

9. ASSESSMENT STRATEGIES FOR ENQUIRY AND PROBLEM-BASED LEARNING

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INTRODUCTION

Whatever approach to innovation in curriculum design and delivery we adopt, it is the assessment of student learning which often proves most problematic for even the most experienced teacher to change. Whilst much has been written about approaches to enquiry and Problem-based Learning, curriculum design, the role of the tutor and various other aspects, much less attention has been given to the purposes and principles of assessment in PBL (see, however, Savin-Baden & Major, 2004; Schwartz et al, 2001; Duch et al, 2001; Boud & Feletti, 1997).

The consequence of this is that, if lecturers retain the assessment methods they used in their traditional curriculum approaches, the outcome can be a misalignment between their objectives and student learning outcomes, the learning and teaching methods adopted and the assessment of student learning. Assessment in enquiry and Problem-based Learning requires as much thought and care as it does under other approaches to learning and teaching. It is important to use assessment to drive the desired type of learning.

This chapter draws heavily on the ideas and content in Macdonald & Savin-Baden (2004) which was written for a similar audience. I am grateful to Maggi for her inspiration and challenging ideas. Whilst we have had constructive disagreements over some aspects of Problem-based Learning we share the basic premise that it is a student-focused approach to learning where the curriculum is built around problem scenarios.

SOME PRINCIPLES OF ASSESSMENT IN ENQUIRY AND PROBLEM-BASED LEARNING

As with any pedagogic approach, it is important to align learning outcomes, teaching and learning activities and assessment tasks, particularly where the intention is to encourage deep, rather than surface, approaches to learning (Biggs, 2003). Using Problem-based Learning as a prime example of alignment, Biggs paraphrases Kingsland (1995):

The essential feature of a teaching system designed to emulate professional practice is that the crucial assessments should be performance-based, holistic, allowing plenty of scope for students to input their own decisions and solutions.

(Biggs, 2003: 237)

This, Biggs argues, requires criterion, rather than norm, referenced assessment, adopting a much more holistic and divergent approach, involving significant peer and self-assessment, all features which enquiry and problem-based curricula increasingly reflect. Woods, who uses Problem-based Learning in his chemical engineering courses at McMaster University in Canada, defines assessment as “a judgement based on the degree to which the goals have been achieved based on measurable criteria and on pertinent evidence” (Woods, 2000: 21).

Assessment has also to move beyond factual recall to the application of knowledge and skills to increasingly complex situations, involving a range of intellectual and practical activities in a variety of contexts. Assessment should therefore reflect the professional contexts in which our students are likely to find themselves in the future, showing how they cope with acting and thinking like a nurse, physicist or historian and the lifelong learning skills needed to continue to develop in these changing professional areas.

Many lecturers claim that their students will not do any work unless it is being assessed - by which they often mean that it is awarded a mark. However, as Knight (2001) notes, assessment for summative purposes is viewed as being of such high stakes that those being assessed see it as being in their own interests to emphasise what they know or can do - however limited or poorly - and to cover up as much as possible what they do not know or cannot do. In enquiry and Problem-based Learning, where students have to make statements about what they already know and can do and where there are gaps in their knowledge and competence, assessment needs to be developed which encourages learners to be open and honest. So, whereas Knight suggests that it is through formative assessment that students can disclose their shortcomings, in enquiry and Problem-based Learning learners may be rewarded summatively for identifying learning needs and reflecting on areas for further development without these being seen as personal shortcomings. As we will see later, it is through peer, self and collaborative assessment that students are able to make judgements about how *well* they are learning and not just how *much* they have learned.

If you want to work with a set of principles to guide you in assessing students in enquiry and Problem-based Learning you might start with those developed by Macdonald and Savin-Baden (2004):

- Assessment should ideally be based in a practice context in which students will find themselves in the future - whether real or simulated
- Assess what the professional does in their practice, which is largely process-based professional activity, underpinned by appropriate knowledge, skills and attitudes
- Assessment should reflect the learner's development from a novice to an expert practitioner and so should be developmental throughout the programme of studies
- Students should begin to appreciate and experience the fact that in a professional capacity they will encounter clients, users, professional bodies, peers, competitors, statutory authorities, etc. who will, in effect, be 'assessing' them
- Students should also be able to engage in self-assessment and reflection as the basis for future continuing professional development and self-directed learning
- As lecturers we need to ensure that there is alignment between our objectives and the students' anticipated learning outcomes, the learning and teaching methods adopted, and the assessment of learning strategies, methods and criteria

Further, you might consider the extent to which your assessment practices are inclusive or whether they discriminate against certain students, whether you are using a variety of approaches and methods for which students (and staff) are adequately prepared, and how you will evaluate and review the effects of the assessment on student learning behaviour.

THINKING STRATEGICALLY ABOUT ASSESSMENT

As well as ensuring that our assessment is aligned with the learning outcomes and the learning and teaching approach adopted, in this case enquiry or Problem-based Learning, it is important to adopt a more strategic approach to assessment by asking ourselves a series of questions:

Why are we assessing the students?

The main purposes are normally, firstly, to support their learning through engaging them in learning activities and providing feedback; secondly, to measure learning against the stated learning outcomes; and, finally, to assure the standards of awards. Whilst the second purpose may dominate students' experience, particularly if they are focussed on marks and institutions emphasise the need to assure standards, our main focus should be on how well assessment promotes effective student learning.

What are we assessing?

Traditionally assessment has been about finding out how much students know, usually in terms of knowledge or content. Increasingly skills are seen as being important for students' future employability. Attitudes and values have also been added to the list. However, in enquiry and Problem-based Learning what we are really interested in is the students' ability to perform in a professional context, to recognise their need to acquire new knowledge and skills, and to view learning holistically rather than atomistically.

When are we going to assess?

Experience has often shown that if we adopt the 'big bang' approach to assessment at the end of a course students will spend most of the class time trying to spot cues as to what they will be assessed on and, preferably, the answer that the lecturer wants. A variety of continuous assessment methods have been used in enquiry and Problem-based Learning including the Triple Jump (see later in this chapter).

Who is going to carry out the assessment?

Enquiry and Problem-based Learning should result in students becoming increasingly more autonomous and, as we are giving them greater responsibility for their own learning, then it makes sense for them to take more responsibility for judging whether they have achieved the learning goals. Similarly, given that they will be working with peers, supervisors, clients, etc. in professional capacities and assessment is matching the contexts in which professional capability will be demonstrated, the range of those involved in assessment and providing feedback needs to be extended.

How are we going to assess?

In the next section, I look at a number of approaches used in enquiry and Problem-based Learning. You might also wish to consider how to modify or adapt other approaches. However, it is important to look across the whole programme to ensure balance and variety in the types and timing of assessment (Knight, 2000). Where enquiry and Problem-based Learning is being used on a whole-course, totally integrated basis this is less of a problem than where students are taking a number of units or modules at the same time. Furthermore, we should consider whether the approaches we adopt reduce the likelihood of students plagiarising and

ensure that, as well as briefing and training students how to avoid it, we design it out of the assessment methods we use (see Carroll, 2002).

Where will the assessment take place?

Assessment can take place wherever the students are learning – at home, on-line, at work, in the classroom and even on the bus or train. The main point here is that assessment performs a number of functions and if it is contributing to student learning then it can happen anywhere and not just in formal educational settings. The growing use of electronic learning environments is widening the opportunities to learn and gain feedback on learning in an almost unlimited number of settings. The blocks to imagination may be in the minds of the lecturers and institutions and less so in those of the students for whom new technologies are part of their everyday lives.

How are we going to grade/mark?

Many enquiry and Problem-based Learning courses use Pass/Fail/Refer with a consequent greater emphasis on the feedback, particularly in the early stages of a course. Knight (2001) examines some of the problems with grading, not least if a norm-referenced approach is adopted. Biggs (2003) refers to the SOLO (Structure of Observed Learning Outcomes) taxonomy as a way of grading and as an alternative to Blooms' hierarchy of educational objectives - knowledge, comprehension, application, analysis, synthesis and evaluation. SOLO has five levels or stages which can be used to gauge students' understanding of a topic: prestructural, unistructural, multistructural, relational and extended abstract (Macdonald, 1999).

What feedback will students receive?

Too often students receive feedback either too late to help them improve their learning in the future or in a format which does not help them to make the improvements. To be of use, feedback has to be timely enough to help them learn and forward looking so as to help them move forward rather than just look back. Traditionally students have received little or no feedback on the major component of their assessment namely examinations. This adds to the pressure and performs even less of learning, and more of a measuring, purpose. Engaging with assessment criteria, and the use of self and peer assessment and feedback, will help improve the quality of feedback.

METHODS OF ASSESSMENT IN ENQUIRY AND PROBLEM-BASED LEARNING

Macdonald and Savin-Baden (2004) list some of the forms of assessment that have been used successfully with enquiry and Problem-based Learning and which also move away from the need to have outcome-based examinations. To summarise, these include:

- group presentations
- individual presentations
- tripartite assessment
- case-based individual essays
- case-based care plans
- portfolios
- triple jump
- self-assessment
- peer assessment
- viva voce examinations
- reflective (online) journals

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- reports
 - patchwork texts
 - examinations
 - electronic assessment

1) *Group presentations.* Students can be asked to take on a role or work within a particular context or scenario, ideally one that is as authentic as possible. These may be difficult to mark and it needs to be made clear what is being assessed – content, how the group ‘performed’ on some combination of both.

2) *Individual presentations.* Students are asked to present the components of work they have researched for their contribution to the overall solution or management of the problem scenario.

3) *Tripartite assessment.* Firstly, the group submits a report for which they receive a mark. Secondly, the individual submits the piece of work they researched. Finally the individual writes an account of the group process that is linked to the theory of group work. These three components are added together to form the overall individual mark. The advantage of this is that it does not privilege some students who do less work and an individual student will be responsible for gaining two-thirds of the marks and therefore most students perceive this kind of grading as being fair.

4) *Case-based individual essay.* The student is presented with a case scenario which they respond to in the form of an essay or report.

5) *Case-based care plan based in clinical practice/client-led project.* Students are presented with a real life scenario to solve / manage for a client.

6) *Portfolios.* These can be unwieldy if not managed well and may be difficult to mark. They are fine if they are well designed. Portfolios have been used in a number of programmes that educate students for the professions. In recent years the requirements for these have been refined away from a vast quantity of materials towards a more concise version that offers greater reflection and criticality than before. Students should also be required to draw out conclusions and synthesise the materials contained in the portfolio.

7) *Triple jump* (Painvin et al, 1979; Powles et al, 1981). Individual students are presented with a problem and expected to discuss the problem and their learning needs with an oral examiner. Students then locate research material and later discuss their findings with the examiner and are rated on problem-solving skills, self-directed learning skills and on their knowledge of the problem area. This method is obviously time and resource intensive, though these elements might be reduced with the use of peer tutoring and assessment or using elements of group work.

8) *Self-assessment.* This works well with enquiry and Problem-based Learning, but students must be equipped to undertake it through explanation and experiencing the learning benefits on small tasks, before engaging in large activities where marks ‘count’. Self-assessment allows students to think more carefully about what they do and do not know, and what they additionally need to know to accomplish certain tasks.

9) *Peer assessment and feedback.* This provides a good fit with enquiry and Problem-based Learning as it more closely replicates the team-based situations in which most professionals will find themselves in the future. This kind of assessment emphasises the cooperative or collaborative nature of the enquiry and Problem-based Learning environment. However, many students find it difficult to adapt to this approach having come from a more competitive, individualised school or college environment.

10) *Viva voce examinations*. These were used very effectively before enquiry and Problem-based Learning was widely in use. They have since been adopted by several curriculum designers for use with enquiry and Problem-based Learning. However, they are best done in practice situations and, although they are very effective, they can be costly, time consuming and extremely stressful for the student. A major benefit is that they do allow the assessor to ask follow-up questions, which is not possible in more formal, written formats.

11) *Reflective (online) journals*. Students hand them in or post them online each week and receive a mark at the end of each term/semester. Students tend to be more open and honest about their learning than one would expect and these can be criterion referenced. They might also be linked to other electronic communications activities such as conferencing or providing feedback to peers.

12) *Reports*. Written communication is an important skill for students to acquire. Requiring written reports allows students to practice this form of communication, particularly if the word allowance is short and it is used in the final year, as it can promote succinct, critical pieces of work. Alternatively, students might be asked to provide an Executive Summary for assessment, accompanied by a portfolio of supplementary back-up evidence which could be sampled rather than marked in full.

13) *Patchwork text* (Winter, R. et al, 1999). This is a way of getting students to present their work in written form. Students build up text in course work over a number of weeks. Each component of work is shared with other students and they are expected to use different styles, such as a commentary on a lecture, a personal account, a book review.

14) *Examinations*. I see nothing wrong with examinations but they need to be enquiry or problem-based examinations. The students should engage in pre-examination activities which reflect the type of learning activities they have experienced previously, including working in groups. Treat the examination as a time-constrained activity (anything from 30 minutes to a week) where the students may have to work individually with new data or scenarios and have to make sense of the new situation. The students should not have to do 'revision' in the traditional sense of learning by rote, though they will have to prepare for the examination. A second challenge would be to have students spending a substantial proportion of the time thinking, working with ideas and not simply writing down the facts they have remembered.

16) *Electronic assessment*. These approaches are becoming increasingly more sophisticated and can be used for simulations, scenarios and other time-constrained activities, often linked to a virtual learning environment providing access to a range of resources and communications opportunities.

Self, peer and collaborative assessment

The use of self, peer and collaborative assessment is worth a little more consideration, though some lecturers prefer to limit the use of this approach to assessment for feedback rather than allocating marks.

Self-assessment

Self-assessment involves students judging their own work. It may include essays, presentations, reports, and reflective diaries. However, one of the difficulties with self-assessment is the tendency for students to make judgments about what they meant rather than what they actually achieved. Boud has defined self-assessment as:

the involvement of students in identifying standards and/or criteria to apply to their work and making judgments about the extent to which they have met these criteria and standards. (Boud, 1986: 12)

Peer assessment

Peer assessment, by contrast, involves students making judgment about other students' work. This is generally used for presentations and practicals but it can also be used for essays and exam scripts. Using peer assessment with essays is really useful and also highly informative for student and tutor and it can be used at various points in the learning and assessment process to give feedback before completing the final piece of work for submission. Ideally the students design their own assessment criteria and use them to assess each other, but in many programmes they are designed by staff. Students learn how to make better sense of assessment criteria if they have to give feedback and/or marks against them. Giving and receiving feedback is an important aspect of student learning and will be valuable skills for them in professional contexts and for future learning.

Collaborative assessment

In collaborative assessment, the student assesses her/himself in light of the criteria agreed with the tutor. The tutor assesses the student using the same criteria and they negotiate a final grade and perhaps even the feed forward comments.

And finally...

Macdonald and Savin-Baden (2004) also contains more detailed examples of assessment in Problem-based Learning in the following subject areas: medicine and dentistry, nursing, physics, law, optometry, introductory sciences, and economics.

Further examples of assessments can be found by using a search engine such as Google or visiting the UK's Higher Education Academy Subject Centre websites (www.heacademy.ac.uk). However, rather than looking to copy examples which may not fit your context, students or the form of enquiry or Problem-based Learning you are using, you might look to adapt your existing assessment methods to ensure that they still align with the learning outcomes and learning and teaching approaches you are using. Knight (2002: 146) contains 50 assessment methods, and Brown and Smith (1997: 25) provide a glossary of some assessment methods which may be less familiar to some. The next two chapters of this handbook provide case studies of assessment in enquiry and Problem-based Learning.

At the same time, asking yourself the following questions might help to ensure your assessment is aligned to the learning outcomes and the principles and practices of enquiry and Problem-based Learning that you want students to engage with:

- What is the relationship between your assessment methods, the learning outcomes you want the students to achieve and the learning activities you anticipate they will engage in?
- What do you want your students to know and be able to do and how might they best demonstrate this?
- What methods could you use to assess enquiry and Problem-based Learning?
- What types of assessment will best suit enquiry or Problem-based Learning in this curriculum?
- How can you evaluate the assessment methods used and your students' experiences of assessment to help you make further improvements?

CONCLUSION

Finally, remember that enquiry and Problem-based Learning are processes leading to a variety of outcomes and that the challenge is to use assessment to contribute to more effective learning, not merely to lead to marks or grades. There may be a lot of ‘un-learning’ and letting go to be done by both students and tutors before there is genuine alignment of assessment with the learning goals and principles and practices of enquiry and Problem-based Learning.

The real challenge is to make assessment a rewarding, challenging and even fun part of a similarly rewarding, challenging and fun learning experience! It has to be taken seriously but that does not mean it has to be serious all the time. Enquiry and Problem-based Learning should be as engaging in an educational setting as it is for the young child finding things out for the first time. They do not engage in formal assessment but they can tell you what they have learned. Think about it ...

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