UNIT 3 TECHNICAL AND VOCATIONAL EDUCATION

Editor's Note:

Technical and vocational education through distance mode is the development of the eighties, and many universities and polytechnic, and more so industrial, government and private sectors provide technical and vocational education in a wide spectrum of skill-based and higher-degree oriented areas through open learning. The Open Learning Agency of UK, RMIT of Australia, Open Polytechnic of New Zealand and IGNOU are best examples of this.

In this unit we have chosen an article on "Developing Generic Work Skills through Distance Education" by Mark S Chambers, John C Clift, and Linda Sissions. The article was chosen because it discusses an experience of formulating a project on curriculum design and the development, implementation and evaluation of a programme in technical and vocational education. The authors have expressed their conviction that technical and vocational learning can be successfully imparted through distance education. They have first explained the need for imparting generic skills and thereafter given their suggestions as to the ways and means, and the steps needed, for developing generic skills among learners through distance education. The authors have referred to the changing socio-economic environment for technical education in this context, and have explained how in the area of technical and vocational education, there is a growing need to train students to perform specific jobs, towards preparing them to adapt to rapid changes in an uncertain professional environment. For this purpose, technical and vocational education now emphasises multi-skills training for the service sector rather than the traditional training for a specific trade career. The curriculum specialists are thus required to identify key emerging competencies which will be required by all citizens to enable them to perform life roles and to adapt to constant change. In this context, The Open Polytechnic of New Zealand (TOPNZ) decided to design the curriculum of its Bachelor's of Applied Science course in such a way that the learner develops generic skills at all levels of 'self management', 'conceptual skills' 'creative problem solving', 'holistic thinking', and self directed learning skills'. The basic consideration for the design and development of the courses was that students should not learn theory by rote but should be able to apply it in a new context. The earlier practice of structuring courses around theoretical knowledge was to be abandoned because education built upon the content' model did not produce graduates with skills as required in the workplace.

The first step in this project was to identify those generic skills which were needed to obtain evidence that a student had acquired the skills of self management, conceptual skills, creative problem solving, holistic thinking and self directive learning skills etc.

The second step was to implement the courses in a way that could be coherent in terms of course and programme design. Coherence was viewed at two levels viz. external coherence and internal coherence. External coherence implied the way an individual course complemented other courses to provide a meaningful programme, whereas internal coherence implied the way a course hung together internally by linking its content presentation and assessment framework with the learning outcomes. At this stage, programme-based learning was the principal strategy in the design of courses contributing to the degree.

The third step was to utilise formative and summative evaluation principles at appropriate stages in the curriculum transactions. For assessing generic skills, two

characteristics of assessment problems viz. their ‘complexity’ and their ‘degree of structure’ were taken into account. With regard to complexity, the amount of information needed to solve the problem and the level of uncertainty confronting the students with respect to the possible solutions or cues, were examined. As regards the problem of ‘degree of structure’, the complexity of the problem, the alternatives available for finding solutions to it and the cues indicating when an appropriate solution had been identified were analysed. The authors have presented the views of various experts, which have been suitably linked and quoted. The article as a whole provides the guidelines needed for those who wish to impart technical and vocational education through distance education, because TOPNZ is one of the 25 polytechnics of New Zealand imparting technical and vocational education through distance education.

Now read the article carefully and attempt to solve the questions given at the end.

DEVELOPING GENERIC WORK SKILLS THROUGH DISTANCE EDUCATION

—Mark S. Chamber, John C. Clift, Linda Sissions

INTRODUCTION

The Open Polytechnic of New Zealand (TOPNZ) is one of 25 polytechnics in New Zealand delivering tertiary education. It is a distance teaching institution offering nationally recognised qualifications from certificate to degree level. A substantial subset of the client population studies for diplomas and certificates targeted to clearly identified vocational fields.

A major theme in current employment literature is the call for graduates to have generic skills for use in a range of increasingly complex and dynamic life situations. This identified need in the workplace provided the focus for substantive debate within our institute culminating in the recommendation that, rather than develop a series of targeted degrees, TOPNZ should develop a 'generic' degree providing a ladder from existing vocational diplomas.

In September 1994 the New Zealand Qualifications Authority (NZQA) recommended that the proposed Bachelor of Applied Science programme of The Open Polytechnic be accredited with three discipline majors: Communication Studies, Environmental Studies, and Psychology. The first student enrolments will occur in 1995. Our student demographic analysis indicates between 50-60 per cent of the students will be in the age group 26-45 and in current employment. Their commitment to study will be part-time with career advancement as the primary motivational factor.

This paper describes the concepts underpinning the development of the generic component of the Bachelor of Applied Science. In the context of this degree, the use of the term 'applied science' denotes 'the systematic application of theoretical concepts and empirical evidence to real world situations.'

SOCIO-ECONOMIC CONTEXT FOR THE NEW DEGREE

There is a considerable body of evidence that vocational education systems throughout the world are shifting their emphasis from training students to perform specific jobs toward preparing learners to adapt to rapidly changing and uncertain professional environments. For example, the OECD report *Pathways for Learning* (1989) reported that in many countries technical education now emphasizes multi-skills training for the service sector rather than the traditional training for a specific trade career. Haworth (1992) describes this shift as a facet of a 'post-industrial revolution' which is driven by rapidly-evolving information technologies and the changed social organisations they produce. The 1991 US Department of Labor SCANS Report took a similar view, and identified the globalisation of business activities as a cause of uncertain future job needs.

Haworth contends that as a consequence of this 'post-industrial revolution', the supposed dichotomy between general and vocation education has ceased to exist. Rather, Haworth sees a set of key competencies emerging which will be required by all citizens to enable them to perform life-roles and to adapt to constant change. In this new environment, Haworth believes, discipline studies should be within a context that enables learners to be competent in their work. Other commentators such as Woditch (1977) have urged that what is wanted from the disciplines for the general education mission is their utility in developing student capabilities, rather than discipline integrity.

In New Zealand, Cooncy (1993), in relation to science graduates, averred that many current vocational degrees are too narrow in education they provide. For

example, he argues that while a targeted degree (e.g. B Telecommunications) may meet a current market demand, graduates will not be prepared for other work should the market for that specialisation diminish.

It was in this context that TOPNZ addressed the design of its B Applied Science. Our guiding principle is to foster in our learners the following generic skills at all levels: Self-management, conceptual skills, creative problem-solving, holistic thinking, self-directed learning skills and literacy.

CONSIDERATIONS FOR DESIGN

Broadening professional specialisms

The need to broaden the education offered in specific disciplines has been extensively documented (Lynton, 1991). Traditionally in New Zealand, core courses called 'add-ons' are intended to achieve a broadening of professional programmes by preparing learners to function efficiently as managers.

As Lynton notes, the 'add-on' approach is criticised because courses intended to broaden specialized curricula are targeted for specific vocations (e.g. Economics for Engineers'). For example, the skills required for economic decision-making are generic, and should be taught in a manner that enables engineers to communicate with economists (Chambers and Clift, 1994). Furthermore, the teaching of such add-on courses typically follows the theoretical approach characteristic of the courses of professional programmes. The result is that often the 'best students' can repeat theory learned by rote, but are unable to apply it in any new context. As Heyne (1993) has summarised it: The students' 'learning may have been comprehensive, but it has not been comprehending.'

Acquiring performance skills

Traditionally professional degrees have been structured on the premise that as students acquires more theoretical knowledge about a subject; they will become more competent to act as professionals in that discipline. However, the widely documented discontent of employers with the 'thinking' and 'transfer' skills of New Zealand graduates suggests that education built upon this 'content' model does not adequately produce graduates with the skills required in the workplace. Furthermore, students have long complained about the amount of information they are expected to learn, leading to 'reproductive' practices, rather than the opportunity to develop a deeper understanding of the material. The level of 'understanding' a person has about a subject is a function of how well they relate new knowledge to existing knowledge within their memory and so create interconnections. (Ausubel, 1968). It is this ability to create interconnections that enables people to think about potential applications in new contexts. People with such a level of understanding question facts and operations and come to recognise gaps in their knowledge.

Critical to the acquisition of higher level performance skills is the ability of a student to deep-process knowledge. The work of Biggs and Collis (1982) in researching teaching objectives built on levels of development in higher thinking, ('the SOLO taxonomy') indicates that students must learn how to engage in the deep processing of knowledge.

Generic course design

The importance of prior knowledge as prerequisite for meaningful learning and for the achievement of advanced level skills has been a consistent finding of research studies over many years (Marton, 1988). Heyne (1993) advocates, as the first step in motivating learners to value their courses, the presentation of a problem that is recognised by each student as 'meaningful'. Heyne urges teachers to draw on their students' prior knowledge and experience.

Our objectives for the generic component of the degree are to encourage students to 'seek meaning', and function through inferences drawn from experience or to 'subject ideas to a search for hidden possibilities'.

In structuring a generic degree using a wide range of building blocks including certificates and diplomas, it is essential that the degree exhibits 'coherence'. In terms of course and programme design, coherence can be viewed at two levels;

1) The way an individual course complements other courses in providing a meaningful programme ('external coherence') and

2) The way a course hangs together internally ('internal coherence'), by linking the content, presentation and assessment framework of a course with the learning outcomes (Hall, 1992).

Assessment principles

An interactive model of competency views the outcomes of learning as an interaction between the individual learner, his or her knowledge and beliefs, and the context in which the knowledge is applied (Hodkinson, 1992). For assessing generic skills, this interactive model was judged to be more useful than a model which assesses competency as a series of elements. Persuasive evidence indicates that elements taught as such do not add up to a whole; the desired competency is more than the sum of knowledge, understanding and context (Hodkinson, 1992).

Central to the TOPNZ application of this interactive model for assessing generic skills are two characteristics of assessment problems; their 'complexity' and their 'degree of structure'.

Assessment problems can vary in their complexity (i.e. the amount of information needed to solve a problem) and the level or uncertainty confronting the student with respect to possible solutions or cues as the correctness of any one solution.

Many problems formulated for students can be described as 'well-structured' (Simon, 1973); such problems contain all the information necessary for the student to achieve a solution. Snow (1980) describes the ability to solve such problems as 'crystallised intelligence' representing the skills to do well in a formal educational setting.

In contrast, 'fluid intelligence' is that which enables a person to succeed in the dynamic would outside of the educational setting. Problems demanding fluid intelligence are seldom 'well-structured'. Typically such problems are complex and, in Simon's phrase, 'ill-structured' (i.e. they lack certainty as to what is to be solved, the range of alternatives available for finding solutions and cues indicating when an appropriate solution has been identified).

The guiding principle for drafting assessment tasks within the degree programme is to present our students problems of progressive complexity and uncertainty which require a demonstration of increasing applications of fluid intelligence.

Problem-based learning

In developing our B Applied Science programme, we sought to adhere to Wittrock's dictum (1977) that:

> …methods of teaching should be designed to stimulate students actively to construct meaning from their own experience rather than stimulating them to reproduce the knowledge of others.

A growing body of educational research indicates that Problem-based Learning (PBL) may be the most effective method of stimulating students to construct meaning from their own experience. (e.g. Vilkinas and Cartan, 1990). The basic

principle of PBL is to facilitate understanding by presenting learners with tasks which resemble those the learners will be confronted by their professional activities. (Rouse, 1990). Typically, such tasks will entail considerable uncertainty and permit many, (and in some instances, even diametrically opposed) 'valid' solutions.

In problem-based learning, understanding of a 'body of knowledge' is achieved through deriving solutions to a series of tasks of increasing complexity. The students are challenged to discover what information and theory as ''tools of analysis'' they will need to discover possible solutions such tasks (Heyne, 1993). A final task may inspire the student to 'reflect' on the process and solution(s).

Problem-based learning stands in considerable contrast to conventional subject-based learning, in which a student typically is required to read a chapter of text, is asked a series of questions about the material or given a very structured problem to solve using the set reading material. Such subject-based learning techniques are widely regarded as inadequate (Gibbs, 1991).

The dichotomy between subject-based learning and PBL is the 'difference between attempting to memorise the subject matter and attempting to understand and apply the knowledge' (Gibbs, 1991). The essential distinction is one of a quest for coherence versus knowledge-orientation on the part of the learner (Burns, et al., 1990). 'Coherence' is achieved when students achieve an appreciation for the order within a subject matter which they can use to understand the meanings of terms and causes of events. By contrast, a 'knowledge-orientation' is concerned with the memorisation of facts and rules which often can be easily tested in a superficial assessment of academic 'achievement'.

Gibbs (1991) has identified four features which foster a deep approach to learning:

- Intrinsic student motivation based on involvement in the selection process;
- Learner activity by planning, reflection and processing of information; Interaction with others to solve problems; and,
- Integration of new information into existing knowledge and experience to form a well-structured knowledge base. These features are characteristic of PBL techniques.

Ferrier (1990) responds to the commonly-implied criticism of PBL, in the form of the question as to whether students may miss important areas of knowledge, by pointing out that implicit in this question is the assumption that there are no gaps in the traditional curriculum. He concludes that the careful, integrated planning needed to support PBL can potentially minimize gaps and redundancies.

IMPLEMENTATION

Practice within courses

Problem-based learning is the principal strategy in the design of courses contributing to the degree. In all courses where generic skills are practiced, the formative assessment will focus on tasks such as reflection and expression of understanding of the influence of factors within a given situation, both in oral and written expression.

Summative assessment guidelines

Recognition of prior learning will be available to the students for all generic courses (Webb et al., 1993)

The criteria guiding summative assessment of our students follows the work of Eisner (1993):

- tasks used to assess skill and knowledge should reflect the tasks to be encountered in the workplace
- such tasks should reveal how a learner solves a problem rather than focus on the learners' solutions
- Assessment tasks should give students the opportunity to display their understanding of the connecting features of the concepts they have explored and have more than one acceptable solution.
- Task design should permit students to select a form of presentation to display what has been learnt.

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QUESTIONS

1) State the role of TOPNZ in one sentence.

2) What is the meaning of generic skill?

3) 'The proposed Bachelor of Applied Science Programme of the Open Polytechnic was accepted with three major disciplines'. Name them……..

4) What is the guiding principle of TOPNZ?

5) Mention the traditional name of 'core courses' in New Zealand.

6) How can performance skills be acquired?

7) Critical to the acquisition of higher level performance skills is the ability of a student to……

8) What are the steps suggested by Heynus for motivating the learners?

9) What does the 'persuasive evidence' indicate?

10) Explain 'fluid intelligence'.

11) The basic principle of PBL is to.....

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12) Haworth believes discipline studies should be.....

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SUGGESTED ANSWERS

1) TOPNZ (The Open Polytechnic of New Zealand) is an institution offering nationally recognized certificates and degrees through distance teaching.

2) The word 'generic' means 'a genus', 'common to a whole group or class, 'not special', and skill means 'ability to do something expertly and well'.

3) Communication studies, Environmental studies and Psychology.

4) The guiding principle of TOPNZ is to train the learners in the generic skills of self management, conceptual skills, creative problem solving, holistic thinking, self-directed learning skills and literacy.

5) Add-on courses.

6) Performance skills can be acquired by relating new knowledge to existing knowledge within the memory and by creating interconnections.

7) Deep-process knowledge.

8) a) Teaching learners to value their courses b) The presentation of a 'meaningful' problem. c) Teachers ought to draw on their students' prior knowledge and experience.

9) Persuasive evidence indicates that elements taught as such do not add up to a whole. The desired and needed competency as essential as the sum of knowledge, understanding and context.

10) 'Fluid intelligence' makes a learner succeed in the changing world outside the educational setting.

11) Facilitate understanding by presenting learners with tasks which resemble those the learners will be confronted by in their professional activities.

12) Within a context that enables learners to be competent in their work.