Delta(s): 5.04

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	112	91.80	-0.43	-5.24(.000)	-1.56	3.64
1	1.00	10	8.20	0.43	5.24(.000)	4.48	2.97

Item 68
----
item:68 (CL18_1)
Cases for this item 122 Discrimination 0.34
Item Threshold(s): -6.85 Weighted MNSQ 1.42
Item Delta(s): -6.85

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	13	10.66	-0.34	-3.95(.000)	-6.46	3.06
1	1.00	109	89.34	0.34	3.95(.000)	-0.73	3.55

Item 69
----
item:69 (CL18_3)
Cases for this item 128 Discrimination 0.78
Item Threshold(s): -1.79 Weighted MNSQ 0.77
Item Delta(s): -1.79

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	57	44.53	-0.78	-14.10(.000)	-4.60	2.53
1	1.00	71	55.47	0.78	14.10(.000)	1.46	2.48

Item 70
----
item:70 (CL18_4)
Cases for this item 130 Discrimination 0.80
Item Threshold(s): -0.35 Weighted MNSQ 0.83
Item Delta(s): -0.35

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	73	56.15	-0.80	-14.87(.000)	-3.74	2.89
1	1.00	57	43.85	0.80	14.87(.000)	2.12	2.29

Item 71
----
item:71 (CL18_5)
Cases for this item 130 Discrimination 0.63
Item Threshold(s): 2.19 Weighted MNSQ 1.31
Item Delta(s): 2.19

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	100	76.92	-0.63	-9.16(.000)	-2.44	3.36
1	1.00	30	23.08	0.63	9.16(.000)	3.06	2.49

Item 72
----
item:72 (CL_6)
Cases for this item 127 Discrimination 0.63
Item Threshold(s): -2.29 Weighted MNSQ 1.43
Item Delta(s): -2.29

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	52	40.94	-0.63	-9.03(.000)	-4.42	3.27
1	1.00	75	59.06	0.63	9.03(.000)	0.94	2.62

Item 73
----
item:73 (CL4_05)
Cases for this item 126 Discrimination 0.81
Item Threshold(s): -2.21 Weighted MNSQ 0.51
Item Delta(s): -2.21

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	52	41.27	-0.81	-15.13(.000)	-5.03	2.27
1	1.00	74	58.73	0.81	15.13(.000)	1.40	2.42

Item 74
----
item:74 (CL4_08)
Cases for this item 129 Discrimination 0.81
Item Threshold(s): -1.11 Weighted MNSQ 0.73
Item Delta(s): -1.11

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	65	50.39	-0.81	-15.75(.000)	-4.23	2.63
1	1.00	64	49.61	0.81	15.75(.000)	1.78	2.35

Item 75
----
item:75 (CL4_10)
Cases for this item 129 Discrimination 0.65
Item Threshold(s): 2.19 Weighted MNSQ 1.26
Item Delta(s): 2.19

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	100	77.52	-0.65	-9.58(.000)	-2.49	3.35
1	1.00	29	22.48	0.65	9.58(.000)	3.04	2.35

Item 76
----
item:76 (CL4_11)
Cases for this item 129 Discrimination 0.80
Item Threshold(s): 0.29 Weighted MNSQ 0.79
Item Delta(s): 0.29

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	81	62.79	-0.80	-15.04(.000)	-3.45	2.91
1	1.00	48	37.21	0.80	15.04(.000)	2.46	2.20

Item 77
----
item:77 (CL5_05)
Cases for this item 124 Discrimination 0.59
Item Threshold(s): -4.48 Weighted MNSQ 0.85
Item Delta(s): -4.48

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	31	25.00	-0.59	-8.06(.000)	-6.13	2.40
1	1.00	93	75.00	0.59	8.06(.000)	0.17	2.66

The following traditional statistics are only meaningful for complete designs and when the amount of missing data is minimal.
In this analysis 3.57% of the data are missing.

The following results are scaled to assume that a single response was provided for each item.

N	131
Mean	29.85
Standard Deviation	22.41
Variance	502.00
Skewness	0.40
Kurtosis	-1.05
Standard error of mean	1.96
Standard error of measurement	2.90
Coefficient Alpha	0.98

APPENDIX Q-FINAL INSTRUMENT OUTPUT FILES- READING

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================================================================================
Literacy-Reading
================================================================================
ConQuest: Generalised Item Response Modelling Software     Tue May 22 13:41 2018
SUMMARY OF THE ESTIMATION
================================================================================

Estimation method was: Gauss-Hermite Quadrature with 15 nodes
Assumed population distribution was: Gaussian
Constraint was: CASES
The Data File: testSPSS\readwith3s.dat
The format:  responses 1,2,4-7,10,11,13-15,18,19,21,23,26,28,31-33,36,40,44,46-49,51,53,54,57-
59,60-64,66-68,73,74,76,77,79,81,82,86-
89,92,95,97,100,104,106,107,109,113,116,117,119,120,122-124,126-
131,135,139,144,147,149,151,156,159,161,168,171-173,176,178,181,182
The regression model:
Grouping Variables:
The item model: items
Slopes are fixed
Sample size: 298
Final Deviance:     6588.92236
Total number of estimated parameters: 92
The number of iterations: 14
Termination criteria:  Max iterations=1000, Parameter Change= 0.00010
                       Deviance Change= 0.00010
Iterations terminated because the convergence criteria were reached
At termination the solution was not the best attained solution
The reported results are for the earlier better solution
Rerunning this analysis using the current estimates as initial values is strongly advised.
Random number generation seed:    1.00000
Number of nodes used when drawing PVs: 2000
Number of nodes used when computing fit: 200
Number of plausible values to draw: 5
Maximum number of iterations without a deviance improvement: 100
Maximum number of Newton steps in M-step: 10
Value for obtaining finite MLEs for zero/perfects:    0.30000

================================================================================
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================================================================================
ConQuest: Generalised Item Response Modelling Software     Tue May 22 13:41 2018
TABLES OF RESPONSE MODEL PARAMETER ESTIMATES
================================================================================
TERM 1: items
```

VARIABLES				UNWEIGHTED FIT			WEIGHTED FIT		
	item	ESTIMATE	ERROR^	MNSQ	CI	T	MNSQ	CI	T
1	RT1_1	-6.031	0.364	58.70	(0.75, 1.25)	68.5	1.30	(0.60, 1.40)	1.4
2	RT1_2	-4.925	0.313	66.16	(0.75, 1.25)	72.2	1.37	(0.65, 1.35)	1.9
3	RT1_4	-3.352	0.282	6.86	(0.76, 1.25)	21.6	1.09	(0.70, 1.30)	0.6
4	RT1_5	-3.355	0.281	1.43	(0.76, 1.24)	3.1	1.01	(0.69, 1.31)	0.1
5	RT1_6	-1.530	0.271	3.58	(0.76, 1.24)	12.9	1.24	(0.72, 1.28)	1.7
6	RT1_7	-1.895	0.268	0.89	(0.76, 1.24)	-0.8	0.88	(0.72, 1.28)	-0.8
7	RT1_10	0.231	0.291	1.71	(0.76, 1.24)	4.8	1.03	(0.70, 1.30)	0.3
8	RT2_1	-6.105	0.370	0.68	(0.75, 1.25)	-2.8	0.72	(0.58, 1.42)	-1.4
9	RT2_3	-4.863	0.314	10.05	(0.75, 1.25)	27.2	1.19	(0.65, 1.35)	1.1
10	RT2_4	-2.826	0.274	1.04	(0.75, 1.25)	0.3	0.97	(0.71, 1.29)	-0.2
11	RT2_5	-1.802	0.271	0.65	(0.75, 1.25)	-3.1	0.84	(0.73, 1.27)	-1.1
12	RT2_8	-0.476	0.283	0.86	(0.76, 1.25)	-1.1	0.71	(0.72, 1.28)	-2.2
13	RT2_9	0.666	0.303	0.79	(0.76, 1.24)	-1.7	1.23	(0.67, 1.33)	1.3
14	RT2_11	1.794	0.348	0.65	(0.76, 1.24)	-3.2	1.30	(0.60, 1.40)	1.4
15	RT3_2	-4.201	0.321	0.81	(0.74, 1.26)	-1.5	1.28	(0.64, 1.36)	1.5
16	RT3_5	-4.094	0.313	13.74	(0.74, 1.26)	32.0	1.04	(0.66, 1.34)	0.3
17	RT3_7	-2.317	0.275	0.83	(0.75, 1.25)	-1.4	1.18	(0.71, 1.29)	1.2
18	RT3_10	-0.623	0.285	0.48	(0.75, 1.25)	-5.2	0.84	(0.71, 1.29)	-1.1
19	RT3_11	0.833	0.308	1.07	(0.76, 1.25)	0.6	1.01	(0.66, 1.34)	0.1
20	RT3_12	2.308	0.372	9.28	(0.76, 1.25)	26.5	1.46	(0.57, 1.43)	1.9
21	RT4_3	-0.567	0.304	0.53	(0.74, 1.26)	-4.3	0.80	(0.70, 1.30)	-1.3
22	RT4_7	0.371	0.306	1.85	(0.75, 1.25)	5.4	1.03	(0.68, 1.32)	0.2
23	RT5_2	1.923	0.380	0.54	(0.74, 1.26)	-4.2	0.98	(0.56, 1.44)	-0.0
24	RT5_4	2.356	0.386	0.53	(0.75, 1.25)	-4.3	1.09	(0.55, 1.45)	0.5
25	RT5_5	5.086	0.636	5.07	(0.75, 1.25)	16.7	1.14	(0.20, 1.80)	0.5
26	RT5_6	5.086	0.636	5.07	(0.75, 1.25)	16.7	1.14	(0.20, 1.80)	0.5
27	RT5_7	4.392	0.542	2.70	(0.75, 1.25)	9.1	1.27	(0.36, 1.64)	0.8
28	RT6_2	-5.475	0.338	1.59	(0.74, 1.26)	3.9	1.25	(0.63, 1.37)	1.3
29	RT6_4	-4.745	0.314	0.34	(0.75, 1.25)	-7.0	0.70	(0.66, 1.34)	-1.9
30	RT6_5	-3.233	0.286	1.01	(0.75, 1.25)	0.1	0.88	(0.69, 1.31)	-0.8
31	RT6_8	-0.501	0.285	0.77	(0.75, 1.25)	-2.0	1.00	(0.71, 1.29)	0.1
32	RT6_9	-0.026	0.290	1.53	(0.75, 1.25)	3.7	1.06	(0.70, 1.30)	0.4
33	RT6_10	2.655	0.397	0.75	(0.75, 1.25)	-2.2	1.08	(0.54, 1.46)	0.4
34	RT6_11	2.038	0.360	0.63	(0.76, 1.25)	-3.3	0.84	(0.58, 1.42)	-0.7
35	RT7_1	-5.839	0.355	0.54	(0.75, 1.25)	-4.4	0.94	(0.61, 1.39)	-0.2
36	RT7_2	-4.949	0.318	2.92	(0.75, 1.25)	10.2	1.24	(0.65, 1.35)	1.3
37	RT7_3	-4.179	0.302	0.40	(0.75, 1.25)	-6.2	0.63	(0.67, 1.33)	-2.5
38	RT7_4	-3.482	0.290	0.55	(0.75, 1.25)	-4.2	0.79	(0.69, 1.31)	-1.4
39	RT7_6	-1.349	0.278	0.60	(0.75, 1.25)	-3.7	0.92	(0.72, 1.28)	-0.5
40	RT7_7	-1.426	0.277	0.82	(0.75, 1.25)	-1.5	1.09	(0.72, 1.28)	0.6
41	RT7_8	-2.103	0.272	0.64	(0.75, 1.25)	-3.2	0.89	(0.72, 1.28)	-0.8
42	RT7_13	1.668	0.343	0.77	(0.76, 1.25)	-2.0	1.01	(0.61, 1.39)	0.1
43	RT8_1	-1.748	0.280	0.78	(0.75, 1.25)	-1.8	1.06	(0.71, 1.29)	0.4
44	RT8_3	-0.352	0.297	0.60	(0.75, 1.25)	-3.6	1.03	(0.69, 1.31)	0.2
45	RT8_4	0.577	0.310	0.62	(0.75, 1.25)	-3.4	0.99	(0.66, 1.34)	-0.0
46	RT8_6	1.561	0.342	0.50	(0.75, 1.25)	-4.9	0.89	(0.62, 1.38)	-0.5
47	RT8_8	1.016	0.318	0.58	(0.75, 1.25)	-3.9	0.83	(0.65, 1.35)	-0.9
48	RT8_9	1.680	0.348	0.65	(0.75, 1.25)	-3.2	0.81	(0.61, 1.39)	-1.0
49	RT8_13	1.538	0.338	0.64	(0.75, 1.25)	-3.2	0.91	(0.62, 1.38)	-0.4
50	RT9_1	0.426	0.309	3.50	(0.75, 1.25)	12.2	0.90	(0.67, 1.33)	-0.6
51	RT9_2	0.717	0.317	4.69	(0.75, 1.25)	15.8	0.84	(0.65, 1.35)	-0.9
52	RT9_3	1.057	0.327	0.44	(0.75, 1.25)	-5.6	0.81	(0.63, 1.37)	-1.0
53	RT9_6	1.891	0.365	0.17	(0.75, 1.25)	-10.4	0.53	(0.58, 1.42)	-2.6
54	RT9_9	2.265	0.377	8.68	(0.75, 1.25)	25.0	0.89	(0.56, 1.44)	-0.4
55	RT9_11	4.134	0.508	0.21	(0.75, 1.25)	-9.5	1.02	(0.40, 1.60)	0.2
56	RT9_14	1.897	0.355	0.22	(0.75, 1.25)	-9.3	0.61	(0.59, 1.41)	-2.1
57	RT9_18	5.541	0.705	0.25	(0.75, 1.25)	-8.8	1.46	(0.03, 1.97)	1.0
58	SM1_2	-5.150	0.325	0.84	(0.75, 1.25)	-1.3	0.93	(0.64, 1.36)	-0.3
59	SM1_3	-4.352	0.307	0.71	(0.75, 1.25)	-2.6	0.92	(0.66, 1.34)	-0.4
60	SM1_5	-3.822	0.297	1.11	(0.75, 1.25)	0.9	1.21	(0.67, 1.33)	1.2
61	SM1_9	-0.737	0.283	1.62	(0.76, 1.25)	4.2	1.01	(0.72, 1.28)	0.1
62	SM1_12	2.307	0.373	0.96	(0.76, 1.25)	-0.3	1.18	(0.57, 1.43)	0.8
63	SM1_13	1.553	0.338	0.93	(0.76, 1.25)	-0.6	1.06	(0.62, 1.38)	0.4
64	SM2_1	-1.174	0.286	1.03	(0.75, 1.25)	0.3	1.00	(0.71, 1.29)	0.0
65	SM2_2	-0.558	0.288	0.36	(0.75, 1.25)	-6.9	0.65	(0.71, 1.29)	-2.6
66	SM2_4	0.815	0.311	0.57	(0.75, 1.25)	-4.0	0.84	(0.66, 1.34)	-0.9
67	SM2_5	0.614	0.303	0.67	(0.75, 1.25)	-2.9	0.95	(0.68, 1.32)	-0.3
68	SM2_6	1.650	0.344	0.40	(0.75, 1.25)	-6.2	0.97	(0.61, 1.39)	-0.1
69	SM2_8	2.903	0.404	0.45	(0.75, 1.25)	-5.5	1.00	(0.53, 1.47)	0.1
70	SM2_9	2.903	0.404	0.27	(0.75, 1.25)	-8.3	0.83	(0.53, 1.47)	-0.7

```
 71  SM2_10           3.661   0.458    0.59 ( 0.75, 1.25) -3.8   1.30 ( 0.46, 1.54)  1.1
 72  SM2_11           4.427   0.539    2.66 ( 0.75, 1.25)  9.2   1.22 ( 0.35, 1.65)  0.7
 73  SM2_12           4.427   0.539    0.23 ( 0.75, 1.25) -9.1   1.08 ( 0.35, 1.65)  0.3
 74  SM3_1            2.901   0.448    3.37 ( 0.74, 1.26) 11.3   1.48 ( 0.47, 1.53)  1.6
 75  SM3_5            5.380   0.727   28.08 ( 0.74, 1.26) 45.8   1.32 ( 0.06, 1.94)  0.8
 76  LK1_4           -2.765   0.278    0.47 ( 0.75, 1.25) -5.2   0.78 ( 0.71, 1.29) -1.5
 77  LK1_9           -0.627   0.287    0.52 ( 0.75, 1.25) -4.5   0.94 ( 0.71, 1.29) -0.4
 78  LK1_12          -0.106   0.289    0.60 ( 0.75, 1.25) -3.7   1.03 ( 0.71, 1.29)  0.2
 79  LK1_14           1.575   0.342    1.24 ( 0.75, 1.25)  1.8   1.23 ( 0.61, 1.39)  1.1
 80  LK1_16           1.668   0.343    1.25 ( 0.76, 1.25)  1.9   1.24 ( 0.61, 1.39)  1.2
 81  LK2_5            0.299   0.304    0.52 ( 0.75, 1.25) -4.6   0.96 ( 0.68, 1.32) -0.2
 82  LK2_8            1.915   0.363    0.73 ( 0.75, 1.25) -2.3   0.97 ( 0.59, 1.41) -0.1
 83  LK2_10           0.819   0.310    0.59 ( 0.75, 1.25) -3.7   0.91 ( 0.66, 1.34) -0.5
 84  PK1_5           -2.359   0.275    3.44 ( 0.75, 1.25) 12.1   1.46 ( 0.71, 1.29)  2.8
 85  PK1_8           -1.523   0.278    2.01 ( 0.75, 1.25)  6.3   1.11 ( 0.72, 1.28)  0.8
 86  PK1_9           -0.745   0.285    0.93 ( 0.75, 1.25) -0.5   1.11 ( 0.72, 1.28)  0.8
 87  PK1_10          -0.193   0.289    0.91 ( 0.75, 1.25) -0.7   1.02 ( 0.71, 1.29)  0.2
 88  PK1_13           1.692   0.348    0.49 ( 0.75, 1.25) -4.9   1.04 ( 0.61, 1.39)  0.3
 89  PK1_15           2.987   0.417    0.56 ( 0.75, 1.25) -4.1   0.92 ( 0.51, 1.49) -0.2
 90  PK1_18           6.021   0.823    0.25 ( 0.75, 1.25) -8.8   1.24 ( 0.00, 2.26)  0.5
 91  PK1_19           3.262   0.426    1.26 ( 0.75, 1.25)  2.0   1.37 ( 0.50, 1.50)  1.4
-------------------------------------------------------------------------------------
An asterisk next to a parameter estimate indicates that it is constrained
Separation Reliability =  0.985
Chi-square test of parameter equality =    5969.27,  df = 91,  Sig Level = 0.000
^ Quick standard errors have been used
=====================================================================================

=====================================================================================
ConQuest: Generalised Item Response Modelling Software     Tue May 22 13:41 2018
TABLES OF POPULATION MODEL PARAMETER ESTIMATES
=====================================================================================
REGRESSION COEFFICIENTS



Regression Variable

CONSTANT                  0.000*
-----------------------------------------------
An asterisk next to a parameter estimate indicates that it is constrained
===============================================
COVARIANCE/CORRELATION MATRIX



Dimension

Dimension 1
-------------------------------------------
Variance                 10.394  ( 0.851)
-------------------------------------------
An asterisk next to a parameter estimate indicates that it is constrained

=========================================

RELIABILITY COEFFICIENTS
------------------------

Dimension: (Dimension 1)
------------------------
MLE Person separation RELIABILITY:  Unavailable
WLE Person separation RELIABILITY:   0.977
EAP/PV RELIABILITY:                  0.521
------------------------
```

```
================================================================================
ConQuest: Generalised Item Response Modelling Software     Tue May 22 13:41 2018
MAP OF LATENT DISTRIBUTIONS AND RESPONSE MODEL PARAMETER ESTIMATES
================================================================================
                                        Terms in the Model (excl Step terms)

                                                                    +items
--------------------------------------------------------------------------------------------
                                          |                                               |
                                          |                                               |
  10                                      |                                               |
                                          |                                               |
   9                                      |                                               |
                                        X|                                               |
   8                                    |                                               |
                                       XX|                                               |
   7                                   XX|                                               |
                                       XX|                                               |
                                      XXX|                                               |
   6                                 XXXX|90                                             |
                                     XXXX|57 75                                          |
   5                                  XXX|25 26                                          |
                                XXXXXXXXXXX|27 72 73                                      |
   4                          XXXXXXXXXXXXXXX|55                                         |
                                XXXXXXXXXXXXX|71                                         |
                            XXXXXXXXXXXXXXXXX|91                                         |
   3                        XXXXXXXXXXXXXXXXX|33 69 70 74 89                             |
                            XXXXXXXXXXXXXXXXX|20 24 54 62                               |
   2                      XXXXXXXXXXXXXXXXXXX|14 23 34 53 56 82                         |
                         XXXXXXXXXXXXXXXXXXXX|42 46 48 49 63 68 79 80 88                |
   1            XXXXXXXXXXXXXXXXXXXXXXXXXXXXX|47 52                                     |
                 XXXXXXXXXXXXXXXXXXXXXXXXXXXX|13 19 45 50 51 66 67 83                    |
   0           XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|7 22 32 81                                 |
              XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|12 44 78 87                               |
         XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|18 21 31 61 65 77 86                       |
  -1        XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|39 64                                     |
      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|5 40 43 85                                 |
  -2               XXXXXXXXXXXXXXXXXXXXXXXXX|6 11 41                                   |
                  XXXXXXXXXXXXXXXXXXXXXXXXXX|17 84                                     |
  -3              XXXXXXXXXXXXXXXXXXXXXXXXXX|10 76                                     |
                        XXXXXXXXXXXXXXXXXX|3 4 30 38                                  |
                   XXXXXXXXXXXXXXXXXXXXXXXX|60                                         |
  -4                        XXXXXXXXXXXXXXXX|15 16 37 59                               |
                             XXXXXXXXXXXXXXX|9 29                                      |
  -5                        XXXXXXXXXXXXXXXX|2 36 58                                  |
                                XXXXXXXXXXXX|28                                        |
  -6                               XXXXXXXXXX|1 8 35                                   |
                                      XXXXX|                                          |
  -7                                 XXXXXX|                                          |
                                    XXXXXXX|                                          |
                                          X|                                          |
  -8                                  XXXXX|                                          |
                                        XX|                                          |
  -9                                    XX|                                          |
                                       XXX|                                          |
  -10                                    |                                          |
                                         |                                          |
  -11                                    |                                          |
                                         |                                          |
                                       XX|                                          |
  -12                                    |                                          |
                                         |                                          |
  -13                                    |                                          |
                                         |                                          |
  -14                                    |                                          |
                                         |                                          |
                                         |                                          |
  -15                                    |                                          |
============================================================================================
Each 'X' represents   0.5 cases

============================================================================================
```

```
================================================================================
ConQuest: Generalised Item Response Modelling Software     Tue May 22 13:41 2018
MAP OF LATENT DISTRIBUTIONS AND THRESHOLDS
================================================================================
                              Generalised-Item Thresholds


--------------------------------------------------------------------------------------------------
--------------------------------------------------------------------------------------------------
                |
                |
  10            |
                |
   9            |
                |
   8            |
                |
   7            |
               X|
               X|
   6           X|90
               X|57 75
   5           X|25 26
             XXX|27 72 73
   4        XXXX|55
            XXXX|71
           XXXXX|91
   3        XXXX|33 69 70 74 89
           XXXXX|20 24 54 62
   2       XXXXX|14 23 34 53 56 82
           XXXXX|42 46 48 49 63 68 79 80 88
   1     XXXXXXX|47 52
         XXXXXXX|13 19 45 50 51 66 67 83
   0    XXXXXXXX|7 22 32 81
        XXXXXXXX|12 44 78 87
      XXXXXXXXXX|18 21 31 61 65 77 86
  -1   XXXXXXXXX|39 64
      XXXXXXXXXX|5 40 43 85
  -2     XXXXXXX|6 11 41
         XXXXXXX|17 84
  -3     XXXXXXX|10 76
           XXXXX|3 4 30 38
         XXXXXXX|60
  -4        XXXX|15 16 37 59
            XXXX|9 29
  -5        XXXX|2 36 58
             XXX|28
  -6         XXX|1 8 35
               X|
  -7           XX|
               XX|
                |
  -8            X|
                X|
  -9            X|
                X|
  -10           |
                |
  -11           |
                |
                |
  -12           |
                |
  -13           |
                |
  -14           |
                |
                |
  -15           |
================================================================================================
================================================================================================
Each 'X' represents   1.9 cases
The labels for thresholds show the levels of
    item, and category, respectively
```

READING

ConQuest: Generalised Item Response Modelling Software Tue May 22 13:41 2018
GENERALISED ITEM ANALYSIS

Item 1

item:1 (RT1_1)
Cases for this item 125 Discrimination 0.33
Item Threshold(s): -6.03 Weighted MNSQ 1.30
Item Delta(s): -6.03

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	17	13.60	-0.33	-3.90(.000)	-5.63	3.28
1	1.00	108	86.40	0.33	3.90(.000)	-1.45	2.85

Item 2

item:2 (RT1_2)
Cases for this item 125 Discrimination 0.38
Item Threshold(s): -4.92 Weighted MNSQ 1.37
Item Delta(s): -4.92

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	27	21.60	-0.38	-4.55(.000)	-5.00	3.52
1	1.00	98	78.40	0.38	4.55(.000)	-1.19	2.63

Item 3

item:3 (RT1_4)
Cases for this item 128 Discrimination 0.57
Item Threshold(s): -3.35 Weighted MNSQ 1.09
Item Delta(s): -3.35

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	46	35.94	-0.57	-7.81(.000)	-4.77	2.71
1	1.00	82	64.06	0.57	7.81(.000)	-0.52	2.42

Item 4

item:4 (RT1_5)
Cases for this item 130 Discrimination 0.61
Item Threshold(s): -3.36 Weighted MNSQ 1.01
Item Delta(s): -3.36

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	46	35.38	-0.61	-8.77(.000)	-4.99	2.45
1	1.00	84	64.62	0.61	8.77(.000)	-0.35	2.34

Item 5

item:5 (RT1_6)
Cases for this item 130 Discrimination 0.63
Item Threshold(s): -1.53 Weighted MNSQ 1.24
Item Delta(s): -1.53

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	71	54.62	-0.63	-9.23(.000)	-3.87	2.80
1	1.00	59	45.38	0.63	9.23(.000)	0.26	2.14

Item 6

item:6 (RT1_7)
Cases for this item 131 Discrimination 0.71
Item Threshold(s): -1.89 Weighted MNSQ 0.88
Item Delta(s): -1.89

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	66	50.38	-0.71	-11.38(.000)	-4.31	2.42
1	1.00	65	49.62	0.71	11.38(.000)	0.45	2.09

Item 7

item:7 (RT1_10)
Cases for this item 131 Discrimination 0.68
Item Threshold(s): 0.23 Weighted MNSQ 1.03
Item Delta(s): 0.23

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	94	71.76	-0.68	-10.64(.000)	-3.28	2.66
1	1.00	37	28.24	0.68	10.64(.000)	1.43	2.07

Item 8

item:8 (RT2_1)
Cases for this item 121 Discrimination 0.47
Item Threshold(s): -6.10 Weighted MNSQ 0.72
Item Delta(s): -6.10

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	17	14.05	-0.47	-5.79(.000)	-7.02	1.96
1	1.00	104	85.95	0.47	5.79(.000)	-1.39	2.53

Item 9
------
item:9 (RT2_3)
Cases for this item 122 Discrimination 0.48
Item Threshold(s): -4.86 Weighted MNSQ 1.19
Item Delta(s): -4.86

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	28	22.95	-0.48	-5.93(.000)	-5.54	2.78
1	1.00	94	77.05	0.48	5.93(.000)	-1.16	2.47

Item 10
----
item:10 (RT2_4)
Cases for this item 124 Discrimination 0.67
Item Threshold(s): -2.83 Weighted MNSQ 0.97
Item Delta(s): -2.83

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	52	41.94	-0.67	-9.98(.000)	-4.72	2.31
1	1.00	72	58.06	0.67	9.98(.000)	-0.23	2.19

Item 11
----
item:11 (RT2_5)
Cases for this item 124 Discrimination 0.73
Item Threshold(s): -1.80 Weighted MNSQ 0.84
Item Delta(s): -1.80

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	66	53.23	-0.73	-11.74(.000)	-4.26	2.30
1	1.00	58	46.77	0.73	11.74(.000)	0.32	2.01

Item 12
----
item:12 (RT2_8)
Cases for this item 128 Discrimination 0.75
Item Threshold(s): -0.48 Weighted MNSQ 0.71
Item Delta(s): -0.48

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	84	65.63	-0.75	-12.63(.000)	-3.64	2.39
1	1.00	44	34.38	0.75	12.63(.000)	1.15	1.85

Item 13
----
item:13 (RT2_9)
Cases for this item 129 Discrimination 0.63
Item Threshold(s): 0.67 Weighted MNSQ 1.23
Item Delta(s): 0.67

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	98	75.97	-0.63	-9.09(.000)	-3.04	2.75
1	1.00	31	24.03	0.63	9.09(.000)	1.50	1.89

Item 14
----
item:14 (RT2_11)
Cases for this item 130 Discrimination 0.56
Item Threshold(s): 1.79 Weighted MNSQ 1.30
Item Delta(s): 1.79

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	109	83.85	-0.56	-7.63(.000)	-2.67	2.86
1	1.00	21	16.15	0.56	7.63(.000)	2.11	1.91

Item 15
----
item:15 (RT3_2)
Cases for this item 113 Discrimination 0.59
Item Threshold(s): -4.20 Weighted MNSQ 1.28
Item Delta(s): -4.20

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	32	28.32	-0.59	-7.65(.000)	-5.36	2.30
1	1.00	81	71.68	0.59	7.65(.000)	-0.81	2.69

Item 16
----
item:16 (RT3_5)
Cases for this item 117 Discrimination 0.57
Item Threshold(s): -4.09 Weighted MNSQ 1.04
Item Delta(s): -4.09

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	34	29.06	-0.57	-7.53(.000)	-5.35	2.73
1	1.00	83	70.94	0.57	7.53(.000)	-0.74	2.43

Item 17
----
item:17 (RT3_7)
Cases for this item 123 Discrimination 0.66
Item Threshold(s): -2.32 Weighted MNSQ 1.18
Item Delta(s): -2.32

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	57	46.34	-0.66	-9.76(.000)	-4.41	2.47
1	1.00	66	53.66	0.66	9.76(.000)	0.03	2.29

Item 18
----
item:18 (RT3_10)
Cases for this item 127 Discrimination 0.75
Item Threshold(s): -0.62 Weighted MNSQ 0.84
Item Delta(s): -0.62

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	80	62.99	-0.75	-12.76(.000)	-3.75	2.43
1	1.00	47	37.01	0.75	12.76(.000)	1.19	1.97

Item 19
----
item:19 (RT3_11)
Cases for this item 128 Discrimination 0.66
Item Threshold(s): 0.83 Weighted MNSQ 1.01
Item Delta(s): 0.83

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	98	76.56	-0.66	-9.99(.000)	-3.06	2.74
1	1.00	30	23.44	0.66	9.99(.000)	1.87	1.76

Item 20
----
item:20 (RT3_12)
Cases for this item 128 Discrimination 0.46
Item Threshold(s): 2.31 Weighted MNSQ 1.46
Item Delta(s): 2.31

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	111	86.72	-0.46	-5.83(.000)	-2.48	3.02
1	1.00	17	13.28	0.46	5.83(.000)	1.89	2.39

Item 21
----
item:21 (RT4_3)
Cases for this item 114 Discrimination 0.75
Item Threshold(s): -0.57 Weighted MNSQ 0.80
Item Delta(s): -0.57

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	76	66.67	-0.75	-12.15(.000)	-3.81	2.46
1	1.00	38	33.33	0.75	12.15(.000)	0.94	1.79

Item 22
----
item:22 (RT4_7)
Cases for this item 121 Discrimination 0.69
Item Threshold(s): 0.37 Weighted MNSQ 1.03
Item Delta(s): 0.37

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	88	72.73	-0.69	-10.39(.000)	-3.27	2.63
1	1.00	33	27.27	0.69	10.39(.000)	1.56	2.13

Item 23
----
item:23 (RT5_2)
Cases for this item 116 Discrimination 0.65
Item Threshold(s): 1.92 Weighted MNSQ 0.98
Item Delta(s): 1.92

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	98	84.48	-0.65	-9.23(.000)	-2.86	2.82
1	1.00	18	15.52	0.65	9.23(.000)	2.52	1.70

Item 24
----
item:24 (RT5_4)
Cases for this item 119 Discrimination 0.60
Item Threshold(s): 2.36 Weighted MNSQ 1.09
Item Delta(s): 2.36

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	103	86.55	-0.60	-8.19(.000)	-2.62	2.96
1	1.00	16	13.45	0.60	8.19(.000)	2.64	1.57

Item 25
----
item:25 (RT5_5)
Cases for this item 119 Discrimination 0.30
Item Threshold(s): 5.09 Weighted MNSQ 1.14
Item Delta(s): 5.09

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	115	96.64	-0.30	-3.37(.001)	-2.08	3.25
1	1.00	4	3.36	0.30	3.37(.001)	2.65	2.82

Item 26
----
item:26 (RT5_6)
Cases for this item 119 Discrimination 0.30
Item Threshold(s): 5.09 Weighted MNSQ 1.14
Item Delta(s): 5.09

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	115	96.64	-0.30	-3.37(.001)	-2.08	3.25
1	1.00	4	3.36	0.30	3.37(.001)	2.65	2.82

Item 27
----
item:27 (RT5_7)
Cases for this item 119 Discrimination 0.37
Item Threshold(s): 4.39 Weighted MNSQ 1.27
Item Delta(s): 4.39

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	113	94.96	-0.37	-4.33(.000)	-2.17	3.20
1	1.00	6	5.04	0.37	4.33(.000)	2.85	2.22

Item 28
----
item:28 (RT6_2)
Cases for this item 118 Discrimination 0.46
Item Threshold(s): -5.48 Weighted MNSQ 1.25
Item Delta(s): -5.48

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	22	18.64	-0.46	-5.56(.000)	-5.83	2.50
1	1.00	96	81.36	0.46	5.56(.000)	-1.29	2.74

Item 29
----
item:29 (RT6_4)
Cases for this item 120 Discrimination 0.60
Item Threshold(s): -4.75 Weighted MNSQ 0.70
Item Delta(s): -4.74

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	29	24.17	-0.60	-8.15(.000)	-6.00	1.93
1	1.00	91	75.83	0.60	8.15(.000)	-0.88	2.45

Item 30
----
item:30 (RT6_5)
Cases for this item 122 Discrimination 0.67
Item Threshold(s): -3.23 Weighted MNSQ 0.88
Item Delta(s): -3.23

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	46	37.70	-0.67	-9.76(.000)	-4.98	2.33
1	1.00	76	62.30	0.67	9.76(.000)	-0.36	2.22

Item 31
----
item:31 (RT6_8)
Cases for this item 127 Discrimination 0.71
Item Threshold(s): -0.50 Weighted MNSQ 1.00
Item Delta(s): -0.50

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	82	64.57	-0.71	-11.33(.000)	-3.57	2.51
1	1.00	45	35.43	0.71	11.33(.000)	1.03	2.11

Item 32
----
item:32 (RT6_9)
Cases for this item 127 Discrimination 0.67
Item Threshold(s): -0.03 Weighted MNSQ 1.06
Item Delta(s): -0.03

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	88	69.29	-0.67	-10.19(.000)	-3.34	2.62
1	1.00	39	30.71	0.67	10.19(.000)	1.21	2.07

Item 33
----
item:33 (RT6_10)
Cases for this item 127 Discrimination 0.55
Item Threshold(s): 2.66 Weighted MNSQ 1.08
Item Delta(s): 2.66

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	113	88.98	-0.55	-7.40(.000)	-2.52	2.91
1	1.00	14	11.02	0.55	7.40(.000)	2.73	1.57

Item 34
----
item:34 (RT6_11)
Cases for this item 128 Discrimination 0.63
Item Threshold(s): 2.04 Weighted MNSQ 0.84
Item Delta(s): 2.04

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	109	85.16	-0.63	-9.12(.000)	-2.68	2.79
1	1.00	19	14.84	0.63	9.12(.000)	2.64	1.74

Item 35
----
item:35 (RT7_1)
Cases for this item 125 Discrimination 0.47
Item Threshold(s): -5.84 Weighted MNSQ 0.94
Item Delta(s): -5.84

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	19	15.20	-0.47	-5.97(.000)	-6.31	2.12
1	1.00	106	84.80	0.47	5.97(.000)	-1.21	2.76

Item 36
----
item:36 (RT7_2)
Cases for this item 125 Discrimination 0.48
Item Threshold(s): -4.95 Weighted MNSQ 1.24
Item Delta(s): -4.95

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	27	21.60	-0.48	-6.12(.000)	-5.39	2.58
1	1.00	98	78.40	0.48	6.12(.000)	-1.05	2.74

Item 37
----
item:37 (RT7_3)
Cases for this item 126 Discrimination 0.65
Item Threshold(s): -4.18 Weighted MNSQ 0.63
Item Delta(s): -4.18

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	35	27.78	-0.65	-9.44(.000)	-5.77	1.89
1	1.00	91	72.22	0.65	9.44(.000)	-0.51	2.32

Item 38
----
item:38 (RT7_4)
Cases for this item 126 Discrimination 0.68
Item Threshold(s): -3.48 Weighted MNSQ 0.79
Item Delta(s): -3.48

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	43	34.13	-0.68	-10.21(.000)	-5.21	2.14
1	1.00	83	65.87	0.68	10.21(.000)	-0.30	2.28

Item 39
----
item:39 (RT7_6)
Cases for this item 126 Discrimination 0.74
Item Threshold(s): -1.35 Weighted MNSQ 0.92
Item Delta(s): -1.35

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	71	56.35	-0.74	-12.38(.000)	-3.99	2.42
1	1.00	55	43.65	0.74	12.38(.000)	0.63	2.07

Item 40
----
item:40 (RT7_7)
Cases for this item 126 Discrimination 0.72
Item Threshold(s): -1.43 Weighted MNSQ 1.09
Item Delta(s): -1.43

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	70	55.56	-0.72	-11.63(.000)	-3.96	2.46
1	1.00	56	44.44	0.72	11.63(.000)	0.52	2.17

Item 41
----
item:41 (RT7_8)
Cases for this item 126 Discrimination 0.74
Item Threshold(s): -2.10 Weighted MNSQ 0.89
Item Delta(s): -2.10

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	61	48.41	-0.74	-12.11(.000)	-4.36	2.35
1	1.00	65	51.59	0.74	12.11(.000)	0.27	2.15

Item 42
----
item:42 (RT7_13)
Cases for this item 128 Discrimination 0.64
Item Threshold(s): 1.67 Weighted MNSQ 1.01
Item Delta(s): 1.67

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	106	82.81	-0.64	-9.43(.000)	-2.76	2.80
1	1.00	22	17.19	0.64	9.43(.000)	2.26	1.86

Item 43
----
item:43 (RT8_1)
Cases for this item 120 Discrimination 0.70
Item Threshold(s): -1.75 Weighted MNSQ 1.06
Item Delta(s): -1.75

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	64	53.33	-0.70	-10.66(.000)	-4.17	2.36
1	1.00	56	46.67	0.70	10.66(.000)	0.38	2.25

Item 44
----
item:44 (RT8_3)
Cases for this item 120 Discrimination 0.71
Item Threshold(s): -0.35 Weighted MNSQ 1.03
Item Delta(s): -0.35

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	81	67.50	-0.71	-11.09(.000)	-3.57	2.56
1	1.00	39	32.50	0.71	11.09(.000)	1.11	1.94

Item 45
----
item:45 (RT8_4)
Cases for this item 122 Discrimination 0.69
Item Threshold(s): 0.58 Weighted MNSQ 0.99
Item Delta(s): 0.58

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	92	75.41	-0.69	-10.51(.000)	-3.18	2.65
1	1.00	30	24.59	0.69	10.51(.000)	1.70	1.92

Item 46
----
item:46 (RT8_6)
Cases for this item 125 Discrimination 0.66
Item Threshold(s): 1.56 Weighted MNSQ 0.89
Item Delta(s): 1.56

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	103	82.40	-0.66	-9.65(.000)	-2.81	2.76
1	1.00	22	17.60	0.66	9.65(.000)	2.29	1.73

Item 47
----
item:47 (RT8_8)
Cases for this item 125 Discrimination 0.71
Item Threshold(s): 1.02 Weighted MNSQ 0.83
Item Delta(s): 1.02

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	98	78.40	-0.71	-11.08(.000)	-2.99	2.68
1	1.00	27	21.60	0.71	11.08(.000)	2.01	1.81

Item 48
----
item:48 (RT8_9)
Cases for this item 125 Discrimination 0.66
Item Threshold(s): 1.68 Weighted MNSQ 0.81
Item Delta(s): 1.68

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	104	83.20	-0.66	-9.69(.000)	-2.79	2.74
1	1.00	21	16.80	0.66	9.69(.000)	2.42	1.75

Item 49
----
item:49 (RT8_13)
Cases for this item 126 Discrimination 0.66
Item Threshold(s): 1.54 Weighted MNSQ 0.91
Item Delta(s): 1.54

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	103	81.75	-0.66	-9.90(.000)	-2.79	2.82
1	1.00	23	18.25	0.66	9.90(.000)	2.30	1.47

Item 50
----
item:50 (RT9_1)
Cases for this item 122 Discrimination 0.71
Item Threshold(s): 0.43 Weighted MNSQ 0.90
Item Delta(s): 0.43

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	90	73.77	-0.71	-11.09(.000)	-3.25	2.59
1	1.00	32	26.23	0.71	11.09(.000)	1.58	2.13

Item 51
----
item:51 (RT9_2)
Cases for this item 122 Discrimination 0.71
Item Threshold(s): 0.72 Weighted MNSQ 0.84
Item Delta(s): 0.72

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	93	76.23	-0.71	-10.91(.000)	-3.15	2.60
1	1.00	29	23.77	0.71	10.91(.000)	1.76	2.17

Item 52
----
item:52 (RT9_3)
Cases for this item 123 Discrimination 0.71
Item Threshold(s): 1.06 Weighted MNSQ 0.81
Item Delta(s): 1.06

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	97	78.86	-0.71	-10.98(.000)	-3.06	2.64
1	1.00	26	21.14	0.71	10.98(.000)	2.10	1.72

Item 53
----
item:53 (RT9_6)
Cases for this item 123 Discrimination 0.73
Item Threshold(s): 1.89 Weighted MNSQ 0.53
Item Delta(s): 1.89

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	104	84.55	-0.73	-11.82(.000)	-2.86	2.66
1	1.00	19	15.45	0.73	11.82(.000)	2.94	1.08

Item 54
----
item:54 (RT9_9)
Cases for this item 124 Discrimination 0.61
Item Threshold(s): 2.26 Weighted MNSQ 0.89
Item Delta(s): 2.26

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	107	86.29	-0.61	-8.45(.000)	-2.64	2.82
1	1.00	17	13.71	0.61	8.45(.000)	2.61	2.18

Item 55
----
item:55 (RT9_11)
Cases for this item 124 Discrimination 0.46
Item Threshold(s): 4.13 Weighted MNSQ 1.02
Item Delta(s): 4.13

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	117	94.35	-0.46	-5.76(.000)	-2.25	3.07
1	1.00	7	5.65	0.46	5.76(.000)	3.60	1.02

Item 56
----
item:56 (RT9_14)
Cases for this item 126 Discrimination 0.71
Item Threshold(s): 1.90 Weighted MNSQ 0.61
Item Delta(s): 1.90

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	106	84.13	-0.71	-11.38(.000)	-2.76	2.73
1	1.00	20	15.87	0.71	11.38(.000)	2.86	1.28

Item 57
----
item:57 (RT9_18)
Cases for this item 126 Discrimination 0.29
Item Threshold(s): 5.54 Weighted MNSQ 1.46
Item Delta(s): 5.54

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	123	97.62	-0.29	-3.35(.001)	-2.00	3.20
1	1.00	3	2.38	0.29	3.35(.001)	3.64	0.75

Item 58
----
item:58 (SM1_2)
Cases for this item 120 Discrimination 0.54
Item Threshold(s): -5.15 Weighted MNSQ 0.93
Item Delta(s): -5.15

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	25	20.83	-0.54	-6.91(.000)	-6.29	2.12
1	1.00	95	79.17	0.54	6.91(.000)	-1.05	2.51

Item 59
----
item:59 (SM1_3)
Cases for this item 126 Discrimination 0.60
Item Threshold(s): -4.35 Weighted MNSQ 0.92
Item Delta(s): -4.35

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	33	26.19	-0.60	-8.29(.000)	-5.74	2.22
1	1.00	93	73.81	0.60	8.29(.000)	-0.62	2.45

Item 60
----
item:60 (SM1_5)
Cases for this item 127 Discrimination 0.58
Item Threshold(s): -3.82 Weighted MNSQ 1.21
Item Delta(s): -3.82

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	39	30.71	-0.58	-8.05(.000)	-5.13	2.39
1	1.00	88	69.29	0.58	8.05(.000)	-0.56	2.55

Item 61
----
item:61 (SM1_9)
Cases for this item 128 Discrimination 0.70
Item Threshold(s): -0.74 Weighted MNSQ 1.01
Item Delta(s): -0.74

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	79	61.72	-0.70	-11.13(.000)	-3.66	2.63
1	1.00	49	38.28	0.70	11.13(.000)	0.89	2.14

Item 62
----
item:62 (SM1_12)
Cases for this item 128 Discrimination 0.56
Item Threshold(s): 2.31 Weighted MNSQ 1.18
Item Delta(s): 2.31

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	111	86.72	-0.56	-7.56(.000)	-2.56	2.99
1	1.00	17	13.28	0.56	7.56(.000)	2.26	1.98

Item 63
----
item:63 (SM1_13)
Cases for this item 128 Discrimination 0.63
Item Threshold(s): 1.55 Weighted MNSQ 1.06
Item Delta(s): 1.55

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	105	82.03	-0.63	-9.16(.000)	-2.79	2.85
1	1.00	23	17.97	0.63	9.16(.000)	2.08	2.03

Item 64
----
item:64 (SM2_1)
Cases for this item 124 Discrimination 0.72
Item Threshold(s): -1.17 Weighted MNSQ 1.00
Item Delta(s): -1.17

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	71	57.26	-0.72	-11.41(.000)	-3.90	2.53
1	1.00	53	42.74	0.72	11.41(.000)	0.80	2.06

Item 65
----
item:65 (SM2_2)
Cases for this item 125 Discrimination 0.80
Item Threshold(s): -0.56 Weighted MNSQ 0.65
Item Delta(s): -0.56

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	79	63.20	-0.80	-14.78(.000)	-3.77	2.35
1	1.00	46	36.80	0.80	14.78(.000)	1.38	1.79

Item 66
----
item:66 (SM2_4)
Cases for this item 124 Discrimination 0.73
Item Threshold(s): 0.81 Weighted MNSQ 0.84
Item Delta(s): 0.81

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	95	76.61	-0.73	-11.64(.000)	-3.11	2.62
1	1.00	29	23.39	0.73	11.64(.000)	2.05	1.78

Item 67
----
item:67 (SM2_5)
Cases for this item 125 Discrimination 0.71
Item Threshold(s): 0.61 Weighted MNSQ 0.95
Item Delta(s): 0.61

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	93	74.40	-0.71	-11.10(.000)	-3.12	2.69
1	1.00	32	25.60	0.71	11.10(.000)	1.77	1.88

Item 68
----
item:68 (SM2_6)
Cases for this item 125 Discrimination 0.67
Item Threshold(s): 1.65 Weighted MNSQ 0.97
Item Delta(s): 1.65

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	103	82.40	-0.67	-9.93(.000)	-2.78	2.82
1	1.00	22	17.60	0.67	9.93(.000)	2.36	1.65

Item 69
----
item:69 (SM2_8)
Cases for this item 125 Discrimination 0.54
Item Threshold(s): 2.90 Weighted MNSQ 1.00
Item Delta(s): 2.90

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	112	89.60	-0.54	-7.13(.000)	-2.43	2.96
1	1.00	13	10.40	0.54	7.13(.000)	2.97	1.62

Item 70
----
item:70 (SM2_9)
Cases for this item 125 Discrimination 0.59
Item Threshold(s): 2.90 Weighted MNSQ 0.83
Item Delta(s): 2.90

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	112	89.60	-0.59	-8.09(.000)	-2.45	2.93
1	1.00	13	10.40	0.59	8.09(.000)	3.15	1.40

Item 71
----
item:71 (SM2_10)
Cases for this item 125 Discrimination 0.44
Item Threshold(s): 3.66 Weighted MNSQ 1.30
Item Delta(s): 3.66

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	116	92.80	-0.44	-5.41(.000)	-2.24	3.10
1	1.00	9	7.20	0.44	5.41(.000)	2.86	1.56

Item 72
----
item:72 (SM2_11)
Cases for this item 125 Discrimination 0.35
Item Threshold(s): 4.43 Weighted MNSQ 1.22
Item Delta(s): 4.43

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	119	95.20	-0.35	-4.20(.000)	-2.11	3.17
1	1.00	6	4.80	0.35	4.20(.000)	2.76	2.36

Item 73
----
item:73 (SM2_12)
Cases for this item 125 Discrimination 0.41
Item Threshold(s): 4.43 Weighted MNSQ 1.08
Item Delta(s): 4.43

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	119	95.20	-0.41	-5.03(.000)	-2.14	3.14
1	1.00	6	4.80	0.41	5.03(.000)	3.40	1.10

Item 74
----
item:74 (SM3_1)
Cases for this item 112 Discrimination 0.46
Item Threshold(s): 2.90 Weighted MNSQ 1.48
Item Delta(s): 2.90

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	101	90.18	-0.46	-5.47(.000)	-2.59	3.05
1	1.00	11	9.82	0.46	5.47(.000)	2.21	2.53

Item 75
----
item:75 (SM3_5)
Cases for this item 112 Discrimination 0.22
Item Threshold(s): 5.38 Weighted MNSQ 1.32
Item Delta(s): 5.38

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	109	97.32	-0.22	-2.38(.019)	-2.24	3.25
1	1.00	3	2.68	0.22	2.38(.019)	2.12	3.87

Item 76
----
item:76 (LK1_4)
Cases for this item 122 Discrimination 0.73
Item Threshold(s): -2.76 Weighted MNSQ 0.78
Item Delta(s): -2.77

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	52	42.62	-0.73	-11.59(.000)	-4.91	2.16
1	1.00	70	57.38	0.73	11.59(.000)	-0.10	2.09

Item 77
----
item:77 (LK1_9)
Cases for this item 124 Discrimination 0.73
Item Threshold(s): -0.63 Weighted MNSQ 0.94
Item Delta(s): -0.63

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	80	64.52	-0.73	-11.79(.000)	-3.71	2.54
1	1.00	44	35.48	0.73	11.79(.000)	0.88	1.95

Item 78
----
item:78 (LK1_12)
Cases for this item 127 Discrimination 0.70
Item Threshold(s): -0.11 Weighted MNSQ 1.03
Item Delta(s): -0.11

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	87	68.50	-0.70	-11.06(.000)	-3.43	2.62
1	1.00	40	31.50	0.70	11.06(.000)	1.23	2.03

Item 79
----
item:79 (LK1_14)
Cases for this item 127 Discrimination 0.57
Item Threshold(s): 1.58 Weighted MNSQ 1.23
Item Delta(s): 1.58

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	105	82.68	-0.57	-7.76(.000)	-2.72	2.92
1	1.00	22	17.32	0.57	7.76(.000)	1.66	2.29

Item 80
----
item:80 (LK1_16)
Cases for this item 128 Discrimination 0.59
Item Threshold(s): 1.67 Weighted MNSQ 1.24
Item Delta(s): 1.67

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	106	82.81	-0.59	-8.16(.000)	-2.69	2.96
1	1.00	22	17.19	0.59	8.16(.000)	1.79	2.18

Item 81
----
item:81 (LK2_5)
Cases for this item 121 Discrimination 0.72
Item Threshold(s): 0.30 Weighted MNSQ 0.96
Item Delta(s): 0.30

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	89	73.55	-0.72	-11.23(.000)	-3.31	2.58
1	1.00	32	26.45	0.72	11.23(.000)	1.49	1.81

Item 82
----
item:82 (LK2_8)
Cases for this item 124 Discrimination 0.63
Item Threshold(s): 1.92 Weighted MNSQ 0.97
Item Delta(s): 1.92

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	105	84.68	-0.63	-9.02(.000)	-2.70	2.84
1	1.00	19	15.32	0.63	9.02(.000)	2.38	1.78

Item 83
----
item:83 (LK2_10)
Cases for this item 125 Discrimination 0.70
Item Threshold(s): 0.82 Weighted MNSQ 0.91
Item Delta(s): 0.82

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	96	76.80	-0.70	-10.97(.000)	-3.04	2.68
1	1.00	29	23.20	0.70	10.97(.000)	1.82	1.92

Item 84
----
item:84 (PK1_5)
Cases for this item 125 Discrimination 0.57
Item Threshold(s): -2.36 Weighted MNSQ 1.46
Item Delta(s): -2.36

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	56	44.80	-0.57	-7.76(.000)	-4.11	2.81
1	1.00	69	55.20	0.57	7.76(.000)	-0.12	2.35

Item 85
----
item:85 (PK1_8)
Cases for this item 125 Discrimination 0.65
Item Threshold(s): -1.52 Weighted MNSQ 1.11
Item Delta(s): -1.52

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	67	53.60	-0.65	-9.42(.000)	-3.89	2.72
1	1.00	58	46.40	0.65	9.42(.000)	0.39	2.09

Item 86
----
item:86 (PK1_9)
Cases for this item 125 Discrimination 0.70
Item Threshold(s): -0.75 Weighted MNSQ 1.11
Item Delta(s): -0.75

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	77	61.60	-0.70	-10.79(.000)	-3.62	2.58
1	1.00	48	38.40	0.70	10.79(.000)	0.85	2.11

Item 87
----
item:87 (PK1_10)
Cases for this item 125 Discrimination 0.70
Item Threshold(s): -0.19 Weighted MNSQ 1.02
Item Delta(s): -0.19

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	84	67.20	-0.70	-10.82(.000)	-3.39	2.65
1	1.00	41	32.80	0.70	10.82(.000)	1.14	1.98

Item 88
----
item:88 (PK1_13)
Cases for this item 125 Discrimination 0.62
Item Threshold(s): 1.69 Weighted MNSQ 1.04
Item Delta(s): 1.69

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	104	83.20	-0.62	-8.77(.000)	-2.73	2.82
1	1.00	21	16.80	0.62	8.77(.000)	2.19	1.76

Item 89
----
item:89 (PK1_15)
Cases for this item 125 Discrimination 0.54
Item Threshold(s): 2.99 Weighted MNSQ 0.92
Item Delta(s): 2.99

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	113	90.40	-0.54	-7.02(.000)	-2.41	2.94
1	1.00	12	9.60	0.54	7.02(.000)	2.89	1.70

Item 90
----
item:90 (PK1_18)
Cases for this item 125 Discrimination 0.25
Item Threshold(s): 6.02 Weighted MNSQ 1.24
Item Delta(s): 6.02

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	123	98.40	-0.25	-2.91(.004)	-1.99	3.19
1	1.00	2	1.60	0.25	2.91(.004)	3.44	1.22

Item 91
----
item:91 (PK1_19)
Cases for this item 126 Discrimination 0.44
Item Threshold(s): 3.26 Weighted MNSQ 1.37
Item Delta(s): 3.26

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	115	91.27	-0.44	-5.45(.000)	-2.28	3.07
1	1.00	11	8.73	0.44	5.45(.000)	2.53	1.91

The following traditional statistics are only meaningful for complete designs and when the amount of missing data is minimal.
In this analysis 5.22% of the data are missing.

The following results are scaled to assume that a single response was provided for each item.

N	131
Mean	31.53
Standard Deviation	22.90
Variance	524.40
Skewness	0.56
Kurtosis	-0.62
Standard error of mean	2.00
Standard error of measurement	3.11
Coefficient Alpha	0.98

APPENDIX R: FINAL INSTRUMENT OUTPUT FILES-WRITING

```
Literacy-WRITING
================================================================================
ConQuest: Generalised Item Response Modelling Software     Sat Oct 13 11:37 2018
SUMMARY OF THE ESTIMATION
================================================================================

Estimation method was: Gauss-Hermite Quadrature with 15 nodes
Assumed population distribution was: Gaussian
Constraint was: CASES
The Data File: testSPSS\write2017.dat
The format:  responses 4,5,7,9-12,14,16,17,19,20,22,24,27,28,30-
34,37,40,41,42,43,46,48,51,53,55,56,59,61,63,64,65,66,67,69,70,71,75,77,79,81,83,8
4,85,86,88,89,90,92,95,99,104,106,112,113,114,116,117,118,120,121,122,125,130,135,
136,137,139,141,143,144,145,146,147,148,150,151,152,153,155,159,161,164,166,167,16
9,170,172
The regression model:
Grouping Variables:
The item model: items
Slopes are fixed
Sample size: 298
Final Deviance:     5733.86723
Total number of estimated parameters: 94
The number of iterations: 18
Termination criteria:  Max iterations=1000, Parameter Change= 0.00010
                       Deviance Change= 0.00010
Iterations terminated because the convergence criteria were reached
At termination the solution was not the best attained solution
The reported results are for the earlier better solution
Rerunning this analysis using the current estimates as initial values is strongly
advised.
Random number generation seed:    1.00000
Number of nodes used when drawing PVs: 2000
Number of nodes used when computing fit: 200
Number of plausible values to draw: 5
Maximum number of iterations without a deviance improvement: 100
Maximum number of Newton steps in M-step: 10
Value for obtaining finite MLEs for zero/perfects:    0.30000

================================================================================
```

```
================================================================================
ConQuest: Generalised Item Response Modelling Software     Sat Oct 13 11:37 2018
TABLES OF RESPONSE MODEL PARAMETER ESTIMATES
================================================================================
TERM 1: items
```

VARIABLES				UNWEIGHTED FIT			WEIGHTED FIT		
	item	ESTIMATE	ERROR^	MNSQ	CI	T	MNSQ	CI	T
1	CI1_4	-7.811	0.414	6.24	(0.75, 1.25)	19.7	1.36	(0.53, 1.47)	1.4
2	CI1_5	-6.672	0.356	13.47	(0.75, 1.25)	32.4	1.02	(0.64, 1.36)	0.2
3	CI1_7	-4.851	0.305	6.66	(0.75, 1.25)	20.7	1.11	(0.66, 1.34)	0.6
4	CI1_9	-2.330	0.257	0.82	(0.75, 1.25)	-1.4	0.98	(0.74, 1.26)	-0.1
5	CI1_10	-0.594	0.289	0.70	(0.75, 1.25)	-2.7	1.02	(0.68, 1.32)	0.2
6	CI1_11	-0.918	0.280	0.55	(0.75, 1.25)	-4.3	0.90	(0.70, 1.30)	-0.7
7	CI1_12	0.166	0.308	0.60	(0.75, 1.25)	-3.7	0.95	(0.66, 1.34)	-0.2
8	CI1_14	1.021	0.348	0.32	(0.75, 1.25)	-7.5	0.73	(0.62, 1.38)	-1.5
9	CI1_16	2.119	0.413	0.27	(0.76, 1.25)	-8.5	0.99	(0.55, 1.45)	0.0
10	CI1_17	0.996	0.344	2.62	(0.76, 1.25)	9.1	0.90	(0.63, 1.37)	-0.5
11	CI2_2	-3.291	0.278	1.41	(0.75, 1.25)	2.8	1.06	(0.71, 1.29)	0.5
12	CI2_3	-2.408	0.263	1.39	(0.75, 1.25)	2.8	1.27	(0.73, 1.27)	1.8
13	CI2_5	-0.942	0.278	0.80	(0.75, 1.25)	-1.7	1.15	(0.70, 1.30)	1.0
14	CI2_7	0.658	0.327	0.61	(0.75, 1.25)	-3.5	0.95	(0.64, 1.36)	-0.2
15	CI3_2	1.717	0.424	0.49	(0.74, 1.26)	-4.7	0.85	(0.55, 1.45)	-0.6
16	CI3_3	1.546	0.410	0.66	(0.74, 1.26)	-2.9	1.18	(0.56, 1.44)	0.8
17	CI3_5	1.497	0.400	0.86	(0.74, 1.26)	-1.1	1.15	(0.58, 1.42)	0.7
18	CI4_1	-1.448	0.278	1.76	(0.75, 1.25)	4.8	1.25	(0.70, 1.30)	1.6
19	CI4_2	-1.266	0.280	0.47	(0.75, 1.25)	-5.2	0.79	(0.70, 1.30)	-1.4
20	CI4_3	-0.188	0.304	0.54	(0.75, 1.25)	-4.3	0.83	(0.67, 1.33)	-1.0
21	CI4_4	-0.094	0.307	0.76	(0.75, 1.25)	-2.0	0.92	(0.66, 1.34)	-0.4
22	CI4_7	0.557	0.326	0.43	(0.75, 1.25)	-5.7	0.95	(0.64, 1.36)	-0.2
23	CI4_10	1.109	0.351	0.30	(0.75, 1.25)	-7.8	0.80	(0.62, 1.38)	-1.1
24	CI4_11	1.950	0.402	0.93	(0.75, 1.25)	-0.5	0.61	(0.57, 1.43)	-2.0
25	CI4_12	1.645	0.382	0.18	(0.75, 1.25)	-10.2	0.58	(0.59, 1.41)	-2.3
26	CI4_13	1.794	0.392	0.28	(0.75, 1.25)	-8.2	0.77	(0.58, 1.42)	-1.1
27	CI4_16	2.290	0.426	0.33	(0.75, 1.25)	-7.3	0.92	(0.53, 1.47)	-0.3
28	CI4_18	2.678	0.460	0.17	(0.75, 1.25)	-10.4	0.78	(0.47, 1.53)	-0.8
29	CI4_21	3.145	0.515	0.31	(0.75, 1.25)	-7.7	1.03	(0.36, 1.64)	0.2
30	CI4_23	4.909	0.952	0.09	(0.75, 1.25)	-13.0	0.78	(0.00, 2.54)	-0.0
31	CI4_25	3.145	0.515	0.21	(0.75, 1.25)	-9.7	0.92	(0.36, 1.64)	-0.1
32	CI4_26	4.909	0.952	0.10	(0.75, 1.25)	-12.7	0.78	(0.00, 2.54)	-0.1
33	CW1_2	-4.926	0.313	0.54	(0.74, 1.26)	-4.2	0.90	(0.65, 1.35)	-0.5
34	CW1_4	-4.504	0.300	0.46	(0.74, 1.26)	-5.2	0.66	(0.67, 1.33)	-2.2
35	CW1_6	-3.283	0.268	0.36	(0.75, 1.25)	-6.9	0.64	(0.72, 1.28)	-2.9
36	CW1_7	-3.141	0.265	1.78	(0.75, 1.25)	5.1	0.91	(0.73, 1.27)	-0.6
37	CW1_8	-3.358	0.269	0.39	(0.75, 1.25)	-6.4	0.68	(0.72, 1.28)	-2.5
38	CW1_9	-2.333	0.257	1.00	(0.75, 1.25)	0.0	0.85	(0.74, 1.26)	-1.2
39	CW1_10	-1.076	0.273	0.89	(0.75, 1.25)	-0.9	1.02	(0.71, 1.29)	0.2
40	CW1_12	0.270	0.311	0.45	(0.75, 1.25)	-5.5	0.82	(0.66, 1.34)	-1.1
41	CW2_1	-1.662	0.271	0.62	(0.75, 1.25)	-3.3	0.94	(0.71, 1.29)	-0.4
42	CW2_2	-0.007	0.309	0.55	(0.75, 1.25)	-4.2	0.87	(0.66, 1.34)	-0.7
43	CW2_6	0.438	0.319	0.36	(0.75, 1.25)	-6.8	0.82	(0.65, 1.35)	-1.1
44	CW2_8	1.235	0.358	0.37	(0.75, 1.25)	-6.6	0.92	(0.62, 1.38)	-0.3
45	CW2_10	1.950	0.402	0.23	(0.75, 1.25)	-9.2	0.82	(0.57, 1.43)	-0.8
46	CW2_12	2.476	0.442	0.28	(0.75, 1.25)	-8.1	1.00	(0.51, 1.49)	0.1
47	CW2_14	4.226	0.733	0.10	(0.75, 1.25)	-12.4	0.83	(0.00, 2.12)	-0.1
48	CW2_15	3.430	0.558	0.17	(0.75, 1.25)	-10.5	0.83	(0.26, 1.74)	-0.4
49	CW2_16	3.145	0.515	0.15	(0.75, 1.25)	-11.0	0.77	(0.36, 1.64)	-0.7
50	CW2_17	3.774	0.624	0.45	(0.75, 1.25)	-5.5	1.19	(0.12, 1.88)	0.5
51	CW2_19	4.909	0.952	0.34	(0.75, 1.25)	-7.1	0.89	(0.00, 2.54)	0.1
52	CW2_20	6.286	1.453	0.01	(0.75, 1.25)	-18.7	0.35	(0.00, 2.95)	-0.6
53	CW2_21	6.286	1.453	0.01	(0.75, 1.25)	-18.7	0.35	(0.00, 2.95)	-0.6
54	CW2_23	4.226	0.733	0.22	(0.75, 1.25)	-9.3	0.92	(0.00, 2.12)	0.0
55	WS1_3	-8.132	0.447	6.14	(0.75, 1.25)	19.7	1.16	(0.44, 1.56)	0.6
56	WS1_7	-4.435	0.289	1.34	(0.75, 1.25)	2.5	1.03	(0.68, 1.32)	0.2
57	WS2_2	-6.276	0.344	3.68	(0.75, 1.25)	12.8	1.36	(0.64, 1.36)	1.8
58	WS2_4	-4.405	0.292	1.70	(0.75, 1.25)	4.6	1.17	(0.68, 1.32)	1.0
59	WS2_10	-2.994	0.261	1.02	(0.75, 1.25)	0.2	0.89	(0.73, 1.27)	-0.8
60	WS2_11	-2.261	0.257	1.03	(0.75, 1.25)	0.2	1.04	(0.74, 1.26)	0.3
61	WS2_12	-1.860	0.261	1.24	(0.75, 1.25)	1.8	1.22	(0.73, 1.27)	1.5
62	WS2_14	0.622	0.329	0.53	(0.75, 1.25)	-4.5	1.08	(0.63, 1.37)	0.5
63	WS2_15	0.210	0.312	0.52	(0.75, 1.25)	-4.7	1.04	(0.65, 1.35)	0.3
64	WS2_16	0.881	0.338	0.64	(0.76, 1.25)	-3.3	1.24	(0.63, 1.37)	1.2
65	WS2_18	1.799	0.391	2.04	(0.76, 1.25)	6.5	1.28	(0.58, 1.42)	1.3

66	WS2_19	2.681	0.460	1.05	(0.76, 1.25)	0.4	1.17	(0.47, 1.53)	0.7
67	WS2_20	3.148	0.515	0.20	(0.76, 1.24)	-10.1	0.79	(0.36, 1.64)	-0.6
68	WS2_23	6.287	1.452	0.01	(0.76, 1.24)	-19.2	0.35	(0.00, 2.95)	-0.6
69	WS2_28	4.911	0.952	0.63	(0.76, 1.24)	-3.4	0.91	(0.00, 2.54)	0.1
70	WS3_2	-3.960	0.287	1.89	(0.75, 1.25)	5.5	1.33	(0.69, 1.31)	1.9
71	WS3_3	-3.303	0.271	0.89	(0.75, 1.25)	-0.9	1.07	(0.72, 1.28)	0.5
72	WS3_4	-2.432	0.258	0.82	(0.75, 1.25)	-1.5	1.20	(0.73, 1.27)	1.4
73	WS3_6	-0.861	0.279	0.90	(0.75, 1.25)	-0.8	0.92	(0.70, 1.30)	-0.5
74	WS3_8	0.073	0.305	0.35	(0.75, 1.25)	-7.1	0.66	(0.66, 1.34)	-2.2
75	WS3_10	0.676	0.330	0.46	(0.75, 1.25)	-5.4	0.95	(0.64, 1.36)	-0.2
76	WS3_11	1.799	0.391	2.66	(0.76, 1.25)	9.3	1.20	(0.58, 1.42)	0.9
77	CS1_1	-5.796	0.332	0.54	(0.75, 1.25)	-4.4	0.71	(0.64, 1.36)	-1.7
78	CS1_2	-4.354	0.294	0.48	(0.75, 1.25)	-5.1	0.80	(0.68, 1.32)	-1.2
79	CS1_3	-2.265	0.262	1.19	(0.75, 1.25)	1.5	0.97	(0.73, 1.27)	-0.2
80	CS1_4	-2.058	0.263	0.60	(0.75, 1.25)	-3.7	0.84	(0.73, 1.27)	-1.1
81	CS1_6	-2.161	0.261	0.50	(0.75, 1.25)	-4.8	0.78	(0.73, 1.27)	-1.7
82	CS1_7	-1.460	0.271	1.00	(0.75, 1.25)	0.0	0.80	(0.71, 1.29)	-1.5
83	CS1_8	0.356	0.325	0.57	(0.75, 1.25)	-4.0	1.05	(0.64, 1.36)	0.3
84	CS1_9	1.504	0.384	0.25	(0.75, 1.25)	-8.7	0.82	(0.57, 1.43)	-0.8
85	CS1_11	0.155	0.309	0.28	(0.75, 1.25)	-8.1	0.61	(0.66, 1.34)	-2.5
86	CS1_15	2.478	0.441	0.34	(0.75, 1.25)	-7.2	1.09	(0.50, 1.50)	0.4
87	CS1_17	3.146	0.515	0.25	(0.75, 1.25)	-8.7	0.95	(0.36, 1.64)	-0.1
88	CS2_2	0.836	0.347	0.59	(0.75, 1.25)	-3.7	1.17	(0.62, 1.38)	0.9
89	CS2_4	2.011	0.415	0.58	(0.75, 1.25)	-3.8	0.85	(0.55, 1.45)	-0.6
90	CS2_5	1.497	0.374	0.49	(0.75, 1.25)	-5.0	0.95	(0.60, 1.40)	-0.2
91	CS2_7	3.773	0.624	0.13	(0.75, 1.25)	-11.6	0.87	(0.12, 1.88)	-0.2
92	CS2_8	3.428	0.559	0.13	(0.75, 1.25)	-11.8	0.81	(0.26, 1.74)	-0.4
93	CS2_10	4.224	0.733	0.39	(0.75, 1.25)	-6.4	0.99	(0.00, 2.12)	0.2

An asterisk next to a parameter estimate indicates that it is constrained
Separation Reliability = 0.977
Chi-square test of parameter equality = 6058.49, df = 93, Sig Level = 0.000
^ Quick standard errors have been used

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================================================================================
ConQuest: Generalised Item Response Modelling Software     Sat Oct 13 11:37 2018
TABLES OF POPULATION MODEL PARAMETER ESTIMATES
================================================================================
REGRESSION COEFFICIENTS



Regression Variable

CONSTANT                  0.000*
-------------------------------------------------
An asterisk next to a parameter estimate indicates that it is constrained
=================================================
COVARIANCE/CORRELATION MATRIX



Dimension

Dimension 1
-----------------------------------------
Variance                  8.766  ( 0.718)
-----------------------------------------
An asterisk next to a parameter estimate indicates that it is constrained

=========================================

RELIABILITY COEFFICIENTS
------------------------

Dimension: (Dimension 1)
-----------------------
 MLE Person separation RELIABILITY:  Unavailable
 WLE Person separation RELIABILITY:   0.980
 EAP/PV RELIABILITY:                  0.632
------------------------
```

```
================================================================================
ConQuest: Generalised Item Response Modelling Software     Sat Oct 13 11:37 2018
MAP OF WLE ESTIMATES AND RESPONSE MODEL PARAMETER ESTIMATES
================================================================================
                                             Terms in the Model (excl Step terms)

                                                                +items
---------------------------------------------------------------------------------------
   9                                          |                                       |
                                              |                                       |
                                              |                                       |
   8                                          |                                       |
                                              |                                       |
   7                                          |                                       |
                                          XXXX|                                       |
                                              |52 53 68                               |
   6                                          |                                       |
                                              |                                       |
   5                                          |30 32 51 69                            |
                                              |                                       |
                                              |47 54 93                               |
   4                                          |50 91                                  |
                                              |48 92                                  |
   3                                          |29 31 49 67 87                         |
                            XXXXXXXXXXXXXXXXXX|28 66                                  |
                                       XXXXXXX|9 27 46 86                             |
   2                                   XXXXXXX|15 24 26 45 65 76 89                   |
                                          XXXX|16 17 25 84 90                         |
   1                    XXXXXXXXXXXXXXXXXXXXXX|8 10 23 44                             |
                               XXXXXXXXXXXXXXX|14 22 62 64 75 88                      |
                                   XXXXXXXXXXX|7 40 43 63 83 85                       |
   0                        XXXXXXXXXXXXXXXXXX|20 21 42 74                            |
                        XXXXXXXXXXXXXXXXXXXXXX|5                                      |
  -1                               XXXXXXXXXXX|6 13 39 73                             |
                        XXXXXXXXXXXXXXXXXXXXXX|18 19 82                               |
      XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|41 61                                  |
  -2                               XXXXXXXXXXX|60 79 80 81                            |
                 XXXXXXXXXXXXXXXXXXXXXXXXXXXXX|4 12 38 72                             |
  -3                 XXXXXXXXXXXXXXXXXXXXXXXXX|59                                     |
          XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX|11 35 36 37 71                         |
                                   XXXXXXXXXXX|                                       |
  -4                    XXXXXXXXXXXXXXXXXXXXXX|70                                     |
                                   XXXXXXXXXXX|34 56 58 78                            |
  -5                           XXXXXXXXXXXXXXX|3 33                                   |
                            XXXXXXXXXXXXXXXXXX|                                       |
                               XXXXXXXXXXXXXXX|77                                     |
  -6                                   XXXXXXX|57                                     |
                               XXXXXXXXXXXXXXX|2                                      |
  -7                    XXXXXXXXXXXXXXXXXXXXXX|                                       |
                                              |                                       |
                     XXXXXXXXXXXXXXXXXXXXXXXXX|1                                      |
  -8                                          |55                                     |
                                       XXXXXXX|                                       |
  -9                                      XXXX|                                       |
                                              |                                       |
                                              |                                       |
 -10                                          |                                       |
                                              |                                       |
 -11                                          |                                       |
                                              |                                       |
                                              |                                       |
 -12                                          |                                       |
                                              |                                       |
 -13                                          |                                       |
                                              |                                       |
                                              |                                       |
 -14                                          |                                       |
                                              |                                       |
=======================================================================================
Each 'X' represents   0.3 cases

=======================================================================================
```

```
================================================================================
ConQuest: Generalised Item Response Modelling Software     Sat Oct 13 11:37 2018
MAP OF WLE ESTIMATES AND THRESHOLDS
================================================================================
                              Generalised-Item Thresholds

--------------------------------------------------------------------------------------------------
   9             |
                 |
                 |
   8             |
                 |
   7             |
                X|
                 |52 53 68
   6             |
                 |
   5             |30 32 51 69
                 |
                 |47 54 93
   4             |50 91
                 |48 92
   3             |29 31 49 67 87
           XXXXX|28 66
              XX|9 27 46 86
   2          XX|15 24 26 45 65 76 89
               X|16 17 25 84 90
   1       XXXXX|8 10 23 44
            XXXX|14 22 62 64 75 88
             XXX|7 40 43 63 83 85
   0       XXXXX|20 21 42 74
           XXXXX|5
  -1         XXX|6 13 39 73
           XXXXX|18 19 82
      XXXXXXXXXX|41 61
  -2         XXX|60 79 80 81
         XXXXXXX|4 12 38 72
  -3      XXXXXX|59
       XXXXXXXXX|11 35 36 37 71
             XXX|
  -4       XXXXX|70
             XXX|34 56 58 78
  -5        XXXX|3 33
           XXXXX|
            XXXX|77
  -6          XX|57
            XXXX|2
  -7       XXXXX|
                |
          XXXXXX|1
  -8            |55
              XX|
  -9           X|
                |
                |
  -10           |
                |
  -11           |
                |
                |
  -12           |
                |
  -13           |
                |
                |
  -14           |
                |
================================================================================================
================================================================================================
Each 'X' represents   1.1 cases
The labels for thresholds show the levels of
    item, and category, respectively

================================================================================================
================================================================================================
```

Literacy-WRITING

ConQuest: Generalised Item Response Modelling Software Sat Oct 13 11:37 2018

GENERALISED ITEM ANALYSIS

Item 1

item:1 (CI1_4)

Cases for this item 122 Discrimination 0.22

Item Threshold(s): -7.81 Weighted MNSQ 1.36

Item Delta(s): -7.81

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	9	7.38	-0.22	-2.49(.014)	-5.65	2.36
1	1.00	113	92.62	0.22	2.49(.014)	-2.51	2.95

Item 2

item:2 (CI1_5)

Cases for this item 122 Discrimination 0.36

Item Threshold(s): -6.67 Weighted MNSQ 1.02

Item Delta(s): -6.67

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	17	13.93	-0.36	-4.19(.000)	-6.43	2.51
1	1.00	105	86.07	0.36	4.19(.000)	-2.15	2.65

Item 3

item:3 (CI1_7)

Cases for this item 122 Discrimination 0.48

Item Threshold(s): -4.85 Weighted MNSQ 1.11

Item Delta(s): -4.85

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	34	27.87	-0.48	-5.94(.000)	-5.65	2.56
1	1.00	88	72.13	0.48	5.94(.000)	-1.62	2.36

Item 4

item:4 (CI1_9)

Cases for this item 126 Discrimination 0.67

Item Threshold(s): -2.33 Weighted MNSQ 0.98

Item Delta(s): -2.33

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	68	53.97	-0.67	-10.11(.000)	-4.66	2.13
1	1.00	58	46.03	0.67	10.11(.000)	-0.41	2.05

Item 5

item:5 (CI1_10)

Cases for this item 126 Discrimination 0.67

Item Threshold(s): -0.59 Weighted MNSQ 1.02

Item Delta(s): -0.59

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	92	73.02	-0.67	-10.18(.000)	-3.86	2.42
1	1.00	34	26.98	0.67	10.18(.000)	0.44	1.91

Item 6

item:6 (CI1_11)

Cases for this item 126 Discrimination 0.73

Item Threshold(s): -0.92 Weighted MNSQ 0.90

Item Delta(s): -0.92

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	88	69.84	-0.73	-11.89(.000)	-4.04	2.31
1	1.00	38	30.16	0.73	11.89(.000)	0.40	1.82

Item 7

item:7 (CI1_12)

Cases for this item 127 Discrimination 0.66

Item Threshold(s): 0.17 Weighted MNSQ 0.95

Item Delta(s): 0.17

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	101	79.53	-0.66	-9.86(.000)	-3.58	2.52
1	1.00	26	20.47	0.66	9.86(.000)	0.84	1.85

Item 8

item:8 (CI1_14)

Cases for this item 127 Discrimination 0.67

Item Threshold(s): 1.02 Weighted MNSQ 0.73

Item Delta(s): 1.02

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	109	85.83	-0.67	-10.17(.000)	-3.38	2.55
1	1.00	18	14.17	0.67	10.17(.000)	1.59	1.49

Item 9
------
item:9 (CI1_16)
Cases for this item 128 Discrimination 0.50
Item Threshold(s): 2.12 Weighted MNSQ 0.99
Item Delta(s): 2.12

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	117	91.41	-0.50	-6.52(.000)	-3.06	2.75
1	1.00	11	8.59	0.50	6.52(.000)	1.87	1.59

Item 10
----
item:10 (CI1_17)
Cases for this item 128 Discrimination 0.64
Item Threshold(s): 1.00 Weighted MNSQ 0.90
Item Delta(s): 1.00

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	109	85.16	-0.64	-9.34(.000)	-3.30	2.72
1	1.00	19	14.84	0.64	9.34(.000)	1.16	1.15

Item 11
----
item:11 (CI2_2)
Cases for this item 120 Discrimination 0.61
Item Threshold(s): -3.29 Weighted MNSQ 1.06
Item Delta(s): -3.29

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	51	42.50	-0.61	-8.47(.000)	-5.11	2.22
1	1.00	69	57.50	0.61	8.47(.000)	-0.87	2.19

Item 12
----
item:12 (CI2_3)
Cases for this item 122 Discrimination 0.60
Item Threshold(s): -2.41 Weighted MNSQ 1.27
Item Delta(s): -2.41

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	64	52.46	-0.60	-8.22(.000)	-4.56	2.33
1	1.00	58	47.54	0.60	8.22(.000)	-0.57	2.19

Item 13
----
item:13 (CI2_5)
Cases for this item 125 Discrimination 0.65
Item Threshold(s): -0.94 Weighted MNSQ 1.15
Item Delta(s): -0.94

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	86	68.80	-0.65	-9.57(.000)	-3.89	2.46
1	1.00	39	31.20	0.65	9.57(.000)	0.14	2.05

Item 14
----
item:14 (CI2_7)
Cases for this item 126 Discrimination 0.64
Item Threshold(s): 0.66 Weighted MNSQ 0.95
Item Delta(s): 0.66

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	104	82.54	-0.64	-9.16(.000)	-3.38	2.60
1	1.00	22	17.46	0.64	9.16(.000)	1.14	1.75

Item 15
----
item:15 (CI3_2)
Cases for this item 115 Discrimination 0.60
Item Threshold(s): 1.72 Weighted MNSQ 0.85
Item Delta(s): 1.72

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	104	90.43	-0.60	-7.90(.000)	-3.30	2.69
1	1.00	11	9.57	0.60	7.90(.000)	1.71	2.07

Item 16
----
item:16 (CI3_3)
Cases for this item 116 Discrimination 0.50
Item Threshold(s): 1.55 Weighted MNSQ 1.18
Item Delta(s): 1.55

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	104	89.66	-0.50	-6.15(.000)	-3.28	2.74
1	1.00	12	10.34	0.50	6.15(.000)	1.20	2.13

Item 17
----
item:17 (CI3_5)
Cases for this item 117 Discrimination 0.50
Item Threshold(s): 1.50 Weighted MNSQ 1.15
Item Delta(s): 1.50

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	104	88.89	-0.50	-6.14(.000)	-3.26	2.76
1	1.00	13	11.11	0.50	6.14(.000)	1.14	2.10

Item 18
----
item:18 (CI4_1)
Cases for this item 120 Discrimination 0.63
Item Threshold(s): -1.45 Weighted MNSQ 1.25
Item Delta(s): -1.45

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	77	64.17	-0.63	-8.74(.000)	-4.20	2.54
1	1.00	43	35.83	0.63	8.74(.000)	-0.10	1.87

Item 19
----
item:19 (CI4_2)
Cases for this item 121 Discrimination 0.76
Item Threshold(s): -1.27 Weighted MNSQ 0.79
Item Delta(s): -1.27

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	80	66.12	-0.76	-12.85(.000)	-4.30	2.21
1	1.00	41	33.88	0.76	12.85(.000)	0.38	1.76

Item 20
----
item:20 (CI4_3)
Cases for this item 122 Discrimination 0.71
Item Threshold(s): -0.19 Weighted MNSQ 0.83
Item Delta(s): -0.19

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	93	76.23	-0.71	-11.18(.000)	-3.78	2.48
1	1.00	29	23.77	0.71	11.18(.000)	0.83	1.66

Item 21
----
item:21 (CI4_4)
Cases for this item 122 Discrimination 0.68
Item Threshold(s): -0.09 Weighted MNSQ 0.92
Item Delta(s): -0.09

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	94	77.05	-0.68	-10.26(.000)	-3.70	2.57
1	1.00	28	22.95	0.68	10.26(.000)	0.71	1.75

Item 22
----
item:22 (CI4_7)
Cases for this item 124 Discrimination 0.67
Item Threshold(s): 0.56 Weighted MNSQ 0.95
Item Delta(s): 0.56

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	102	82.26	-0.67	-9.90(.000)	-3.47	2.60
1	1.00	22	17.74	0.67	9.90(.000)	1.13	1.68

Item 23
----
item:23 (CI4_10)
Cases for this item 125 Discrimination 0.64
Item Threshold(s): 1.11 Weighted MNSQ 0.80
Item Delta(s): 1.11

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	107	85.60	-0.64	-9.19(.000)	-3.32	2.64
1	1.00	18	14.40	0.64	9.19(.000)	1.53	1.58

Item 24
----
item:24 (CI4_11)
Cases for this item 125 Discrimination 0.59
Item Threshold(s): 1.95 Weighted MNSQ 0.61
Item Delta(s): 1.95

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	113	90.40	-0.59	-8.09(.000)	-3.11	2.68
1	1.00	12	9.60	0.59	8.09(.000)	2.01	2.20

Item 25
----
item:25 (CI4_12)
Cases for this item 125 Discrimination 0.66
Item Threshold(s): 1.64 Weighted MNSQ 0.58
Item Delta(s): 1.64

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	111	88.80	-0.66	-9.63(.000)	-3.22	2.62
1	1.00	14	11.20	0.66	9.63(.000)	2.19	1.39

Item 26
----
item:26 (CI4_13)
Cases for this item 125 Discrimination 0.59
Item Threshold(s): 1.79 Weighted MNSQ 0.77
Item Delta(s): 1.79

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	112	89.60	-0.59	-8.19(.000)	-3.15	2.70
1	1.00	13	10.40	0.59	8.19(.000)	1.95	1.67

Item 27
----
item:27 (CI4_16)
Cases for this item 125 Discrimination 0.55
Item Threshold(s): 2.29 Weighted MNSQ 0.92
Item Delta(s): 2.29

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	115	92.00	-0.55	-7.28(.000)	-3.00	2.80
1	1.00	10	8.00	0.55	7.28(.000)	1.79	2.02

Item 28
----
item:28 (CI4_18)
Cases for this item 125 Discrimination 0.54
Item Threshold(s): 2.68 Weighted MNSQ 0.78
Item Delta(s): 2.68

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	117	93.60	-0.54	-7.04(.000)	-2.97	2.77
1	1.00	8	6.40	0.54	7.04(.000)	2.60	1.62

Item 29
----
item:29 (CI4_21)
Cases for this item 125 Discrimination 0.44
Item Threshold(s): 3.15 Weighted MNSQ 1.03
Item Delta(s): 3.15

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	119	95.20	-0.44	-5.42(.000)	-2.86	2.87
1	1.00	6	4.80	0.44	5.42(.000)	2.24	2.18

Item 30
----
item:30 (CI4_23)
Cases for this item 125 Discrimination 0.35
Item Threshold(s): 4.91 Weighted MNSQ 0.78
Item Delta(s): 4.91

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	123	98.40	-0.35	-4.10(.000)	-2.73	2.92
1	1.00	2	1.60	0.35	4.10(.000)	4.27	2.70

Item 31
----
item:31 (CI4_25)
Cases for this item 125 Discrimination 0.49
Item Threshold(s): 3.15 Weighted MNSQ 0.92
Item Delta(s): 3.15

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	119	95.20	-0.49	-6.15(.000)	-2.88	2.84
1	1.00	6	4.80	0.49	6.15(.000)	2.65	1.87

Item 32
----
item:32 (CI4_26)
Cases for this item 125 Discrimination 0.35
Item Threshold(s): 4.91 Weighted MNSQ 0.78
Item Delta(s): 4.91

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	123	98.40	-0.35	-4.18(.000)	-2.73	2.92
1	1.00	2	1.60	0.35	4.18(.000)	4.37	2.56

Item 33
----
item:33 (CW1_2)
Cases for this item 117 Discrimination 0.58
Item Threshold(s): -4.93 Weighted MNSQ 0.90
Item Delta(s): -4.93

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	32	27.35	-0.58	-7.55(.000)	-6.00	1.72
1	1.00	85	72.65	0.58	7.55(.000)	-1.54	2.44

Item 34
----
item:34 (CW1_4)
Cases for this item 118 Discrimination 0.64
Item Threshold(s): -4.50 Weighted MNSQ 0.66
Item Delta(s): -4.50

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	37	31.36	-0.64	-8.86(.000)	-6.03	1.55
1	1.00	81	68.64	0.64	8.86(.000)	-1.27	2.23

Item 35
----
item:35 (CW1_6)
Cases for this item 124 Discrimination 0.71
Item Threshold(s): -3.28 Weighted MNSQ 0.64
Item Delta(s): -3.28

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	53	42.74	-0.71	-11.27(.000)	-5.30	1.87
1	1.00	71	57.26	0.71	11.27(.000)	-0.76	2.01

Item 36
----
item:36 (CW1_7)
Cases for this item 124 Discrimination 0.66
Item Threshold(s): -3.14 Weighted MNSQ 0.91
Item Delta(s): -3.14

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	55	44.35	-0.66	-9.72(.000)	-5.03	2.24
1	1.00	69	55.65	0.66	9.72(.000)	-0.84	2.04

Item 37
----
item:37 (CW1_8)
Cases for this item 125 Discrimination 0.71
Item Threshold(s): -3.36 Weighted MNSQ 0.68
Item Delta(s): -3.36

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	52	41.60	-0.71	-11.21(.000)	-5.33	1.87
1	1.00	73	58.40	0.71	11.21(.000)	-0.78	2.01

Item 38
----
item:38 (CW1_9)
Cases for this item 125 Discrimination 0.70
Item Threshold(s): -2.33 Weighted MNSQ 0.85
Item Delta(s): -2.33

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	67	53.60	-0.70	-10.83(.000)	-4.65	2.23
1	1.00	58	46.40	0.70	10.83(.000)	-0.39	1.90

Item 39
----
item:39 (CW1_10)
Cases for this item 127 Discrimination 0.68
Item Threshold(s): -1.08 Weighted MNSQ 1.02
Item Delta(s): -1.08

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	86	67.72	-0.68	-10.51(.000)	-3.96	2.38
1	1.00	41	32.28	0.68	10.51(.000)	0.13	2.03

Item 40
----
item:40 (CW1_12)
Cases for this item 127 Discrimination 0.72
Item Threshold(s): 0.27 Weighted MNSQ 0.82
Item Delta(s): 0.27

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	102	80.31	-0.72	-11.46(.000)	-3.55	2.45
1	1.00	25	19.69	0.72	11.46(.000)	1.06	1.82

Item 41
----
item:41 (CW2_1)
Cases for this item 121 Discrimination 0.72
Item Threshold(s): -1.66 Weighted MNSQ 0.94
Item Delta(s): -1.66

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	74	61.16	-0.72	-11.33(.000)	-4.37	2.22
1	1.00	47	38.84	0.72	11.33(.000)	0.03	1.88

Item 42
----
item:42 (CW2_2)
Cases for this item 121 Discrimination 0.71
Item Threshold(s): -0.01 Weighted MNSQ 0.87
Item Delta(s): -0.01

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	94	77.69	-0.71	-10.99(.000)	-3.68	2.43
1	1.00	27	22.31	0.71	10.99(.000)	0.89	1.85

Item 43
----
item:43 (CW2_6)
Cases for this item 124 Discrimination 0.69
Item Threshold(s): 0.44 Weighted MNSQ 0.82
Item Delta(s): 0.44

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	100	80.65	-0.69	-10.42(.000)	-3.49	2.51
1	1.00	24	19.35	0.69	10.42(.000)	1.20	1.65

Item 44
----
item:44 (CW2_8)
Cases for this item 124 Discrimination 0.59
Item Threshold(s): 1.24 Weighted MNSQ 0.92
Item Delta(s): 1.24

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	107	86.29	-0.59	-8.09(.000)	-3.25	2.62
1	1.00	17	13.71	0.59	8.09(.000)	1.60	1.62

Item 45
----
item:45 (CW2_10)
Cases for this item 124 Discrimination 0.60
Item Threshold(s): 1.95 Weighted MNSQ 0.82
Item Delta(s): 1.95

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	112	90.32	-0.60	-8.33(.000)	-3.09	2.68
1	1.00	12	9.68	0.60	8.33(.000)	2.09	1.58

Item 46
----
item:46 (CW2_12)
Cases for this item 124 Discrimination 0.46
Item Threshold(s): 2.48 Weighted MNSQ 1.00
Item Delta(s): 2.48

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	115	92.74	-0.46	-5.78(.000)	-2.96	2.76
1	1.00	9	7.26	0.46	5.78(.000)	2.18	1.77

Item 47
----
item:47 (CW2_14)
Cases for this item 124 Discrimination 0.40
Item Threshold(s): 4.23 Weighted MNSQ 0.83
Item Delta(s): 4.23

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	121	97.58	-0.40	-4.87(.000)	-2.75	2.85
1	1.00	3	2.42	0.40	4.87(.000)	3.93	1.96

Item 48
----
item:48 (CW2_15)
Cases for this item 124 Discrimination 0.47
Item Threshold(s): 3.43 Weighted MNSQ 0.83
Item Delta(s): 3.43

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	119	95.97	-0.47	-5.88(.000)	-2.82	2.82
1	1.00	5	4.03	0.47	5.88(.000)	3.07	1.89

Item 49
----
item:49 (CW2_16)
Cases for this item 124 Discrimination 0.50
Item Threshold(s): 3.15 Weighted MNSQ 0.77
Item Delta(s): 3.14

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	118	95.16	-0.50	-6.42(.000)	-2.87	2.78
1	1.00	6	4.84	0.50	6.42(.000)	3.05	1.62

Item 50
----
item:50 (CW2_17)
Cases for this item 124 Discrimination 0.31
Item Threshold(s): 3.77 Weighted MNSQ 1.19
Item Delta(s): 3.77

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	120	96.77	-0.31	-3.62(.000)	-2.75	2.89
1	1.00	4	3.23	0.31	3.62(.000)	2.29	2.61

Item 51
----
item:51 (CW2_19)
Cases for this item 124 Discrimination 0.28
Item Threshold(s): 4.91 Weighted MNSQ 0.89
Item Delta(s): 4.91

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	122	98.39	-0.28	-3.24(.002)	-2.69	2.91
1	1.00	2	1.61	0.28	3.24(.002)	3.82	3.33

Item 52
----
item:52 (CW2_20)
Cases for this item 124 Discrimination 0.29
Item Threshold(s): 6.29 Weighted MNSQ 0.35
Item Delta(s): 6.29

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	123	99.19	-0.29	-3.40(.001)	-2.66	2.92
1	1.00	1	0.81	0.29	3.40(.001)	6.18	0.00

Item 53
----
item:53 (CW2_21)
Cases for this item 124 Discrimination 0.29
Item Threshold(s): 6.29 Weighted MNSQ 0.35
Item Delta(s): 6.29

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	123	99.19	-0.29	-3.40(.001)	-2.66	2.92
1	1.00	1	0.81	0.29	3.40(.001)	6.18	0.00

Item 54
----
item:54 (CW2_23)
Cases for this item 124 Discrimination 0.35
Item Threshold(s): 4.23 Weighted MNSQ 0.92
Item Delta(s): 4.23

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	121	97.58	-0.35	-4.12(.000)	-2.73	2.88
1	1.00	3	2.42	0.35	4.12(.000)	3.37	2.48

Item 55
----
item:55 (WS1_3)
Cases for this item 124 Discrimination 0.22
Item Threshold(s): -8.13 Weighted MNSQ 1.16
Item Delta(s): -8.13

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	7	5.65	-0.22	-2.46(.015)	-6.28	2.47
1	1.00	117	94.35	0.22	2.46(.015)	-2.48	2.88

Item 56
----
item:56 (WS1_7)
Cases for this item 127 Discrimination 0.53
Item Threshold(s): -4.43 Weighted MNSQ 1.03
Item Delta(s): -4.43

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	39	30.71	-0.53	-7.02(.000)	-5.59	2.20
1	1.00	88	69.29	0.53	7.02(.000)	-1.39	2.25

Item 57
----
item:57 (WS2_2)
Cases for this item 122 Discrimination 0.37
Item Threshold(s): -6.28 Weighted MNSQ 1.36
Item Delta(s): -6.28

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	20	16.39	-0.37	-4.30(.000)	-6.01	2.28
1	1.00	102	83.61	0.37	4.30(.000)	-2.08	2.67

Item 58
----
item:58 (WS2_4)
Cases for this item 123 Discrimination 0.54
Item Threshold(s): -4.41 Weighted MNSQ 1.17
Item Delta(s): -4.41

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	39	31.71	-0.54	-6.97(.000)	-5.42	2.26
1	1.00	84	68.29	0.54	6.97(.000)	-1.46	2.38

Item 59
----
item:59 (WS2_10)
Cases for this item 126 Discrimination 0.65
Item Threshold(s): -2.99 Weighted MNSQ 0.89
Item Delta(s): -2.99

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	58	46.03	-0.65	-9.49(.000)	-4.95	2.19
1	1.00	68	53.97	0.65	9.49(.000)	-0.75	2.02

Item 60
----
item:60 (WS2_11)
Cases for this item 126 Discrimination 0.68
Item Threshold(s): -2.26 Weighted MNSQ 1.04
Item Delta(s): -2.26

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	69	54.76	-0.68	-10.40(.000)	-4.50	2.30
1	1.00	57	45.24	0.68	10.40(.000)	-0.48	2.05

Item 61
----
item:61 (WS2_12)
Cases for this item 126 Discrimination 0.62
Item Threshold(s): -1.86 Weighted MNSQ 1.22
Item Delta(s): -1.86

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	75	59.52	-0.62	-8.81(.000)	-4.23	2.43
1	1.00	51	40.48	0.62	8.81(.000)	-0.41	2.09

Item 62
----
item:62 (WS2_14)
Cases for this item 127 Discrimination 0.65
Item Threshold(s): 0.62 Weighted MNSQ 1.08
Item Delta(s): 0.62

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	105	82.68	-0.65	-9.56(.000)	-3.42	2.57
1	1.00	22	17.32	0.65	9.56(.000)	1.05	1.84

Item 63
----
item:63 (WS2_15)
Cases for this item 127 Discrimination 0.68
Item Threshold(s): 0.21 Weighted MNSQ 1.04
Item Delta(s): 0.21

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	101	79.53	-0.68	-10.26(.000)	-3.57	2.50
1	1.00	26	20.47	0.68	10.26(.000)	0.93	1.76

Item 64
----
item:64 (WS2_16)
Cases for this item 128 Discrimination 0.57
Item Threshold(s): 0.88 Weighted MNSQ 1.24
Item Delta(s): 0.88

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	108	84.38	-0.57	-7.84(.000)	-3.30	2.65
1	1.00	20	15.63	0.57	7.84(.000)	1.05	1.82

Item 65
----
item:65 (WS2_18)
Cases for this item 128 Discrimination 0.46
Item Threshold(s): 1.80 Weighted MNSQ 1.28
Item Delta(s): 1.80

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	115	89.84	-0.46	-5.89(.000)	-3.04	2.82
1	1.00	13	10.16	0.46	5.89(.000)	1.09	1.54

Item 66
----
item:66 (WS2_19)
Cases for this item 128 Discrimination 0.40
Item Threshold(s): 2.68 Weighted MNSQ 1.17
Item Delta(s): 2.68

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	120	93.75	-0.40	-4.90(.000)	-2.91	2.80
1	1.00	8	6.25	0.40	4.90(.000)	1.61	2.52

Item 67
----
item:67 (WS2_20)
Cases for this item 129 Discrimination 0.50
Item Threshold(s): 3.15 Weighted MNSQ 0.79
Item Delta(s): 3.15

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	123	95.35	-0.50	-6.52(.000)	-2.88	2.75
1	1.00	6	4.65	0.50	6.52(.000)	2.90	1.78

Item 68
----
item:68 (WS2_23)
Cases for this item 129 Discrimination 0.29
Item Threshold(s): 6.29 Weighted MNSQ 0.35
Item Delta(s): 6.29

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	128	99.22	-0.29	-3.45(.001)	-2.68	2.88
1	1.00	1	0.78	0.29	3.45(.001)	6.18	0.00

Item 69
----
item:69 (WS2_28)
Cases for this item 129 Discrimination 0.29
Item Threshold(s): 4.91 Weighted MNSQ 0.91
Item Delta(s): 4.91

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	127	98.45	-0.29	-3.38(.001)	-2.71	2.88
1	1.00	2	1.55	0.29	3.38(.001)	3.48	3.81

Item 70
----
item:70 (WS3_2)
Cases for this item 120 Discrimination 0.54
Item Threshold(s): -3.96 Weighted MNSQ 1.33
Item Delta(s): -3.96

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	44	36.67	-0.54	-6.88(.000)	-5.11	2.42
1	1.00	76	63.33	0.54	6.88(.000)	-1.40	2.40

Item 71
----
item:71 (WS3_3)
Cases for this item 124 Discrimination 0.63
Item Threshold(s): -3.30 Weighted MNSQ 1.07
Item Delta(s): -3.30

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	53	42.74	-0.63	-8.99(.000)	-5.02	2.17
1	1.00	71	57.26	0.63	8.99(.000)	-0.95	2.24

Item 72
----
item:72 (WS3_4)
Cases for this item 126 Discrimination 0.63
Item Threshold(s): -2.43 Weighted MNSQ 1.20
Item Delta(s): -2.43

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	66	52.38	-0.63	-9.11(.000)	-4.54	2.30
1	1.00	60	47.62	0.63	9.11(.000)	-0.58	2.15

Item 73
----
item:73 (WS3_6)
Cases for this item 127 Discrimination 0.70
Item Threshold(s): -0.86 Weighted MNSQ 0.92
Item Delta(s): -0.86

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	89	70.08	-0.70	-11.06(.000)	-3.91	2.36
1	1.00	38	29.92	0.70	11.06(.000)	0.31	1.99

Item 74
----
item:74 (WS3_8)
Cases for this item 127 Discrimination 0.76
Item Threshold(s): 0.07 Weighted MNSQ 0.66
Item Delta(s): 0.07

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	100	78.74	-0.76	-13.07(.000)	-3.67	2.37
1	1.00	27	21.26	0.76	13.07(.000)	1.12	1.60

Item 75
----
item:75 (WS3_10)
Cases for this item 127 Discrimination 0.62
Item Threshold(s): 0.68 Weighted MNSQ 0.95
Item Delta(s): 0.68

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	106	83.46	-0.62	-8.90(.000)	-3.39	2.59
1	1.00	21	16.54	0.62	8.90(.000)	1.10	1.58

Item 76
----
item:76 (WS3_11)
Cases for this item 128 Discrimination 0.46
Item Threshold(s): 1.80 Weighted MNSQ 1.20
Item Delta(s): 1.80

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	115	89.84	-0.46	-5.82(.000)	-3.05	2.76
1	1.00	13	10.16	0.46	5.82(.000)	1.28	1.96

Item 77
----
item:77 (CS1_1)
Cases for this item 122 Discrimination 0.50
Item Threshold(s): -5.80 Weighted MNSQ 0.71
Item Delta(s): -5.80

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	24	19.67	-0.50	-6.40(.000)	-6.62	1.60
1	1.00	98	80.33	0.50	6.40(.000)	-1.76	2.38

Item 78
----
item:78 (CS1_2)
Cases for this item 122 Discrimination 0.60
Item Threshold(s): -4.35 Weighted MNSQ 0.80
Item Delta(s): -4.35

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	39	31.97	-0.60	-8.29(.000)	-5.84	1.76
1	1.00	83	68.03	0.60	8.29(.000)	-1.25	2.17

Item 79
----
item:79 (CS1_3)
Cases for this item 122 Discrimination 0.68
Item Threshold(s): -2.26 Weighted MNSQ 0.97
Item Delta(s): -2.26

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	67	54.92	-0.68	-10.11(.000)	-4.55	2.18
1	1.00	55	45.08	0.68	10.11(.000)	-0.49	2.15

Item 80
----
item:80 (CS1_4)
Cases for this item 122 Discrimination 0.72
Item Threshold(s): -2.06 Weighted MNSQ 0.84
Item Delta(s): -2.06

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	70	57.38	-0.72	-11.33(.000)	-4.53	2.14
1	1.00	52	42.62	0.72	11.33(.000)	-0.27	2.00

Item 81
----
item:81 (CS1_6)
Cases for this item 123 Discrimination 0.71
Item Threshold(s): -2.16 Weighted MNSQ 0.78
Item Delta(s): -2.16

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	69	56.10	-0.71	-11.12(.000)	-4.61	2.08
1	1.00	54	43.90	0.71	11.12(.000)	-0.26	1.93

Item 82
----
item:82 (CS1_7)
Cases for this item 123 Discrimination 0.72
Item Threshold(s): -1.46 Weighted MNSQ 0.80
Item Delta(s): -1.46

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	79	64.23	-0.72	-11.29(.000)	-4.23	2.30
1	1.00	44	35.77	0.72	11.29(.000)	0.04	1.80

Item 83
----
item:83 (CS1_8)
Cases for this item 123 Discrimination 0.64
Item Threshold(s): 0.36 Weighted MNSQ 1.05
Item Delta(s): 0.36

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	100	81.30	-0.64	-9.15(.000)	-3.53	2.51
1	1.00	23	18.70	0.64	9.15(.000)	0.87	1.88

Item 84
----
item:84 (CS1_9)
Cases for this item 124 Discrimination 0.63
Item Threshold(s): 1.50 Weighted MNSQ 0.82
Item Delta(s): 1.50

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	110	88.71	-0.63	-8.93(.000)	-3.26	2.56
1	1.00	14	11.29	0.63	8.93(.000)	1.89	1.53

Item 85
----
item:85 (CS1_11)
Cases for this item 125 Discrimination 0.75
Item Threshold(s): 0.15 Weighted MNSQ 0.61
Item Delta(s): 0.15

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	99	79.20	-0.75	-12.54(.000)	-3.64	2.39
1	1.00	26	20.80	0.75	12.54(.000)	1.15	1.58

Item 86
----
item:86 (CS1_15)
Cases for this item 127 Discrimination 0.50
Item Threshold(s): 2.48 Weighted MNSQ 1.09
Item Delta(s): 2.48

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	118	92.91	-0.50	-6.39(.000)	-2.95	2.75
1	1.00	9	7.09	0.50	6.39(.000)	1.94	2.03

Item 87
----
item:87 (CS1_17)
Cases for this item 127 Discrimination 0.47
Item Threshold(s): 3.15 Weighted MNSQ 0.95
Item Delta(s): 3.15

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	121	95.28	-0.47	-5.99(.000)	-2.86	2.77
1	1.00	6	4.72	0.47	5.99(.000)	2.70	1.92

Item 88
----
item:88 (CS2_2)
Cases for this item 121 Discrimination 0.59
Item Threshold(s): 0.84 Weighted MNSQ 1.17
Item Delta(s): 0.84

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	102	84.30	-0.59	-7.99(.000)	-3.40	2.65
1	1.00	19	15.70	0.59	7.99(.000)	1.03	1.96

Item 89
----
item:89 (CS2_4)
Cases for this item 123 Discrimination 0.55
Item Threshold(s): 2.01 Weighted MNSQ 0.85
Item Delta(s): 2.01

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	112	91.06	-0.55	-7.20(.000)	-3.13	2.69
1	1.00	11	8.94	0.55	7.20(.000)	2.01	1.97

Item 90
----
item:90 (CS2_5)
Cases for this item 125 Discrimination 0.54
Item Threshold(s): 1.50 Weighted MNSQ 0.95
Item Delta(s): 1.50

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	110	88.00	-0.54	-7.16(.000)	-3.20	2.67
1	1.00	15	12.00	0.54	7.16(.000)	1.55	1.93

Item 91
----
item:91 (CS2_7)
Cases for this item 125 Discrimination 0.36
Item Threshold(s): 3.77 Weighted MNSQ 0.87
Item Delta(s): 3.77

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	121	96.80	-0.36	-4.30(.000)	-2.83	2.84
1	1.00	4	3.20	0.36	4.30(.000)	3.43	1.88

Item 92
----
item:92 (CS2_8)
Cases for this item 125 Discrimination 0.41
Item Threshold(s): 3.43 Weighted MNSQ 0.81
Item Delta(s): 3.43

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	120	96.00	-0.41	-5.02(.000)	-2.87	2.81
1	1.00	5	4.00	0.41	5.02(.000)	3.26	1.67

Item 93
----
item:93 (CS2_10)
Cases for this item 125 Discrimination 0.35
Item Threshold(s): 4.22 Weighted MNSQ 0.99
Item Delta(s): 4.22

Label	Score	Count	% of tot	Pt Bis	t (p)	PV1Avg:1	PV1 SD:1
0	0.00	122	97.60	-0.35	-4.20(.000)	-2.77	2.89
1	1.00	3	2.40	0.35	4.20(.000)	3.17	2.75

The following traditional statistics are only meaningful for complete designs and when the amount of missing data is minimal.
In this analysis 4.44% of the data are missing.

The following results are scaled to assume that a single response was provided for each item.

N	130
Mean	25.26
Standard Deviation	19.63
Variance	385.28
Skewness	0.89
Kurtosis	0.26
Standard error of mean	1.72
Standard error of measurement	2.97
Coefficient Alpha	0.98