

HOW TO ASSESS FOR IMPROVEMENT OF LEARNING?

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SUMMARY

This review summarises and builds on a seminar about assessment of student learning in higher education. Assessment can be looked upon as simply something that has to be done at the end of a course. During the course of discussions at the seminar the participants became more aware how assessment can have an impact on learning. This means that assessment can be used as a means to improve learning. This realisation is not a new one, but it is highlighted here in a more coherent and concise way than usual. Many alternative methods of assessment are possible. Some instructional design rules will be presented here for designing assessment sessions in such a way that learning can be improved. When designing an assessment method, one can be guided by the following considerations. The content of assessment should be chosen in accordance with the learning outcomes one hopes to achieve. The organisation of assessment can be designed in such a way that the desired learning process is promoted. The outcome of assessment can provide feedback to many of the stakeholders: to the students on their learning process; to the faculty on its outcomes; and to the teacher by pointing out the following steps to be taken in improving assessment, learning and teaching.

1. Introduction

The European Society for Engineering Education (Société Européenne pour la Formation des Ingénieurs: SEFI) has several active working groups. This paper builds on the SEFI-Curriculum Development Working Group seminar, held on April, 22nd and 23rd, 1999, at the University of Delft in the Netherlands. The seminar was entitled ‘What Have They Learned? Assessment of Student Learning in Higher Education’, and organised by Daudt & Rompelman [1]. The seminar included four themes, the most relevant of which, from the viewpoint of assessment in educational practice, being theme 2: ‘Do teachers use the most appropriate forms of assessment?’

The presentations and discussions in the seminar formed the basis of the following selection and after-thoughts. The present article forms both a report summarising the proceedings on a theme of the seminar, and an integrative, concise and coherent view on the role of assessment in education. First, several forms of assessment are presented, followed by some arguments to change assessments. Next, several ways of changing assessment are mentioned, and a practical analysis of assessment with respect to the function of assessment for the various parties involved. Following this, some problems in assessment of individual students and students working in groups are discussed. Finally, some concise--but in my opinion essential--instructional design rules are presented to systematically develop forms of assessment that will have a meaningful impact on learning.

2. Forms of assessment

What is assessment? Assessment can not easily be distinguished from evaluation. Often the terms are used interchangeably, both in the US and Europe. The outcome of summative assessment is usually presented as a mark or score, while evaluation is more often used for feedback purposes. Any distinctions are not fundamental, however, as assessment, evaluation and feedback are all based on measurements and comparison with a standard or norm.

Several forms of assessment are possible (see [2, 3] for concise introductions): traditional written or oral assessment, multiple choice, open book, group assessment, tutor-, self-, peer- and co-assessment, portfolio, assessment by projects, by investigations, by realistic problem-solving tasks, etc. So there is no lack of possible assessment forms to choose from. Most often, however, traditional forms of assessments are chosen for.

Traditional forms of assessment have the following testing characteristics (Liz McDowell, [1]): standardised; controlled; expert measurement; quantitative; restricted range; written evidence; detached. Alternative assessments have other characteristics: diverse; authentic; collective judgement; qualitative; wide range; performance evidence; integrated.

A lot of people are not content with the traditional ways of assessment for various reasons.

3. Why change assessment?

Some reasons for making changes in the practice of assessment can be that assessment limits teaching and learning, and exams (certification) are a barrier to real learning. A student is able to pass his examination by simply going to the library, looking up the relevant books and copying the relevant chapters in a different language. Students say: “You shallow-learn for an exam, but you don’t know the stuff. It’s poor learning which you quickly forget.”

In response, traditional teachers say: “It’s always worked that way, so why change?” or: “I am not content with the results of learning and the passing rates, but ...”, or: “I am already running as fast as I can, and it isn’t hard enough.” Some experimenters say “It cost me a lot of time and it just doesn’t work”. So in order to effectively change assessment practices there must be both strong reasons and good guidelines. A further analysis is needed.

Assessment should be valid and reliable, which means that they should test the right things and, when repeated by different teachers, give the same results. However, in higher education it is often very difficult to test what the teacher values most. She might, for example, like to see the students showing a systematic problem-solving approach, or being able to independently continue study in the subject matter.

Real learning involves more than that which can be tested. For practical reasons, tests are usually more simple than they should ideally be. And students are tailoring their learning to the test. The movie ‘Ballroom’ --in which tests were designed for admission to the dance contest-- nicely illustrated the effect that this ‘learning for the test’ can have on meaningful performance. The result was that when contestants’ marks were good, there was no real dancing going on any more. Some characteristics of practical tests promote this effect.

Easy to use assessments and easy marking of students’ work is greatly facilitated by using questions with answers that are either right or wrong. This in turn leads to learning by rote. Some

participants also said that the so-called 'professional level' of examination questions (peer-assessment of quality!) leads to formal and abstract questions, limits teaching and lowers passing rates.

The administration also plays a role. The faculty requires objective marks, and those are most easily obtained by traditional assessment. This often leads to 'cook-book' laboratories and compulsory examinations, without any motivation or challenge to students. Of course, it is important in our society that students be able to provide some proof of what they have learned, and that they do get some sort of certification. But this should be combined with meaningful learning.

These are some of the reasons why more and more teachers want to change assessment practices, and why this is so difficult to achieve. Luckily, the change in assessment need not be a large one. Teachers can incrementally implement small changes, one at a time and put them to the test at the pace they see fit

4. Types of changes in assessment

Changes in assessment need not necessarily be sweeping. Continuous assessment in small parts (partial examinations) is a possible choice, and as such is a continuous change requiring small amounts of effort. One could gradually change assessment by introducing some new elements one after the other. For example, one could use the same type of assessment methods for different learning outcomes and learning processes, so for different goals.

As an example one could change teaching in such a way that students learn to really understand the subject matter, and keep the same type of exam but with a different content included, i.e. aimed at assessing the understanding of the student. Such a change does not necessarily lead to higher passing rates as one would expect. Experiments and investigations of Jacobsen showed only 45 % correlation between good understanding and good results in examinations [1].

In any case, exams can test real learning. Instead of promoting passive rote learning, assessment can be focused on skills that require active and productive learning such as comparing several ways to solve a problem, information retrieval and evaluation, computing (simulation) in project work, modelling in lab work, etc. Some people contend that assessment should reflect the structure of a scientific paper: statement of problems, theoretical analysis, possible solutions, outcome, and discussion.

Others are of the opinion that exams are no barrier to learning when there is a good interaction between teacher and students. As an example, both students and teacher of a course can accept

working some time just for a traditional examination, while 'real' learning takes place during the rest of the time [4]. The quality of education is in that case less strongly dependent on assessment.

Of course, in any case the assessment results--as expressed in a mark--should reflect the learning outcomes of the student as closely as possible.. Many changes in assessment method are possible, but the assessment should always serve several purposes at the same time.

5. Practical analysis

Thinking about change, it is good not to forget the purpose of assessment. There are several goals in the opinion of the participants, related to the parties involved.

For the students the purpose of assessment can be to assist learning. Assessment can provide a direction, a goal. Also, when assessment is done in partial examinations, it functions as a coach by providing milestones and breaking the subject matter into parts.

For the department the purpose of assessment is to certify what has been learnt, to predict future performance of the students, to keep students from continuing their studies when they are not yet ready to do so, and to indicate educational effectiveness and quality.

For the teacher it is to transmit norms and values, i.e. what is really important, not only in the subject matter, but also in the scientific community and to society.

Some other functions of assessment are important, too. Assessments ensure that students can work to their strength, can spread their time and effort over all tasks they have to do. When a choice in assessment is offered, students can choose the way of assessment related to the way of learning they are most comfortable with.

The method of assessment is not so much related to learning more or less of the subject matter but to learning in a different way. A clear method of assessment gives the mature student the opportunity to use her time more efficiently.

So an analysis of the parties involved is important in choosing a means of assessment, because not only the teacher, but also the department and most important, the student is involved. A complete picture of the problem of education is needed before solutions to problems in learning are designed. Now the problems that are inherent to assessment will be summarised.

6. Problems

What are the problems inherent to assessment? With the external requirements for assessment put aside in this article, the remaining questions are: what to assess?

- Knowledge and facts?
- Skills, competences or competencies?
- Having mastered the learning process like in open book exams?
- And in group work, does one have to assess the group product and group work only, or are individual assessments possible?

A great deal of experience has been built up concerning the assessment of individual work . In assessment of group work, however, a lot of difficulties still arise. Some say that with respect to project work teachers are assessing the same things every time the students do a new project, thus giving the impression that students learn nothing new in projects. A further point of discussion is whether reports have to be in the students' own (!) words and how this can be checked. The values that count in assessment of group work such as originality, equal input of all, respect for each other, are mostly implicit. Should criteria for these areas be agreed on explicitly and assessed, or not?

One prevailing view on assessing group work is that it is easy to assess because every teacher can do it, and do it well. An opposing viewpoint is that group work is hard to assess because an individual, numerical value has to be given and validity of the assessment has to be shown.

For the student, the most important question to be answered in order to be content with the outcomes of the assessment is 'what is a fair assessment?' The most important issue for the department is that a documented assessment be provided in case students want clarification of their marks. For the teacher, the most important issue seems to be that the process of assessment, and the activity of improving it, should not take up too much of his time in a given academic year. These interests are often in conflict..

During one of the sessions of the seminar, the question of a fair assessment was tackled in the form of a workshop. The participants generated the following characteristics for a fair assessment (see table 1).

INSERT TABLE 1 HERE.

It becomes apparent from the above that a broad spectrum of expertise was available in this session including teachers, experts designers of traditional assessment, facilitators of experiments in

assessment, and students. It is equally apparent that a lot of work has to be done to meet all these requirements, if that is possible at all.

7. Possible solutions

In order to find solutions to ones assessment needs, questions to be answered are the following. What is the purpose of the intended assessment? What is wanted? Whose responsibility are we talking about? What is allowed by the system? What possibilities are available to solve the problems?

Quality improvement of assessment can exert influence on both the learning outcome and the learning process. The desired learning goal of the students should come near to the intended teaching goal of the teachers and be the object--the content--of assessment. That is well known, is it not?

The learning process of the students, intended by the teachers, should be the goal of the form of assessment. With this in mind, it would be advisable to organise assessment in the way that would stimulate how you want the students to study. If you want them to learn for the test during a restricted time, then make one examination at the end of your course. If you want to make them study continuously, then include partial exams or assignments to hand in, etc.

The desired meta-cognition (learning to learn) should be included, too. It is of some value for a student to learn that his study habits do not work in certain circumstances, or in certain fields of knowledge. He should not learn this at the end of the course, however, by failure to pass a test, but rather at the beginning of the course, by an early end-level test, so that he can better attune his efforts to the requirements of the subject matter.

A great deal of literature and know-how is available for examples of solutions to assessment problems (cf. [5], for over 120 accounts of recent changes in assessment). Finding a solution requires a creative mind as well as some (instructional) design rules or guidelines, just as in research.

8. Some instructional design rules for applications

It has been suggested that the key features for impact of assessment on learning are (John Cowan, private communication, 1998): learners must truly understand criteria; learners must be encouraged to monitor work, at least, against criteria; and criteria must describe the learning you REALLY want to happen.

The first rule to be followed is to *assess what you value*. What is the learning you really want to take place? That should be the goal of teaching/learning and the generic germ for constructing the assessment. By controlling assessment in this way, we can communicate priorities and we can provide control of study methods.

A second important consideration is to reach agreement with the students about a fair system for determining the final mark, as close to the necessary validity as according to assessment experts is possible (cf. theme 3, 'How to Assess Group Work', in [1]).

The following are some instructional design rules for assessment in project work, including self-assessment, with an impact on learning.

1. Separate guidance and support from assessment, so that assessment is based on a clear definition - whomever it is made by - of what has to be achieved.

2. Assess the product against clearly defined criteria. Perhaps the criteria will be derived from, or even strongly influenced by, a panel of staff or visiting engineers. Even if they assess the work, make sure that the learners understand the criteria, and can "play them back" satisfactorily.

3. Let the groups assess their work against the declared criteria for the product (excellent versus satisfactory work, group-assessment).

4. Let the individuals assess their progress and achievement against their own criteria (self-assessment).

5. Let the final mark be EITHER simply the external mark (2), with discussion of differences between 2 and 3, OR a weighted combination of the outcomes of 2, 3 and 4.

Conclusions of the preceding might be that:
the goal of learning = the content of assessment;
the goal of assessment = to assist real learning;
the goal of teaching = to prepare for assessment.

A general systematic has been presented here for designing assessment in such a way that learning is improved. Choosing an assessment method can be guided by the above. The content of assessment has to be chosen in accordance with the learning outcomes one wishes to achieve. The organisation of assessment can be designed in such a way that the learning process one wants to take place is promoted. And the teaching of the subject matter should be attuned to the examinations: what is not assessed should either not be taught or – when it is highly valued -- be taught separately, in agreement with the students.

The outcome of assessment can provide feedback:

- to the students on their learning process;
- to the faculty (and the students) on its outcomes;
- and to the teacher on the following steps to be taken in improving teaching, learning, and assessment.

At the end of the day, the enthusiasm of the teacher and the motivation of the student are the chief driving forces for learning and for improvement of learning. Assessment should neither be a barrier for this enthusiasm, nor provide a formal mark based only on those outcomes that are easy to evaluate.

Table 1. Characteristics of a fair assessment

Top priorities

Openness re criteria

Predictable: students should know what they have to do in order to reach their own standards

Relates to genuine important learning achievement

Gives feedback and is reliable (repeatable, takes multiple samples)

Other characteristics

Accurate; unbiased; has standards; not dependent from anything; clear distinction of levels; objective;

Shows differences; considers background

Relevant to content, level, knowledge, educational objectives; equable; appropriate;

Comparable with previous, consistent, valid

Transparent; feasible; clear; no surprises; based on clear criteria (i.e. including information about: requirements; satisfactory performance; weights; deadlines; support; failure communication/redemptal)

Encouraging; related to effort; gives opportunity to show good points

Physical environment good

Adhere to rules; no cheating; appeals procedures possible

Guides learning

Continuous; timely

Anonymous (!)

Takes into account own assistants and schedules

Accounts for mitigating circumstances and special cases; open to non-conventional responses

Reviewed AND changeable, flexible so that improvement is possible

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Henk Vos is an Educational Consultant and Assistant Professor in the Faculty of Electrical Engineering at the University of Twente, Enschede, the Netherlands. He has joined the faculty in 1985. He was a Staff Trainer in Yogyakarta, Indonesia, from 1979 to 1983, for staff members both of the Gadjah Mada University, Yogyakarta, and of other universities in Indonesia. This project was supported by the Free University and the University of Twente, alternatingly. From 1973 to 1979 he participated in building up the Physics Department of the Teacher Training College connected to the Free University, where he designed and taught many different courses and physics experiments. He received his B.Phys.&Math. degree in 1965, his M.Phys.&Math. degree in 1968 and his Ph.D. degree in 1972, all from the Free University in Amsterdam. In 1972 he also received his Teaching License in Physics and Mathematics. Dr. Vos is a member of the Dutch Society for Educational Research, the Dutch Physics Society, the Dutch Association for Education in Science and the American Educational Research Association.

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