



**VICTORIA UNIVERSITY
OF TECHNOLOGY**

**DEPARTMENT OF
MATHEMATICS, COMPUTING
AND OPERATIONS RESEARCH**

TEACHING, LEARNING
AND ASSESSING

Anthony Sofo

(15 TEACH 4)

August, 1991

TECHNICAL REPORT

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ABSTRACT

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TEACHING LEARNING AND ASSESSING

In this modern age of mass education, a period in which a high proportion of secondary students are entering tertiary education, it is becoming increasingly important to review and question the roles of quality teaching, deep approaches to learning and appropriate assessment methods. There is no doubt that there are principles which contribute towards better teaching, approaches that will enhance quality learning and appropriate assessment methods that will reinforce deep approaches to learning. These properties of education, it is suggested, are best implemented through the specific subject matter, with a constant review of the curriculum. Further it is suggested that innovative teaching in some tertiary institutions, together with research, is now beginning to be more fully recognized by university administrators.

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INTRODUCTION

The predominant reason why most students continue education to tertiary level should be that they have a desire to learn. The desire may be shallow and driven by extraneous reasons such as an obsession to obtain a particular degree so as to enter a particular high financially rewarding career. The desire may be deep in the sense that they wish to learn for the sake of acquiring knowledge . In some rare cases there is no desire at all to learn and students simply attend tertiary institutions because of circumstances, such as peer group pressure or economic recession.

Whatever reasons students give for attending tertiary institutions, if they wish to learn, then it should be the foremost task of lecturers to impart their knowledge and expertise in a professional and educationally sound manner.

Like students, we must recognize that lecturers work at tertiary institutions for a multitude of reasons. By far a majority are there to impart their knowledge in a professional manner and to genuinely help students learn. Some are there because, in the main, their interests lie in research and graduate studies, and a very small proportion are there because they see the job as a relatively easy task and generally take the path of least resistance to their teaching responsibilities.

What appears to be crucial in tertiary education (or for that matter any other level of education) is that effective learning cannot be taken for granted. That is, there may be methods, techniques or strategies that enhance learning and we should be aware of them. Similarly ; it cannot be taken for granted that good teaching comes naturally. It may for some, but surely for others not so naturally gifted an awareness of methods and/or techniques is crucial.

Assessment appears to be another vital link in the education triangle of teaching, learning and assessment. It's important that we are aware how these concepts influence one another so that hopefully, we will be in a better position to effect change in our tertiary education system.

Students entering courses at tertiary level face many difficulties. In some cases the problems of coping and adjusting may be further compounded by inadequate learning habits, a lack of good teaching and inappropriate assessment methods. Tertiary life in many cases is a new experience, a new culture for students, and it seems appropriate to be sensitive to individual student needs. Many programmes that are now being developed are considering issues related to student learning, quality of teaching and appropriate assessment methods. These issues are complex and varied, but they are becoming more important in this new era of mass education.

For students to develop a tertiary culture to their education, academics need to question their own commitment to the teaching programmes that are offered. If the quality of teaching as part of the overall change in education cannot be affected at least marginally, then perhaps changing learning patterns will be much more difficult.

In this paper some issues relating to teaching, learning and assessment are explored.

TEACHING

A greater part of the function of a university and the academics within it is to teach, to impart knowledge of particular subjects to students and the community in general. In part some of the problems that first year students may encounter are in the quality of teaching. If learning with understanding is to occur, we must continually question and challenge the quality of teaching. There are, without a doubt, a number of problems for first year students. Many of these problems may manifest themselves through signs of underachievement, dropping out and poor adjustment to tertiary life. One may suspect that these problems and attitudes may be associated more with students attending larger prestigious institutions or prestigious courses, ones which may have very large numbers of students in lectures. Institutions in which research and graduate studies dominate an academics career rather than perhaps a commitment to teaching. Current research is indicating that these attitudes are universal and are not necessarily associated only with prestigious institutions and prestigious courses.

We need to ask 'what can lecturers do to enhance the qualities of good teaching?' and therefore promote deep rather than superficial approaches to learning. Are we aware of what qualities constitute good teaching? If we are, do we find the task of quality teaching too demanding and perhaps opt for an easier teaching method that may reinforce the students' alternative for surface learning? Teaching, for some, can become frustrating, for example having to explain an elementary concept over and over, or having to teach the same subject year in year out may result in an undesirable complacency on the part of the academic.

Good quality teaching should and does encourage deep approaches to learning on the part of the students. In fact, to achieve better teaching, we must be able to see what we are doing from the student's point of view. Most of us in the profession of teaching would agree that there is no one best way of teaching.

Obviously good teaching is a phenomenon associated with personality, confidence and ability, and therefore a particular method of good teaching would be as unique as the individual academic. While there is no one best way of teaching, there are principles of teaching that can optimize quality teaching and deep approaches to learning. These principles expound desirable attributes that distinguish good teaching from bad.

There is an increasing apprehension, in the general community that academics perform neither research nor teaching very well. Moreover, a Senate Committee Report (1990) attacked the academic community for 'appalling' teaching. We must allay both the apprehension and the attacks by putting in more effort on improving the quality of our teaching.

There is a mistaken belief that teaching undergraduates, especially at first year, is easier than teaching postgraduates, or researching or being able to administer effectively. Quality teaching is both demanding and rewarding and must be assessed and reviewed for each separate subject matter.

Some academics may also believe that since a great deal of learning takes place outside lectures and tutorials, then quality teaching may not be very important. It's a mistake to consider learning somehow separate from teaching, and in no way should the two complementary activities be isolated. Quality of teaching is sometimes not a criterion used to evaluate academics. It is assumed in many cases that expert knowledge of the subject material is both a necessary and sufficient condition for good quality teaching. Quality teaching should lead the students to independence in learning, however in cases where students cannot apply the skills and techniques they have been exposed to, we should not dismiss ourselves as blamefree in our teaching.

A great deal is known about the qualities of effective teaching at tertiary level. Academics and students appear to be in agreement as to what the qualities of a good teacher are. The problem is in translating these qualities into practice. That is, into being able to transmit effective teaching techniques for deep approaches to learning.

Research tells us that among the important characteristics of effective teaching, seen from the lecturers' point of view, and with broad agreement from the students' point of view as well, are: (*Martin p.c.*)

- to share enthusiasm for the subject with students,
- an ability to explain the subject clearly,
- an ability to engage the students at their level of understanding,
- an ability to make the subject interesting and stimulating,
- showing respect and concern for students,
- an ability to encourage student independence in learning,
- to focus on key concepts and help students overcome misunderstandings of them,
- giving the highest quality feedback on student work,
- making it clear at what level the subject has to be understood and why,
- an ability to improve and adapt to new teaching demands,
- utilizing teaching methods and tasks that require students to learn actively,
- using valid assessment methods,
- a desire to learn from students and others about the effects of teaching.

While these may be important characteristics of effective teaching, in themselves however, they may not be sufficient, and in some circumstances, an individual characteristic may not even be necessary. Showing respect and concern for students is certainly not sufficient for good teaching and in individual cases may not even be necessary, this is not to say that one is necessarily disrespectful to students. Alternatively in some cultures having respect for students and academics may be of prime importance. The degree of importance placed on individual characteristics is difficult to ascertain. The importance of one particular characteristic is also highly variable both with academics and students and may not even correlate well between students and academics.

A survey was conducted in which a group of 100 academics and 100 students were asked to list in numerical order of importance the above characteristics of what constitutes a good teacher. They were asked to rank the above properties

from 1 to 13 in decreasing order of importance. Considering the statement 'an ability to explain the subject clearly', both the academics and the students listed it over the full range of importance from 1 to 13. On average the students rated this statement marginally lower:

(\bar{x} = mean = 3.4 ; s = standard deviation = 3.2)

than the academics (\bar{x} = 3.1; s = 1.7).

Coefficient of Variation; students = 94%
 academics = 55%.

While the variability of the importance of the statement 'an ability to explain the subject clearly' is high for both the students and the academics, the students perception on the importance of this property is about 70% more variable than the academics. The other interesting feature of this example is the observation that the students considered, on average, this statement about as important as did the academics.

The thirteen characteristics listed above that contribute towards quality teaching can be reduced to six key principles, (*Martin p.c.*) , as follows:

- clear goals and intellectual challenge,
- concern and respect for students and student learning,
- interest and explanation,
- appropriate assessment and feedback,
- learning from students, and
- independence, control and active engagement.

Quality of teaching can and should be assessed scrupulously. What is very encouraging to see is University administrators acknowledging publicly not only research excellence but also teaching excellence. This is just one way of lifting the profile of teaching at tertiary level, another way may be to devise career structures that would allow the very best teachers to remain in the classroom should they wish it.

LEARNING

According to the sixth edition concise Oxford dictionary, learning is defined as 'possession of knowledge got by study especially of language or literature or history as subjects of systematic investigation'. Learning is inextricably tied up with teaching and like quality teaching, the academic's task is to reinforce quality or deep approaches to learning in the student's particular subject area. Deep approaches to learning involves a commitment to understanding. To understand key and basic concepts with a view to translate and utilize ideas across a broad range of activities. Learning for understanding requires detailed information to be organized in a meaningful way. In turn deep approaches to learning should set up more positive attitudes and make learning more rewarding.

It follows that there should be long term payoffs from learning for understanding, for it should lay the foundations for further meaningful study in a particular subject area or in general. Learning with understanding is one of the results of a deep approach to learning, however, a deep approach is a necessary, but not a sufficient condition for understanding. In Contrast, surface approaches to learning may be associated with negative attitudes to study. Learning for reproduction, wanting only to obtain enough marks to pass a particular exam, not wanting or being able to organize detailed information in a meaningful way, can all be associated with surface approaches to learning. Rote learning of material is the antithesis of learning with understanding. If one takes the time and makes the effort to listen to what students have to say about a particular subject, it may be possible to ascertain their particular approach to learning.

The following two examples are taken from the comments of first year students at tertiary level:

"I find that study is a bit of a bore, and I usually don't do a lot. I can work out different ways, little tricks, that allow me to remember bits and pieces of information, and this usually gets me through my exams - it did last year. All that theory stuff that the lecturer gives you, its not necessary and its usually not

very interesting. In some cases ,I do my maths assignment with my friend, he does half, I do half, and then we put it together. This saves us lots of time . Anyhow, this maths is like the alphabet, x's and y's all over the place. Besides you don't use it anywhere else."

The learning patterns and study techniques illustrated by the above example demonstrate significant negative attitudes that highlight surface approaches to learning. It would be too simplistic to suggest that in this example the student developed these learning approaches at tertiary level, more likely than not they are symptoms of surface learning carried on from earlier years. It may be a problem of adaption and it is not unreasonable to expect some students to perhaps have difficulties in adjusting. On the question of adapting *Martin, Bowden and Ramsden (1990)* carried out a study in which they investigated the feelings of students in adapting from learning at school to learning at tertiary level. They found, perhaps with no surprise, that first year tertiary students who focus on the similarities between school and tertiary study are most likely to adapt to tertiary study, in other words, gain high marks and satisfaction from their study. Poor grades and dissatisfaction with their study will, in some cases, result from students focusing on the differences between study at school and study at first year tertiary level.

The minimalist approach adopted by the student in the above example is a classic symptom of surface approaches to learning and the ability to adjust to different situations is one of many factors that determine the degree of success in learning at tertiary level.

Compare the above example with the following:

"I usually go over my lecture notes at home and try to pick the key issues the lecturer is trying to present. This I find helps me put the subject into context. There are issues and concepts that I can see are related to other subject matter and sometimes this helps me to learn better. Also the lecturer always encourages us to ask questions, to enquire constantly. This makes me feel happy and although learning is a lot of hard work, it can also be fun!"

This student is displaying some of the consequences, the characteristic qualities, of a deep approach to learning. The lecturer, it appears, is also encouraging the student to enquire, to critically examine, and to integrate ideas and concepts.

Learning for understanding has motivation as a driving force; it normally depends upon intrinsic motivation and especially the depth factor in curiosity. How can we fire this intrinsic motivation? Students need to show a committed desire to learn, and as academics we need to excite, to move students to crave for more and more knowledge. We need to engender in the students a feeling of confidence in their learning and a desire to continue to study outside the formal allotted lecture time. Learning is not to be done just at University, it's a life long process that should continue if intrinsic motivation can be maintained. The essential feature of intrinsic motivation is that, ideally, rewards should come from participation in learning rather than from some consequences of its completion. It may include, for example, the deep inquiry into a specific subject. Intrinsic motivation in higher education may be expressed as a desire to go on with study; incentives for a deep approach to learning are intrinsic to the learning task. That is, students should get satisfaction out of learning some things in depth, independently of what it leads to. Some measure of correlation has been suggested, by *Biggs (1978)*, between measures of a deep approach and measures of intrinsic motivation.

Extrinsic motivation for learning, on the other hand, need not be mutually exclusive to intrinsic motivation. It should be obvious that some learning may be rewarded both intrinsically and extrinsically, some neither and some in an uneven mixture of both. Extrinsically motivated learning may have rewards in terms of income, security of some future position or the termination of some perceived threat. Incentives for a surface approach to learning are extrinsic to the learning task. It is possible that some negative effects of extrinsic motivation may interfere with learning behaviour that may otherwise be intrinsically satisfying. Anxiety arising from extrinsic motivation in a learning task may inhibit the operation of search mechanisms and other risk-taking cognitive behaviour like those inspired by curiosity and so resulting in failure or poor performance. It is the mixture and interaction between

extrinsic and intrinsic motivation that may have important consequences in higher education.

At first glance it might appear that it may be best to eliminate extrinsic motivation to learning and promote only intrinsic motivation. This may be unwise. *Beswick Hayden and Schofield (1983)* have shown that a lack of extrinsic motivation is associated with the likelihood of dropping out; that is, on average students who are not studying for rewards such as the prospect of a future job are less likely to stay in the system. Both intrinsic and extrinsic motivation need to be balanced. Extrinsic motivation may be necessary to keep students in the learning habit long enough for intrinsic interests to mature, or develop. However, *Deci (1975)* has shown that in general, there is a strong tendency for students to cease doing for intrinsic satisfaction those activities that they were previously prepared to do for intrinsic reasons, if they have been extrinsically rewarded by such things as money for undertaking the same activity. It is not unreasonable to suggest that the lack of extrinsic motivation of a sustaining kind can have as many negative effects as the lack of intrinsic motivation. Therefore given that students come to study, with a great mixture of motives, we should not assume that we have a pure basis for learning with understanding and hence we should not rely solely on intrinsic motivation. It is the balance of both extrinsic and intrinsic motivation that is important.

The question on hand is, how can intrinsic motivation be maintained if it tends to be suppressed by the operation of extrinsic rewards? *Freedman and Phillips (1985)* have suggested that a clue to moderating the suppressive effects of extrinsic rewards lies in individual self-respect, self-determination, self-efficacy, personal control or perceived competence. If extrinsic rewards are not to suppress the operation of intrinsic motivation, then the teacher will need to make a special effort to enhance the learner's belief in his/her personal control of the learning task.

Research has shown that many outcomes of work can be classified as either intrinsically or extrinsically satisfying and that intrinsic motivation is sometimes understood to include the seeking of rewards which are

administered or mediated by the individual himself where feelings of self-fulfilment, feelings of worthwhile accomplishment or pride in work will be regarded as intrinsically satisfying outcomes.

What is necessary is the need to make academics aware to increase students' sense of control over the learning task when anticipated satisfaction of extrinsic motivation is likely to be strong enough to suppress the operation of intrinsic motivation. If academics fail in this endeavour, then a deep approach to learning is likely to be abandoned in favour of minimising strategies in pursuit of external rewards.

Incentives for learning with understanding are essential. Because of the nature of intrinsic motivation and its effect on learning with understanding, it follows that, fundamentally, intervention must lie in the way the subject matter is handled. Negative incentives for learning must be removed, and positive incentives can be reinforced by the teacher through his/her speciality subject matter. It is imperative that learning tasks, assessment and support be arranged in such a way as to strengthen incentives for a deep approach to learning. The structure of the curriculum, the methods of assessment and teaching should be such as to allow personal growth and satisfaction through the subject matter. The difficulty, of course, is to design courses so as to allow students to learn in their own way, to reinforce deep approaches to learning combined with the positive aspects of social support and good personal relations. From this point of view we need to examine specific requirements of a department or a course and ask what in the general atmosphere and climate of the interaction between teaching staff and students may constitute incentives for a surface approach to learning that could be minimized. Then it would be appropriate to investigate a positive action plan to alleviate anxiety and promote a deep approach to learning.

Intrinsic motivation should be built up directly through appropriate teaching of the subject matter. Therefore intervention to improve learning in higher education would be best served through academic staff development and co-operative research on student learning. What is being advocated is a fruitful relationship between educational specialists and subject matter specialists.

The extent of the relationship from the point of view of the educational specialists should be in course and programme evaluation. This may help to focus attention of the teaching staff on learning problems and contribute to more effective learning and study. All of this needs appropriate positive signals from institute administrative leaders to academics, they need to make it clear that effective teaching is a high priority area. As was noted in the previous section, in some institutions, this is already occurring.

From the academics' point of view, it should be possible to gain as much intrinsic satisfaction from teaching as might be gained from research. Another point to note is that there are factors such as tolerance, flexibility and accessibility of a department or academic that have a strong effect on learning with understanding. Flexibility on the part of the academic may be limited in terms of administrative structures, however, tolerance and accessibility should never be compromised. It goes without saying that student services and counselling are essential in the total scheme of learning. A supportive environment for in depth learning is essential, but instruction for learning skills should not be provided independently of the teaching of the subject matter. For the most part, educational theory tells us, only a little may be achieved where learning skills interventions are external to and additional to the teaching of the subject matter.

We do know a great deal about the learning processes from the perspective of pupils in schools and students in higher education. *Marton and Saljo (1984)* and *Laurillard (1984)* were concerned with learning in higher education, while *Biggs (1987)* and *Ramsden (in press)* were concerned with the learning processes of students at secondary level.

The knowledge and processes must filter down to the classroom lecturer and therefore seek to develop appropriate implementation strategies for the particular subject matter through mutual co-operation on the part of the lecturer and the educationalist researcher. Educational theory is valuable but it must be put into action at the chalk face otherwise the theory loses its importance and impact.

ASSESSMENT

There is emerging evidence, *Bowden, Masters and Ramsden*(1987), to suggest that first year students entering prestigious courses are likely to perceive the assessment in first year as encouraging a superficial approach to learning. A superficial approach to learning is obvious by its dependence on rote learning and a lack of consistent dedication to the task. First year students entering prestigious courses are more likely to be among the highest performing in secondary school assessment.

If this evidence is conclusive, that in fact assessment may encourage inappropriate learning patterns rather than assist in deep approaches to learning, then surely a rethink about assessment procedures is necessary. Student assessment is not only required for progression through tertiary courses. What we also require is appropriate assessment procedures that will complement and reinforce deep learning strategies rather than inappropriate assessment that may lead to or reinforce superficial learning. There does appear to be a good deal of evidence, *Crooks and Mahalski* (1985) that suggests that the quality of student learning in tertiary institutions is adversely affected by inappropriate assessment methods. The assessment should be constructed around our aims of reinforcing deep approaches to learning and driven by a specifically defined curriculum. Not as *Rowntree* (1977) maintains, that the spirit and style of student assessment define the defacto curriculum.

One major purpose of assessment in higher education, as perceived by people both inside and outside the education system, is to provide a basis for selection, for further education or employment. At present assessment procedures are, in the main, about grading; about expressing a level of performance within a narrow criteria, in the ability to reproduce selective bits of knowledge under artificial conditions. Sometimes, much of this knowledge is quickly forgotten once the assessment has been completed. Some may argue that teachers are not trained to know much about assessment, however, they do know a great deal about grading. Moreover, they have perceptions and expectations of overall educational objectives. Sometimes the

objectives of education and the reality of the inert education system make it difficult in practice to insist upon the primacy of educational objectives over the secondary values of assessment.

It is crucial to insist that any method of assessment must assess what has been learned and be valid, reliable and convenient. Validity and reliability are closely related and the difficult problem in assessing is to strike an adequate balance between the two.

What students learn and how they learn will be influenced by what they think teachers and examiners value. Their views of what really counts in learning will relate quite closely to what is being assessed.

Masters (1987) considers the problem of constructing measures of achievement which are based not on tests of learners' abilities to recall facts and applying memorized routines, but on inferences about students' levels of understanding of key concepts in an area of learning. This is consistent with a view of learning as an active constructive process. The proposed method begins by identifying key concepts in an area of instruction and building assessment procedures around them.

Tolley (1989) builds up the thesis that assessment techniques should be developed to match the current growth in learning based on work experience. He claims that the process of assessment in schools will have to change and the school curriculum will have to respond if in fact, it is the case that, as some claim, many school leavers demonstrate a lack of personal effectiveness and transferable skills. This is an area, as *Fletcher (1989)* notes, which needs much more definition and research.

Modern educational assessment should not be intrusive; appropriate assessment is important for the particular learning task. Those students being assessed must be permitted to attain their full potential. This may be achieved by reducing any risk factors. *Nuttall (1989)* claims that research has no unambiguous answers about how this can be achieved. But features of the task and the conditions of assessment that seem to be important are:

- tasks that are concrete and within the experience of the individual,
- tasks that are presented clearly,
- tasks that are perceived as relevant to the current concerns of the student,
- conditions that are not unduly threatening, something that is helped by a good relationship between the assessor and the student.

Assessment may be seen, by some, to have failed if as some major employers claim, a proportion of school leavers are almost completely unemployable. Some may be regarded as innumerate, illiterate, undisciplined and demonstrate a total unpreparedness for work. Learning, for some of these students may have been an unrewarding experience. We must constantly review our assessment procedures of student learning. In a particular study of students undertaking physical sciences subjects, *McDermott (1984)* noted that many students emerge from their study of physics without a functional understanding of some elementary but fundamental concepts.

Because of a superficial knowledge of formulae similar misunderstandings may occur among mathematics students. Some of these students may graduate and go on to be primary/secondary school mathematics teachers.

Our task is to identify, through appropriate assessment, basic misconceptions in any particular subject matter.

CONCLUSION

The problems of education, teaching, learning and assessment are extremely varied and multifaceted. It is obvious that there are no easy solutions or quick fixes to the many problems that we face. However, if we sincerely want to educate our young generation for the future, we must carry out our assault on the triangle of education, teaching, learning and assessment, with renewed vitality and vigour. We must constantly review the curriculum, be prepared to modify strategies for learning, critically reappraise our own techniques of teaching and always question any administrative hindrance to our prime task - that of teaching.

All of this does not imply that students are absolved from all responsibility in their education. Far from it, students who are treated as responsible adults act accordingly. We need to build a sense of achievement and success in their learning, aim for high expectations, for it is well known that low expectations produce low achievement and conversely that high expectations encourage higher achievement.

It has been argued that the quality of teaching is important in the education process and have demonstrated that there are key principles which will enhance deep approaches to learning. Teaching itself should be assessed and in some cases, more emphasis for the selection of academics should be placed on teaching skills.

Incoming tertiary students face a number of challenges in their education, but the quality of student learning is a crucial issue for consideration. One basis for the introduction of successful interventions for improvement to learning is provided by an understanding of the relationship between intrinsic motivation and meaningful learning. Interventions are only useful if they are effective and effectiveness may be maximized by focussing on specific subject content. Learning may further be enhanced through counselling and guidance, innovative programmes that may help to reduce

transitional problems and making learning a fun activity. Fun in learning is just one way in which we may increase the students' curiosity in a specific subject matter. Key strategies for the enhancement of deep approaches to learning can be developed for particular subject matter, by the mutual co-operation of the subject specialist and the educational researcher. Education by definition is a dynamic process, teaching and learning are individual experiences that need to be challenged and reassessed continuously.

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