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Innovation in the assessment of technology within primary initial teacher education

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Abstract
One of the common features of assessment is that those things which are most worthwhile assessing, are in many ways those things which are most difficult to assess. This is undoubtedly the case in the field of Technology where assessing a student’s ability to engage in design and technology activity is not satisfactorily achieved solely by written assignments and examinations.

Throughout all stages of education there is also an increasing emphasis on the vital role of formative assessment, and for this to be achieved students must understand both the relevance of assignments within the whole course structure, and the skills and competencies they are expected to exhibit in order to complete assignments satisfactorily.

The Faculty of Education at the University of Central England in Birmingham, is one of the few institutions in the country to offer Technology as a subject specialism option for intending primary school teachers, and this paper outlines the developments of both the course structure and assessment strategy which have taken place over the last four years to ensure that students engage in meaningful assessment activities.

Setting The Context
The Studies In Technology component of the current four year Primary BA (with QTS), was instigated in September 1988 because it was believed that, being so broad in nature, and encompassing so many aspects of human knowledge, technology was an ideal vehicle for both teacher education, and the delivery of much of the primary school curriculum. It is one of four subjects which students on the course can select to study, the others being Studies In The Arts, Environmental Studies and Humanities. Students spend approximately half of their time over the four years, following their subject studies option.

The course was written with the rationale of the Assessment of Performance Unit (1987) very much in mind.

“The basic premise of design and technological activity is that, using materials, tools and systems, human beings can intervene to modify and improve their environment. Underlying this intervention is the motive of responding to human needs. From this premise it follows that design and technological activity is not the preserve of any single curriculum subject, but rather refers to an activity that may be exercised in a range of subjects, albeit with some different emphases.”

The component, which is modular in nature, aims firstly to develop students’ own technological capability in a wide range of media and secondly to give students an opportunity to develop a whole range of strategies for teaching technology in the primary classroom. Although each module focuses on one or other of these aims, they are both implicitly covered throughout the course as a whole.

The Technological Matrix
Within each module, skills and knowledge are developed within the context of design and technology activities. As students progress through the course, they are expected to draw upon an ever increasing repertoire of skills and background of knowledge, which culminates in their fourth year individual study.

Studies in Technology is constructed in a matrix form. Vertical strands have been identified encompassing vitally important aspects of technology which are revisited at an increasingly sophisticated level as the course progresses. The strands have been designated as Materials, Control, Visualisation, Issues and Application.

The horizontal dimension of the matrix is provided by a range of general and cross-curricular threads. Energy is one such all-pervading concept, providing a strong horizontal link between the vertical strands. It has a particularly important place in the Issues Strand where societal implications of the world’s use of energy are set in an historical and multicultural context.
The development of student's skills in the use of resistant materials also provides an important horizontal link. It is impracticable to develop the variety of skills which students will need in order to work with a range of materials within any one component, so students practice these skills in many of the components throughout the four years, providing yet another integrating feature. Aesthetic considerations and the communication of ideas, including the production of folios are highlighted in the Visualisation Strand but are also addressed in many other modules.

Figure One: The Vertical Strands

Figure Two: The Horizontal Threads

Information technology, in its broadest sense, is an important aspect of Studies in Technology. Many of the early modules focus on particular aspects of IT, in order to make students aware of the possibilities which exist. Once students are aware of both the hardware and software available, they are able to make use of it wherever they see fit within the course.

Issues relating to Economic and Industrial Understanding also percolate throughout the course. A series of study visits to factories, commercial centres and museums enables students to acquire first hand experience of the technological environment. The industrial placement provides prospective teachers with first-hand experience of participation with a local company and the experience and contacts made assist students in developing young children's contact with their technological environment in a meaningful way.

The matrix therefore provides a mechanism for building up student's design and technology capability in a wide range of contexts and introduces them to specific knowledge and skills in a coherent way. The topics covered have been carefully selected to give the students a broad technological background at an appropriate level of rigour, but at the same time, encompassing areas of work which are normally covered in the primary school curriculum.

The matrix structure is an important feature of the course design, in that students are expected to make use of the new skills they learn and the new knowledge they gain in each successive component. This is formalised by broadening the range of assessment criteria for subsequent assignments. This process culminates in the fourth year in a major individual design and technology activity of the student's own choice, encompassing the whole range of experiences which they have encountered in the first three years of the course. The whole structure is illustrated in diagrammatic form in Figure Three.

Assessment Strategies

In developing the assessment strategy for Studies in Technology, it became clear that there were a number of prerequisites for an approach which would adequately measure students technological capability. Boud (1991) identifies three general
principles for good assessment practices at degree level.

- Assessment should help students to become self-determining;
- Assessment should be like real research or real work;
- Assessment should focus on "deep learning" processes.

Analysis of these principles and building upon research undertaken on assessing pupils in secondary schools (Ager 1992) led to the development of a number of requirements for an effective system for assessing technological capability.

(i) Assignments should involve students in useful activity with functional outcomes. It is important that assignments should be the framework around which modules are built, rather than peripheral activities.

(ii) All assignments should indicate clearly what a student needs to do in order to satisfactorily complete the work. This not only assists the student, but also provides a structure which tutors are able to use to ensure consistency in marking.

(iii) Students should be encouraged to be more interested in the constructive comments which tutors provide as feedback to assignments than the tick or the grade. In this way their strengths are acknowledged and their weaknesses identified so that students are fully aware of the areas of work which they need to concentrate on, if they are to make appropriate progress.

(iv) Assignments should encourage students to engage in meaningful activities, utilising appropriate modes of working. If an activity is best undertaken by working as a group then that is how the assignment should be organised. Supplementing group-work outcomes with individually written rationales, analysing the way in which the work was carried out, has proved a useful way of assessing this kind of work. The use of examinations within this component was discounted as, though it is simple to organise and easy to administer, it fails to mirror any real-life situation, and short-term memory recall was not deemed to be an important aspect of technological capability!

These criteria match well with a formative assessment strategy, but assignments also need to contribute to the students' final degree classification - clearly a summative role. In an attempt to overcome this apparent dichotomy of purpose, two distinct types of assessment were developed. One attempts to measure students' ability to engage in very specific activities, whilst the other gives them the opportunity to work on much longer tasks, demonstrating their powers of research, communication and analysis.

The names given to these two different kinds of assessment instruments are Profile Assignments and Classification Assignments. All modules have assignments linked with them, and of the 16 assignments undertaken within Studies in Technology, 12 are Profile Assignments and 4 are Classification Assignments.

Profile Assignments
These are all marked on a pass/fail basis. Each profile assignment has three or four clearly defined
Figure Three: Studies in Technology Course Structure

Year One
- Design and Technology at Key Stage One
- Drawing and Designing
- Food Technology
  - Newspapers
- Introduction to Control
- Technology and Society Centre for Alternative Technology

Year Two
- Design and Technology at Key Stage Two
- Imaging and Modelling
- Textiles
  - Bradford
- Electronic Control
- Structures

Year Three
- The Role of the Design and Technology Coordinator
- Critical and Contextual Studies
- Industrial Control
- Canals: An Historical Perspective
- Economic and Industrial Understanding
  - Industrial Placement

Year Four
- Project Proposal
- Major Project
- Project Presentation

Application Strand | Visualisation Strand | Materials Strand | Control Strand | Issues Strand
Ager

Descriptors associated with it. Students' work must satisfy these statements if they are to achieve a pass.

For example, in the Economic and Industrial Understanding module, students are expected to produce a small resource package which will be of use in undertaking a design and technology activity in the classroom, but which is also related to their industrial placement. This has to be in an appropriately presented form, suitable for distribution to both a representative of the firm involved and to other members of the Studies In Technology group.

They are also required to write a 1000 word report on their industrial placement experience for the industrial liaison officer.

To focus the student's mind on the important features of this assignment, they are provided with the following statement.

In passing this assignment you will show that you are

* able to produce a clear and concise typewritten or word-processed account of a week-long industrial placement;

* able to develop a resource appropriate for a particular identified age group, emphasising links between the world of work, design and technology and the primary classroom;

* able to produce the materials to such a standard of presentation that it would be in a form suitable for distribution to student colleagues and employees at the industrial placement.

Students are therefore fully aware of what the assignment is assessing, and the standards that are expected from them. The assignment is an integral part of the industrial placement, and both the resource and the report are needed for purposes other than assessment. They are also clearly expected to draw upon desk-top publishing skills which they will have developed in the Newspaper module and design skills covered in the Visualisation Strand.

The assignments can therefore be seen as an integrating feature of the course, as well as providing a clear mechanism for progression, by ensuring that the criteria for assignments later in the course include aspects of work covered in earlier modules. The criteria for each Profile Assignment therefore build up into an embryo student profile, providing the foundation for a competence-based approach to assessment which is currently under development for the course as a whole. Students need to complete every Profile Assignment satisfactorily, before they can be awarded a degree.

Classification Assignments

The classification assignments are marked on a 6-point scale. A, B, C and D correspond to a piece of work of a 1st, 2.1, 2.2 and 3rd class degree standard, with E and F as the two fail grades. Detailed criteria, which are common to all seven classification assignments on the BA degree as a whole, are provided for each grade, encompassing areas such as powers of analysis, coverage of issues, ability to communicate ideas and standards of research, but specific criteria are also provided which relate closely to the nature of the work being assessed in each particular assignment.

For example, the major project in the 4th Year is a classification assignment, so that specific criteria, in this case, relate to identification of client needs, standard of design work, the quality of the finished product and the ability to present their ideas to their client in a formal presentation.

The degree award is obtained by looking at the pattern of the seven classification assignments, four of which are undertaken within Studies In Technology. A series of relatively simple rules have been drawn up which take account of student's progress on the course, and the level of overall achievement. Therefore, whilst AAAAAA is obviously a first class degree, BBAAAAA is also credited with a first, whilst AAAAAABB, with a student clearly doing less well later in the course, is designated a 2.1.

The most significant feature about this system, is that the final award actually says something about the general standard of work of the student. It is not an average of seven numbers, achieved over four years, but a detailed record of the strengths and weaknesses of particular students.

The Future

Studies In Technology makes use of many different forms of assessment, ensuring that a wide range of appropriate skills and competencies can be assessed, rather than focusing on those which can be most easily measured by written assignments and examinations. Students therefore use video, photography, desk-top publishing, displays, seminars and multi-media presentations as vehicles for their assessment, as well as detailed design folios and the production of high quality outcomes. Because of the very nature of design and technology capability, innovative assessment strategies have
had to be developed to ensure that assignments are actually giving students an opportunity to show their ability to engage in a wide range of technological processes.

No new development is without its problems, but by careful and detailed evaluation, involving both staff and students, it is hoped that the scheme will eventually provide a fair, comprehensive and reliable method of assessing students' technological capability. Step by step evaluation is, after all, the key to the success of any curriculum development, even though this would seem to have escaped the notice of those who perpetrated the present National Curriculum on schools in England and Wales!

References


