High peaks and low valleys: confronting the examinations inheritance of a Swedish university[1]

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ABSTRACT: This paper presents and discusses development work that has taken place within the framework of a 3-year internetbased assessment project funded by the EU (www.onlineassessment.nu). The project's task has been to bridge the gap that exists between the everyday practices of teachers and the ideals that are associated with on-line learning, on the one hand, and so-called 'alternative' or 'authentic' assessment, on the other. Following a general discussion of the problem of responding to the pedagogical interests of university teachers, two case studies report development work that has taken place within the departments of Applied Physics and Modern Languages at a university in the north of Sweden. Finally the paper discusses the implication of these case studies for comparable development work in other European institutions of higher and distance education.

Background

The landscape of Swedish higher education is changing. A handful of universities serving a student elite has been replaced by a system of mass higher education. Students have more opportunities to choose courses according to their own wishes, irrespective of their entry qualifications and where they live. They start their higher education later than earlier generations and many absent themselves from studying for long periods while they are registered as students.

At the same time, the number of teachers per student has decreased. Teachers feel themselves under pressure not only from the size but also the diversity of the student population. It was no surprise, therefore, that in 2000 the Swedish Public Accounts Office noted signs of

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reduced effectiveness in the higher education system - at a time when the system was under 'quality assurance' pressure to improve the quality of teaching and assessment.

Information and communication technology (ICT) has been proposed as a solution to these problems of increasing numbers of students, reduced resources, changed expectations of students and the demand for new forms of teaching. An assumption is made that internet-based software can liberate teachers from mechanical tasks and allow them to raise students to new levels of learning. Internet use, therefore, is seen as a desirable part of every university teacher's toolkit.

The Challenge

But is this possible in the current context of Swedish higher education? What kind of development work is required so that university teachers can bring their pedagogic practice closer to these aspirations?

To investigate this question, the universities of Umeå, Sussex and Ghent have received EU and local support. The aim of the project partners is to investigate how and whether internetbased assessment can be used to support teaching and learning in the current context of European higher education.

Internetbased assessment is based on four linked activities: (1) the creation of questions using an authoring tool; (2) assembling these questions into a coherent assessment; (3) publishing the assessment on a web server; and (4) testing the assessment to eliminate bugs and errors. The first three activities - manual input of the text, choice of question type and net-based publishing - are technical and may present difficulties to inexperienced users. After training, however, these threshold problems can be overcome. In practice, the real challenge lies not in achieving mastery of the software - in this case Questionmark Perception (version 3) - but in the construction of questions that both monitor acquired knowledge and stimulate further learning.

Curiosity, Participation and Commitment

This paper presents and discusses the Umeå contribution to the project. Following a general discussion of the problem of responding to the pedagogical interests of university teachers, two case studies report development work that has taken place within the departments of Modern Languages and Applied Physics and Electronics. Finally the paper discusses the implication of these case studies for the next phase of development work. In effect, this paper evaluates and disseminates the project's practices and insights.

A conspicuous feature of the Swedish initiative has been the contrast between the large initial interest among teachers and the drop-out that occurs when they are invited to participate in the project. This was particularly noticeable in the turn-out from our first workshop in December, 2002. Of the 30 participants in the workshop, from the university administration (1) and from the faculties of Arts (9), Medicine (11), Social Science (6), Natural Science and Technology (2), and Teacher Education (1), only three wanted to be actively involved, two of whom had already committed themselves before the workshop. Thus, it is obvious that curiosity exists but there is something else which makes people hesitant about greater levels of commitment.

To study this more closely a telephone interview was carried out with 19 (70%) of the workshop participants who did not join the project (Eight participants could not be reached for various reasons (travel, sickness etc.) at the time of the survey). The interviews took place in February 2003. The results were the following:

- Three people had moved to new posts and were no longer involved in teaching.
- Six people were not interested at all. Three reasons were mentioned:

  a) IBA did not meet their wish to continue using essay-type questions.

  b) They used a demanding net platform would find it too time-consuming to learn another application.
  c) Unable to make the necessary investment of time.

- Ten people said that they were still interested, but they felt that they could not commit themselves early in 2003. Some of these teachers thought that it would take a long time to learn the program and that, therefore, they could not commit themselves.

These interviews seem to suggest that long-term commitment on behalf of the university or other organisation may be instrumental in encouraging teachers' to change their practice. Many teachers in Swedish universities work under stress and they are reluctant to involve themselves in projects unless they can assess, in advance, professional rewards and side-effects.

In our continued work in the project, the conflict between curiosity and commitment is pervasive. It is clear that many teachers are keen to try new methods, yet few teachers have sufficient spare time. They look very carefully at a prospect before they get actively involved. Thus, successful implementation of a project of this type may require that teachers are guaranteed long-term institutional commitment, including a reduction of their teaching hours in the initial stage.

Modern Languages

In comparison with other departments, Modern Languages has had many participants in the workshops and several teachers have also joined the project. As a department within the Faculty of Arts, it is exceptional in its high level of participation. Generally speaking, the interest within the Faculty of Arts has been very low.

Why, then, would the Department of Modern Languages show this interest in IBA? On closer inspection, two important circumstances can be identified which made the teachers particularly receptive to new teaching tools.

- *A change in funding.* In 1993, Swedish universities changed the financial system which meant a major reduction in the funds available to Modern Languages which, in its turn, led to a 25-30% reduction in staff contact hours. Modern Languages appears to have been affected more than other departments within the Arts faculty.

- *A change in the entrance requirements for language studies.* The level of these requirements has been lowered substantially for courses taught within Modern Languages.

These two factors have made it difficult for the teachers to maintain the aims and standards of the courses, and they have been forced to look for new methods. The IT medium has been viewed favourably within the department: in both English and Spanish several projects involving teaching and IT have been launched. Thus, a need to find diverse methods for supporting students already existed. During 2003, seven teachers in the English department

have used use IBA and another seven teachers have shown interest by their participation in workshops. No gender differences of interest (eight women, six men) are evident.

Problems and successes

The implementation of IBA in the Department of Modern Languages has been incremental. First, only two teachers actively used IBA for students' self-assessment, but in 2002-3 several other teachers joined the project. Teachers have been able to help one another and share their experience with new-comers.

Most problems encountered have been closely linked to the use of the software. Some teachers have found some aspects of the program counter-intuitive, since not all types of questions are formed in the same way. Some teachers have also found some editing aspects difficult to master: italics, pictures, bold etc. However, workshops and individual personal support have eliminated the initial frustration. In fact, most teachers have been surprised to find the formulation and creation of questions to be the difficult part, not mastering the program.

One drawback is that some teachers have restricted themselves to multiple-choice questions at the initial stage. No doubt fear of failure with the application, in combination with the lack of time, led teachers to adopt this strategy. This could also explain why the tests showed little variation in terms of the types of questions that were used.

In Umeå, a net-based forum was created around frequently asked questions (FAQs). But it was not widely used. In Modern Languages, personal support was preferred. The availability of such support may also account for the relatively high interest shared in the English department.

The highpoint of the IBA initiative in the department of modern languages, was the great interest that it aroused. Teachers who started with one course have discussed introducing it into other courses. It has also led to a discussion of what examinations are for, since IBA is exclusively used for students' self-evaluation. Another spin-off has been that teachers have been forced to state course objectives more explicitly. This, in turn, has brought about cross-language discussions concerning what grammar, linguistics etc should be taught. And how?.

The response from the students has also been very positive. Moreover, a subjective impression reported by the teachers is that IBA has improved the performance of their students. This impression has, of course, inspired other teachers to test the tool.

Insights and Reflections

The case of Modern Languages shows that IBA can be integrated into departments within the faculty of Arts, providing that:

- There is a positive attitude towards IT as a teaching tool.
- Personal support is available.
- Innovation is incremental - such that early success stimulates others.

In return, the project has stimulated cross-language discussion of assessment and teaching and, as a result, has fostered discussion about good practice, teamwork and innovation. A

departmental culture of competence has been created through this dialogue. External workshops have had an important role in this respect too, providing a larger forum for the discussion and definition of good practice.

Applied Physics and Electronics

The department of Applied Physics and Electronics offers degrees in electronics, mechanics, house building, energy and multimedia whose duration extends up to five years. Most of the courses within the programmes are presented as lectures combined with half day laboratory exercises. By convention, students work is assessed via a written assignment at the end of each course. Each student group has about 40 members.

In recent years the conditions under which the programmes have been offered has changed significantly. Reduced funding has led to an increase in the number of students which, as noted above, has restricted the time that teachers spend per student. Moreover, novice students come from more heterogeneous groups, often with a non-technical background. They tend to be characterised as immature, lacking of self-confidence, poorly motivated and prone to take short cuts when following courses. Awareness of this situation led to a review of the courses and their assessments. Certain courses were modified, including Analog Electronics (five weeks) and Electronics with Measurement Technology (10 weeks).

Experience from the terminal, end-of-course assessment shows that the students often engage in:

- *last-minute behaviour* (concentrating their work in the days before the exam).
- *Cue-seeking* (finding out what type of problems will appear in the assessment)
- *Reviewing earlier assessments* (rehearsing solutions to problems). which then, to the student, becomes the course knowledge.

As a consequence, students neglect the lectures and the foundational ideas of the course. Their last-minute work becomes a surrogate for the course knowledge. They behave as knowledge containers. They store up knowledge by activating a record button; play back the knowledge during the course assessment; and erase it before the next course! This behaviour can be changed by lowering the stakes associated with such a substantial final written assessment. If, however, the assessment is focused on one occasion only, the investment is often worth the effort of last-minute behaviour.

To counteract this unwelcome behaviour, the assessment on the revised courses is divided into several 'sub-assessments'. Students are forced to choose whether to search out short cuts or to engage with the totality of the course. By implementing sub-assessments, students are encouraged to spread the workload over the whole course. Such assessment can also test different abilities - both theoretical and practical skills. The nature of the assessment should, therefore, be multidimensional, with students encouraged to present their acquired knowledge from different perspectives and in different forms.

The new course assessment is regarded as an opportunity to learn. The modified form should allow the student to test, as a form of self-diagnosis, their level of knowledge. This self-assessment should also present relevant feedback to the student. If this feedback is integrated as a course component, it will manifest itself in changes in the qualities acquired by students. Such self-assessment also changes the students' own perspective on their acquired

knowledge. To be able to self-test skills repeatedly in a neutral medium, free in time and space, changes learning - moving it, perhaps, closer to the course ideals.

The demand for short, repeatedly-recurring assessments with built-in self-diagnosis, together with a positive attitude towards ICT among engineering students, led to internet-based assessment (IBA). At first, IBA was introduced to complement the already existing oral- and practical assessments of the Analog Electronics (AE) course but, eventually, IBA replaced the high-stakes written assessment.

In this case study, data are drawn from the Analog Electronics course, but the results can be extended to the other courses. The Analog Electronics course is currently structured around four modules which deal with basic electronic circuit theory. The last module consists of a small project where practical skills are demonstrated. Each module begins with the introduction of a topic while, simultaneously, the internet-based self-diagnosis tool is activated. The self-diagnosis is accessible and can be run at any time (day and night) during the module. It comprises a set of randomly chosen questions from the question database associated with the module. The desired performance is steered by means of an 80% pass level; there is no limit in the number of runs a student can make; and the self-assessment is de-activated 24 hours before the final module assessment.

The final assessment gives each student an opportunity to demonstrate acquired knowledge. The first part of the assessment consists of a session where the students tackle a set of questions from the IBA database; and the second part of the assessment is an oral/practical demonstration of selected problems. In 2003, for instance, the pass threshold is established solely on students' performance on the internet-based assessment.

Problems and Successes

Constructing the initial question archive (100 items) was time-consuming. The workload was divided among the course teachers. Discussions among the teachers immediately arose about the pass-level and the quality of the questions. These discussions strengthened the shared understandings of the teachers, above all in defining the desired pass level. Discussion about cognitive levels was also initiated, something that had been almost non-existent beforehand.

The questions included in the AE database have the following qualities:

Fact/Language-related: These introduce students to the language of the electronic world and electronics engineers. Most question authors started with this category (e.g. What is a shorted resistor? What is electrical current measured in?).

Understanding: Questions in this category test the students' ability to interpret the behaviour of electronic circuits by, for example, identifying the formula for an electrical impedance of a network or explaining how to measure an electronic quantity.

Application related: Students draw conclusions about the behaviour of an electronic network. For example, they are asked to predict the amount of power that a certain component will dissipate.

These three categories roughly correspond to the lower levels of Blooms taxonomy: knowledge, comprehension, application but neglect the higher levels of analysis, synthesis and evaluation (see Bloom et al., 1956). Questions from the higher levels are absent which suggests that they posed construction difficulties. Questionmark Perception (version 3)

course also allows linking a series of questions to outcome levels – a facility that has not been used.

The authoring tool is easy to work with. Authors appreciate using built-in 'wizards' which makes it easy to start generating questions. Earlier versions could not handle mathematical expressions, a deficiency that has now been corrected. The majority of questions generated by the course team are multiple-choice, where the student is asked to select one or more text or graphic alternatives. The graphic functions in the report tool which facilitate the presentation of test data are very useful. Statistical analysis of questions and answers is also possible. Essay type questions are allowed but the software has limited resources for marking these automatically.

An assessment is built from a set of questions, which is then transferred over the internet and published on a web server. The AE course uses a system administrator who can also support the author. Some question authors, however, have found this a disadvantage because it lowers the flexibility of the system such that the author loses total control over the material. The Question mark server is not optimal for working in a multi-user environment since it does not offer a directory structure for different authors. There is always the risk, therefore, that files are over-written.

Authors familiar with computers usually have few problems in running the software; and they can start authoring questions with a minimum of assistance. Others may need a brief demonstration of the different question types and of handling the available graphic tools. Constructing valid assessments and publishing them on web needs, however, more extensive knowledge about test contruction and analysis.

Insights and Reflections

The student group was very positive about working with IBA. In the course evaluations, a majority want the IBA part of the course to be extended and deepened. Moreover, they reported that IBA stimulated their studying and that they found its level of difficulty to be appropriate to their interests. Many students ran the self-test repeatedly - up to 10 times - until they felt secure enough to pass the module assessment.

The teaching staff involved in the basic electronics courses has now accepted IBA as a natural course component. The tedious marking process of the earlier written exams has been replaced by course-integrated procedures. The greatest difficulty reported by staff has been insufficient time to keeping the question archive up to date with suitably demanding questions. Many reported that they lack competence in constructing high quality questions and that they require assistance in this respect.

Students appreciate the chance to engage in self-diagnosis, independent of time and space. Staff and students in other courses have begun to show interest in IBA. For staff, the work of marking assessments is greatly reduced which means, in principle, that released time can be devoted to improving the quality of teaching and learning. Further, this collaborative work stimulates discussions about pass-levels and cognitive levels. IBA increases flexible learning on the Analog Electronics course because, without increasing the workload, assessment can be subdivided into several smaller low-stakes exercises. Distributed assessment acts against last-minute behaviour; while the fact that such assessment is low-stakes also mitigates against cue-seeking. Instead, the procedures introduced via IBA help to direct students to more important knowledge.

The difficulty in constructing higher cognitive level questions is, however, a weakness in the current procedures. To be able to test higher levels of cognition would increase the validity

and utility of IBA. Nevertheless, awareness of this problem has not diminished discussion of cognition, assessment criteria and course goals.

Successful extension of IBA in the engineering field will depend on a variety of factors. Teachers and students must be committed to the concept of IBA and the importance of assessment. IBA highlights the relationship between assessment and pedagogy. Its implementation is never a substitute for careful attention to these activities. Further, successful extension requires that, the focus of IBA remains on self-diagnosis – a form of assessment where students can acquire valid knowledge with the help of focused feedback. To use assessment for high-stakes, summative purposes is a different activity, with different social consequences.

The final lesson from the Analog Electronics course is that the choice of software is not important. Nevertheless, it is important that teachers/authors have insight into how questions and assessments can be assembled and managed on the webserver. Overall, the successful introduction of IBA requires a positive attitude to pedagogic change. Such attitudes foster the creation of an open environment where material can be freely exchanged among teachers and where the resultant question archive makes teaching and learning more manageable - or, in the Swedish formulation, more flexible - for both teachers and students.

Conclusions: Landscaping the Future

Internet-based assessment (IBA) is big business. It is successfully used alongside the delivery of courses and, in a generalised form, to assess student competence. To this extent, it serves as a summative, convergent and high-stakes instrument. Yet, in that form, it is alien to the pedagogic practices of teachers. It is neither consciously integrated into course plans nor into the exchanges that teachers share with their students.

The EU-funded development project discussed in this paper builds on the view that assessment is central to dialogic pedagogic practice. It asks the question: how can assessment be built into teaching and, especially, the kind of teaching that takes place among adults in colleges, universities and other institutions of face to face or on-line learning?

Overall, the project has been developmental. Its task has been to bridge the gap that exists between the everyday practices of teachers and the ideals that are associated with on-line learning, on the one hand, and so-called 'alternative' or 'authentic' assessment, on the other hand. Moreover, the project operates within a tension that is spread across national boundaries - the assumption that efficiency gains can be made by increasing student:staff ratios so that the unit costs of education are reduced.

Thus, the developmental task of the EU project has not been to identify and recycle the intrinsic - or abstract - merits of internet-based assessment. Rather, it has been to detail the practices and problems that have arisen in three European institutions making the effort to introduce internet-based assessment.

The case studies described above record the experiences of the Swedish partner. In this final section, we try to distil the lessons learned from the case studies. We present them because we believe that they may be useful in other contexts.

1. IBA can change the conscious practices of teachers
2. IBA can changes the conscious practices of learners.
3. IBA can change the practices of teachers and learners in a direction that corresponds to the expressed goals of Swedish higher education in the 21st century.

4. Insofar as the introduction of IBA focuses attention on the fusion of learning and assessment, it may challenge the hegemonic status of summative, high-stakes and convergent assessment.
5. Extending educational assessment to include formative, divergent and low-stakes practices places cognitive, emotional and organisational demands on teachers and students.
6. Successful penetration of IBA into the practices of teaching and learning requires that innovation is incremental - an activity built around cultural, hands-on change rather than top-down, technological innovation-by-substitution.
7. The penetration of IBA into the practices of teaching and learning requires an institutional horizon based on long-term pedagogic change - a horizon that extends, for instance, beyond the funding of piecemeal, project-based trials.

The final year of the EU project (2004) is devoted to evaluation and dissemination. Much effort will be given, therefore, to the clarification, elaboration and validation of the efforts and provisional claims made in this paper.

References

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