Slaves to the Rhythm: An Approach to ITT Beyond Competence

Abstract

This, our first article for the *Journal of Design and Technology Education*, introduces our thoughts on assessment as being at the heart of the curriculum. We believe that too often trainees are encouraged to see coursework assessment as a series of hoop jumping exercises rather than an aid to understanding their own performance and thus improving on it.

We suggest that this might be so because, within the conflicting roles of assessment in both selection and diagnosis and remediation, selection so often wins out. Therefore, it is up to the tutor to seek out ways to reward the student for considering their own performance as a learner and importantly how to improve that performance.

We put forward some tentative approaches we have used with initial teacher training (ITT) trainees to encourage the understanding of their own learning processes and development of schemata. It is our belief that the development metacognitive activity and ipsative assessment strategies help our trainees go beyond 'settling' and toward real learning experiences.

> 'Nevertheless, it is sometimes possible, by observing and reflecting on our actions, to make a description of the tacit knowing implicit in them. Our descriptions are of different kinds, depending on our purposes and the languages of description available to us. We may refer, for example, to the sequences of operations and procedures we execute; the clues we observe and the rules we follow; or the values, strategies, and assumptions that make up our 'theories' of action.'
> (Schon, 1987: 25)

In our teaching we assess a number of coursework assignments and these frequently take the form of written reports of a technical nature.

Amongst the learning and teaching objectives to which we aspire are the development of professional levels of subject knowledge in intending teachers and the encouragement of a reflective and critically aware thinker in the classroom. To this end, our aims are:

- improved knowledge, leading to an increase in the general use of metacognition
- the development of a practitioner able to utilise an ipsative approach to improvements in the effectiveness of their performance (and so their trainees learning).

Note: Although in its widest sense, metacognition describes the post-processing of all sensory input and subsequent increased perception, we restrict the meaning in this paper to that which develops from subject delivery in the classroom and the corresponding interactive feedback with pupils.

The evidence available to us at this time indicates that our trainees do indeed show an improved capability in the domain of knowledge, but the development of thinking and reflection at a 'deep' level does not seem to be flourishing to the extent that we would wish. (Black and William, 1998) Much more effort is observed at the 'shallow' level where short-term goals can be realised. For example, within our modular programme, many constraints and requirements are imposed before the final degree classification can be arrived at. Some trainees are able to develop and refine very effective strategies to ensure progression in all elements with the minimum of effort whilst not disadvantaging themselves at the final classification. This is undoubtedly the result of much reflective thought, intertwined with the application of value judgements between the needs for paid employment, academic success and leisure time. However, 'success' and 'quality' are not necessarily synonymous.

Our intention here is to look at the ethos that has encouraged this state of affairs, to suggest some strategies to improve practice through assessment and, as a consequence, to improve the quality of student learning.

We would hope to show that abilities to think and reason at a deeper level would be obtained when cognitive activities are encouraged through ipsative assessment. Such an outcome will not be in the form of an 'added extra' to the knowledge which is gained, but rather, explicitly developed during the process of obtaining such knowledge and skills, as are prescribed for teacher education and training.

Functions of assessment

Assessment has been classified under six headings: Diagnosis, Evaluation, Guidance, Prediction, Selection and Grading. (Frith and Macintosh, 1984 in Broadfoot (Ed), 1990: 112)

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CURRICULUM

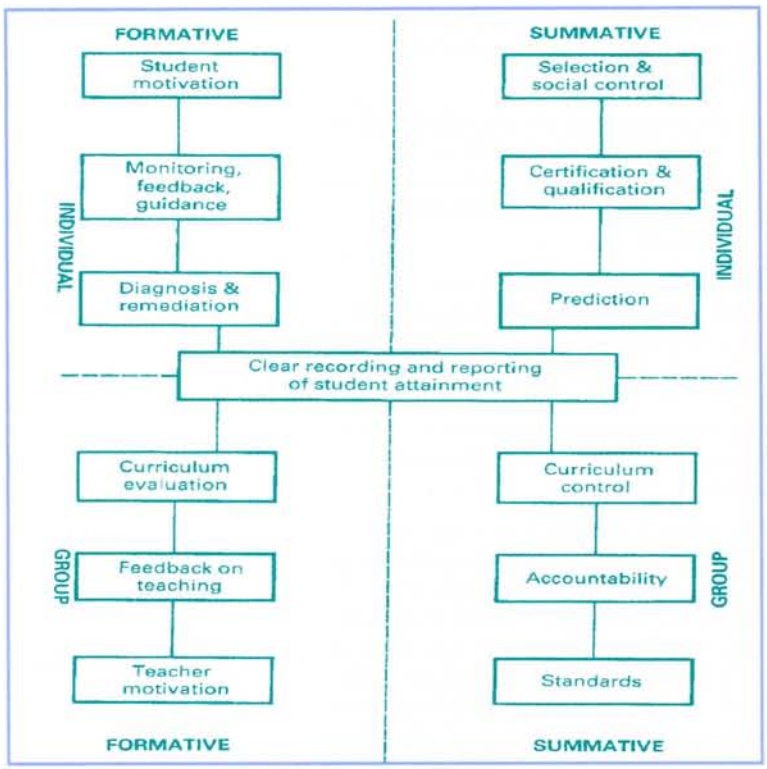

Figure 1: The Map of Assessment Functions (Pennycuick, D. in Broadfoot (Ed) 1990).

A more extensive classification was outlined by Pennycuick (in Broadfoot (Ed), 1990: 112)

1. Certification and qualification.
2. Selection and social control (see Edwards and Usher, 1994).
3. Clear recording and reporting of attainment.
4. Prediction.
5. Measurement of individual differences (psychometrics).
6. Student/pupil motivation (whether teaching-learning structures are competitive, co-operative or individualistic).
7. Monitoring student progress and feedback to trainees on that progress.
8. Diagnosis and remediation of individual difficulties.
9. Guidance.
10. Curriculum evaluation.
11. Feedback on teaching and organisation effectiveness.
12. Teacher motivation and teacher appraisal.
13. Curriculum control.
14. Evidence for accountability and/or distribution of resources.
15. Maintaining or raising standards.

Many of the above were cited when programmes within our institution changed to modularization and coursework-based assessment.

In our practice, we inevitably give greater emphasis to some areas than others. This is not just a matter of their importance to us, it is also partly because some functions such as diagnosis and remediation of individual difficulties are hard to apply in the time that we have available for assessment, and partly because some (e.g. the selective and motivational functions of assessment) may be in conflict. (Gipps, 1995)

The 'map' of assessment functions (Figure 1) is intended to clarify the classification and to stress that there are many assessment functions other than selection. Two dimensions are used in the model:

1. formative/summative
2. functions which can/cannot be applied to individual trainees.

The model is not intended to be prescriptive.

The recording/reporting function is seen as central since all other assessment functions depend on it. (Torrence, 1993) Other functions fall into one of the four quadrants, with varying degrees of certainty. Formative functions are mainly internal support structures, while the summative functions tend to have greater external significance. These formative functions fit more closely with the concept of assessment as an integral part of the teaching and learning process. They may be seen as more 'educational' and carry the more nebulous concepts of value and quality. In contrast, summative functions are of a more 'political' nature, whereby we are able to 'measure' and be measured with some precision, and thereby justify both our standing and that of our trainees.

It has been argued (Pennycuick, D. in Broadfoot, 1990) that the reliability of assessment is more important in the top half of the diagram, (assessment which can be applied to individuals), than in the bottom half (assessment functions applicable to groups of trainees). Here we are interested in the introduction of continuous assessment, which our institution has recently implemented. This involves a shift of emphasis from the right of the map (summative) to the left (formative).

Problems of continuous assessment (CA)

Continuous assessment within a modular undergraduate programme has not been without its problems. Problems, both technical and practical, some of which being more

problematic than others. (Nwakoby, 1987 in Broadfoot, 1990)

The root of these problems, in practice, lies with the very act of being transparent and fair in assessment. As criteria are explained and outcomes are attached to levels of achievement, we find that there is often a targeting on the knowledge-based elements from any given text, 'risk taking' through personal engagement with the real issues is avoided. In other words trainees stick to the 'clues' given in these indicators and end up handing in very similar pieces of work that seem to evidence a lack of engagement in the deeper issues of critical analysis and self reflection. This can, of course, happen in other forms of assessment, but the initial discussion (verbal or paper based) that leads to trainees settling for work which avoids risk, cannot take place in say examination conditions. In order to clarify this argument we have looked at the traditions that lead us from physchometric to outcomes based assessment (OBA) or, as it is often termed, CA.

> 'Critical thinking must have before it something to criticize, and this, I thought, must be the result of dogmatic thinking.'
> (Popper, K.R. in Johnson-Laird and Watson, 1977)

Schemata and pedagogical theories

'The discussions on the significance of organised knowledge can be drawn together by introducing the concept of the 'prototypical knowledge structures' or 'schemata'.' (Glaser in McCormick, 1994). Cognitive psychologists in accounting for various phenomena in memory, comprehension, problem solving and understanding, have found it useful to use this notion of schemata. Schemata theory can describe how acquired knowledge is organised and represented and how such cognitive structures facilitate the use of knowledge in particular ways. 'Like a theory, a schema is a source of prediction and it enables individuals to make assumptions about events that will generally occur in a particular situation. The knowledge they infer goes beyond the observations that are available in any instance.' (Riley, Greeno and Heller, 1983)

These studies suggest that we sometimes base solutions on our understanding of the context and structure in a problem situation. They present analyses of our problem-solving skill, in which the major influences appear to be the acquisition of knowledge structures that enable an improved ability to represent problem 'information'.

To use a metaphor here, we may cite the experienced motorist, who, although new to a particular road sees a traffic flow situation ahead, and is able to draw on past experience of similar situations and outcomes and take appropriate action.

Contrast this with the newly qualified driver, who, possessing the same physical skills for car driving and comparable knowledge of the Highway Code, continues onward, less aware of potential problems ahead. One has only to look at the insurance premiums for young drivers to find proof of this.

The strong assumption, then, is that problem solving, comprehension and learning are based on knowledge, and that people continually try to understand and think about the new, in terms of what they already know. (Atkins *et al*, 1993) 'If this is indeed the case, then it seems best to assess such skills at solving problems and correcting errors of understanding in terms of knowledge domains with which individuals are already familiar.' The notion of schemata, as theories that are a basis for learning, suggests several important pedagogical principles in our view.

First, tutors must understand an individual's current state of knowledge in a domain related to the subject matter to be learned, and within which thinking skills are to be exercised. (This alone presents a serious challenge in view of the diverse range of backgrounds from which we draw our trainees, but unfortunately is beyond the present scope of this paper).

Secondly, a 'pedagogical theory' can be specified by the tutor that is different from, but close to, the theory held by the learner, or, some differentiation of the base theory is postulated inviting the development of finer divisions or sub-groupings. (For example, starting from 'Ohms Law' which is the 'known', the boundaries are moved and segmented as topics such Kirchoffs' Laws and impedance in a.c. theory are explored).

Then thirdly, in the context of this pedagogical theory, trainees assess and modify their current theory, which leads to an arrival at some resolution between the two. Thus, the stage is set for further progression of schemata changes as the trainees work with, refine, and generate new theories. Those readers wishing to explore this concept in greater depth may find a well rounded development, all these being elements of the Zone of Proximal Development (ZPD) postulated by Vygotsky. (in Torrance, H., 1993)

We can view a schemata as a pedagogical mental structure. (Child, D., 1978: 118) One that enables learning by facilitating memory retrieval and the learner's capacity to make inferences based on current knowledge. When dealing with individuals who lack adequate knowledge organisation, we must provide a beginning knowledge structure. (Shield, G., 1998)

This may be accomplished either by providing overt organisational schemes or by teaching temporary models as scaffolds for new information. (Ecclestone, K., 1996: 78) The ultimate aim being to develop accurate and effective self-assessment skills in the learner, this being aligned to *the concept of metacognition and ipsative assessment.* Teachers can thus devise temporary models, or pedagogical theories. Such structures can, when they are used, help organise new knowledge and offer a basis for problem solving that leads to the formation of more complete and expert schemata. The process of knowledge acquisition can be seen as the successive development of structures that are tested and modified (or replaced) in ways that facilitate *learning and thinking.*

Inquiry in teaching and learning

The pedagogical implication that develops from this is that an effective strategy for instruction involves a kind of interrogation and confrontation. Methods of inquiry instruction have been analysed (Ecclestone, K., 1996), and these findings suggest a useful approach to the design of tutorial instructional systems.

A major goal of good inquiry teachers, in addition to teaching facts and concepts about a domain, is to teach a particular rule or theory for that domain. This is done, in part, by helping the learner make predictions from his or her current theory and secondly, in reflecting on outcomes, re-contextualising the foundation on which the theory was based.

A second goal is to teach ways to derive a rule or theory for related knowledge. The student learns what sort of questions to ask in order to construct a theory, to test it, and establish what its properties are. Unfortunately, if used with inadequate skill, an inquiry approach can become an inquisition. This leaves many less able trainees in a state of such anxiety that it precludes the very learning for which we are aiming. The use of this method requires constant vigilance by the teacher. They must keep in mind not only the particulars of each student's thinking, as outlined in student centered learning (Anning, A. in McCormick *et al,* 1994) but also the de-motivational and antagonistic group effects which can result from an over zealous approach to the progress of the individual.

Despite the inherent difficulties, it is, in our view, possible that levels of thinking can be taught in parallel with the acquisition of subject-matter, knowledge and skills. Specific declarative knowledge and associated procedural knowledge can be learned, as well as the general processes involved in using one's knowledge and skill.

In the process of carrying out instruction, the strengths and weaknesses within a particular domain of learning could be assessed

For instance, if we were to outline some critical terms in an area of knowledge that our trainees needed to understand, then asked them to construct questions, so that the answers to the questions were the key terms that we originally outlined. We would be developing both knowledge and metacognition at the trainees' own level. If the trainees were then asked to re-construct the questions so that they were aimed at a level which pupils could answer, we would be extending the deeper thought processes from the lecture theatre into the realm of the practitioner and the classroom.

We could assess not only the trainees' understanding of the knowledge, but also their ability to construct a schemata for diagnostic assessment through classroom discussion. (Here, group interaction is a rich vein of ideas, where what is 'obvious' to one may be equally obvious but different to another and yet a third is left with no idea at all). We could expect that, rather than looking for correct or incorrect answers, trainees would be looking beyond what is 'obvious to them', to the reasons why a pupil might answer in a certain way. The good practitioner is not the one who seeks perfect subject mastery, it is the one with adequate subject knowledge who seeks through review and evaluation, the vision to see the problems ahead and subsequently re-moulds the learning environment to best meet the needs of each particular group.

If a trainee has acquired much of the specific knowledge needed for subject-matter mastery, instruction aimed primarily at general self-reflective skills of metacognition may be indicated. However, if a trainee shows competence in general problem solving and self-regulatory strategies, *and* is likely to employ them to guide learning in a new area, then an emphasis on knowledge and skills specific to a domain are called for. The relative emphasis on general and specific knowledge in instruction will vary as a

function of both the competence of the learner and the characteristics of the domain.

This tactic seems to be a reasonable one for us to investigate, but rather than switching between general and specific, we would also examine a further possibility: teaching specific knowledge domains in interactive, interrogative ways so that general self-regulatory skills are exercised in the course of acquiring domain-related knowledge. (Glaser in McCormick, 1994)

Conclusion

So where are we now? Do we unwittingly present constructs in our assessment strategies, which, rather than supporting reflective improvement, encourage only success via the use of summative instruments? One must ask 'How often are we able to structure the learning to the various maps of individual need?' The corollary to this issue is again assessment – are we able to develop multiple assessments, which are both fair and also tailored to an individual learning programme? Even if we can, will the student still accept the assessment as fair and comparable when the outcome is failure?

Despite these difficulties, with the deepening study of cognition, current research and development is increasing the likelihood that we can move to a new level of application in which a wide spectrum of thinking skills are sharpened in the course of education and training. Assessment has a central role to play here and few other educational possibilities beckon us to apply ourselves as much as the education of reflective teachers who can develop learning strategies which encourage ipsative assessment skills in learners.

> 'Good, effective assessment is hard to do. Even experienced teachers find changes to a system, or to their own role in it, difficult. There are complex technical processes to implement as well as complex, and sometimes controversial, principles underpinning them. It is also clear, though, that the goal of raising learners' achievements and abilities to learn are powerful reasons for pursuing better assessment…' (Ecclestone, K., 1996: 162)

Teaching thinking has been a long-term aspiration, (Johnson-Laird and Watson, 1977; Child, D., 1978; Peters, R.S., 1987) and now progress has occurred that brings it into reach. The cognitive skills developed by people in a society are profoundly influenced by the ways knowledge and literacy are taught and used. We should take heed. The task is to produce a changed environment for learning – an environment in which there is a new relationship between trainees and their assessment, in which knowledge and skill become objects of interrogation, inquiry and extrapolation. As individuals acquire knowledge and qualifications they also should be empowered to think and reason.

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