ICT AND INNOVATION IN ASSESSMENT & EVALUATION

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Abstract

In this contribution recent developments in the field of assessment and evaluation are considered that build upon the potential of information and communication technologies (ICT). A number of dimensions is distinguished that help to describe these developments. The author focuses on a number of trends that illustrate a thorough rethinking of the function, position and place of assessment and evaluation within the overall learning context. One trend in particular is discussed: the involvement of the learner(s) in the evaluation process through self- and peer-assessment procedures and portfolio-assessment. The author links these developments to shifts in educational paradigms.

Next, the author discusses the new challenges when we focus on the evaluation of e-learning courses in general.

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Dimensions in assessment and evaluation

When looking at the way assessment and evaluation evolve in the context of instruction, we can distinguish a number of dimension to grasp their role and function. When considering the innovation of education and especially when focussing on the role of ICT in this change process the following dimensions are of relevance:

What learning objectives does the assessment & evaluation focus upon?

When we distinguish between declarative, procedural and meta-cognitive knowledge, we can perceive in the evolution of assessment & evaluation approaches a clear change in focus. Initially, there was a strong emphasis on the assessment & evaluation of declarative knowledge (facts, concepts, principles, theories, structures, etc.). Now there is a clear interest in procedural knowledge (skills, heuristics, procedures, etc.). And with the growing attention being paid at regulative processes (cf. Vermunt, 1996), also meta-cognitive knowledge is being assessed and valued. Learners are as such expected to reflect upon their individual (or group) learning process and measures in relation to these processes are part of the assessment and evaluation procedure.

For the purpose of this contribution, the growing attention for the meta-cognitive knowledge is of importance. Especially our focus upon self- and peer-assessment builds upon the fact that this kind of knowledge is being pursued.

Who is responsible for the evaluation?

Figure 1 depicts how the instructor is now no longer considered as the sole actor responsible for the assessment & evaluation process. On the one hand there is a tendency to involve peer groups of learners in the process. Learners 'learn' to assess their own individual and group behaviour and to value this behaviour, described in the literature as 'peer evaluation'. This is linked to - as will be explained later - new ideas about the role learner in stating objectives and directing the learning process. In the same line is the development along which learners take - at the individual level - a responsibility for the assessment and evaluation process. Self-assessment is an approach that is more and more accepted as a part of the overall evaluation cycle. To a certain extent, we can link this observation to the former dimension that focused upon new types of objectives. Involving learners actively in the evaluation cycle is in line with pursuing and assessing/evaluating meta-cognitive objectives.

The availability of computer-based test service systems also enlarges the possibility to support self-assessment. Such systems give professional tools in the hand of the learner to monitor their learning process.
On the other hand we also perceive a growing interest in involving other persons that take a responsibility in the assessment & evaluation process. For typical objectives, experts get involved. Next, we can state a growing tendency to design, develop and control the overall assessment and evaluation cycle at the institutional level. The teacher is becoming a member of a team. He/she is supported by assessment specialists. The assessment is 'instrumented' by making use of test service systems, etc. A further development is the situation where an external body/institute takes the lead in the assessment process. Controlling the extent to which e.g. private training institutes adhere to clear standards and norms is but one context where such external positioning of the assessment might be of relevance. When discussing the recent developments at the macro-level in the context of this article, we see that evaluating digital distance learning (i.e., based on the use ICT) especially stresses the development of an evaluative capacity of each educational institute, next to the involvement of third parties to monitor the overall process.

**When does the evaluation take place?**

Earlier and very traditional views on instruction solely focus upon assessment & evaluation processes at the end of the instructional process. Considering the development of new views on learning, this has changed to a very large extent. In this perspective we can e.g. refer to the didactical model of Dochy (1995) as depicted in figure 2. Figure 2 shows how the instructor can adopt a variety of assessment and evaluation approaches to support the didactical process 'before, during and afterwards'.

This test-driven approach is an early evocation of the later development of adaptive learning systems where assessment & evaluation techniques continuously direct further steps in the instructional process. A large number of innovative approaches that incorporate the use of ICT do expand the number of assessment & evaluation moments and especially focus upon assessment prior to and during the learning process. This is consistent with the earlier focus upon the new kinds of knowledge being pursued, the role of the learner in the process and the broader vision of the ‘value’ of the assessment as will be explained in the next paragraph.
As to recent development at the macro-level, we also perceive a growth of interest in monitoring activities that cover the complete life-cycle of innovative change processes.

What is the formal value of the assessment and evaluation procedure?

The former dimension explains also how the focus has been redirected from summative evaluation that is directed towards certification, towards recurrent formative evaluation cycles that especially serve the instructor of the instructive system to (re)orient the instructional process.

But this new development can also be approached from another direction. In the former way of reasoning, there is still a focus upon a kind of final summative assessment. New directions illustrate that such focus is no longer needed. E.g., learners demonstrate a clear performance level in relation to specific (procedural) objectives on subtasks. The performance on these subtasks is considered as the base for the final evaluation. Adding the task-sub-scores gives the instructor the final score.

Depending on the choices instructors make along the dimensions described above, we can reflect upon their – implicit or explicit – views about the nature of the learning process and consequently the instructional approach. We elaborate this in the next section.
Assessment & evaluation and views on learning and instruction

In this contribution there is hardly room to elaborate in a detailed way this issue. But in summary we can focus on three major theoretical positions towards 'learning' and consequently the way instruction and evaluation should be addressed: the behavioural approach, the cognitivist approach and the constructivist approach. The three approaches reflect the way assessment and evaluation is perceived and organised.

The behavioural approach has introduced a strong focus on operational objectives and evaluation. Skinner (1968) states this as follows: “The application of operant conditioning to education is simple and direct. Teaching is the arrangement of contingencies of reinforcement under which students learn. They learn without teaching in their natural environments, but teachers arrange special contingencies which expedite learning, hastening the appearance of behaviour which would otherwise be acquired slowly or making sure of the appearance of behaviour which otherwise never occur.” (...) "... the school of experience is no school at all, not because no one learns in it, but because no one teaches. ...; a person who is taught learns more quickly than one who is not ...",

Applications of the behavioural vision on the learning process are abundant. The Personalised System of Instruction (PSI) is a first example (also called the Keller Plan). Learning materials are split into small units with clear objectives. Students progress individually. There is - in relation to each unit a type of testing. Students get immediate feedback by a 'proctor'. Students only progress when they master at least 90 % of the objectives (Gage & Berliner, 1984, pp.529-530, Woolfolk, 1990, pp.185-186). Another typical application of the behavioural approach is mastery learning. Bloom stresses again the importance of clear objectives and the central position of formative assessment.

The cognitivist approach introduces new perspectives. Ausubel (1968) introduces e.g., the importance of building upon prior knowledge. Instructors need to assess and evaluate this to use it as a corner stone for the forthcoming learning process. Another typical cognitivist theorist is Gagné (1965, 1985) who explicitly states a number of instructional events' that are related to assessment and evaluation:

1. State clear objectives.
2. Activate prior knowledge; measure prior knowledge.
3. Give informative feedback to guide the learner step-by-step to the right solution.
4. Use performance tests that focus upon application of things learned. Apply progress tests.

The constructivist approach introduces completely new ideas. Summarising the great variety of interpretations of the constructivist principles, we find again clear-cut ideas about assessment & evaluation (Jonassen, 1991; Merrill, 1991; Valcke, 1990; Wilson & Cole, 1991; Murphy, 1998):

- Build upon learning objectives of the learner.
- Stress the importance of problem solving objectives
- Assessment & evaluation is not a separate process. It is part of the experiential cycle and interwoven in the learning process.
- Look for assessment criteria that are in line with the objectives put forward by the learners.

When looking at specific applications of the constructivist principles, we find an additional list of alternative views. Evans (1994) states that prior knowledge - whether certified or not - should be acknowledged in a learning process. He defends the position that such prior knowledge should be certified and especially that this prior knowledge should direct the intake-procedure.
Also problem-based learning is an application of constructivist principles. Moust & Schmidt (1998, p.165) state in relation to assessment & evaluation that the students themselves state the objectives. They also play a major role in determining whether the objectives have been reached. In this context it is important to indicate that the role of the facilitator in the problem based learning process especially focuses upon meta-cognitive scaffolding of the process.

New developments in assessment and evaluation and the link with innovation of education and ICT

The discussion in the former paragraph is strongly linked to the innovation of education and the use of ICT (Nipper, 1989). Current approaches to distance education reflect the second generation ‘industrial’ model for education. Operational objectives direct the instructional process that focus especially on declarative knowledge and some procedural knowledge. Assessment & evaluation builds upon the potential of new audio-visual media to develop and assess skills. But there is still a pre-dominance of attention being paid to learning material development. Also the fact that a large number of second-generation distance education institutes use automated test service systems (with MC-questions) reflects a certain one-sided orientation towards assessment & evaluation.

The now growing interest in realising the third generation of distance education models introduces completely new perspectives (cf. Kirkwood, 1999 and Thorpe, 1999). In this third-generation approach the information and communication technologies help to restructure the entire learning and instructional setting:

- materials are considered as resources;
- materials are flexible and delivered on demand and in line with learner needs
- collaborative learning;
- competency driven;
- interaction and communication is fundamental (intake, task elaboration, assessment & evaluation).

For the purpose of this article, it is essential that in this approach assessment & evaluation are an integral part of the overall process. This third generation approach reflects the shift towards the constructivist model for ‘learning’ as described in the former paragraph. This means that self-assessment and peer assessment now play a major role and are e.g., are now used in audio-graphics settings, video-conferencing sessions, discussion lists, on-line courses, etc.

The relationship between self- and peer-assessment and the constructivist model for learning is a natural one since:

- students work together and this collaboration influences the quality of the learning process and the final product;
- students take a responsibility in the learning process and as such have to monitor their own learning process (what, how, standards, planning, timing, task division, …).
- students state their own objectives that might differ from those of other students and those put forward initially by the teacher/facilitator;
- the monitoring activity is part of the objectives pursued by the educational institution.

In the next paragraph we will exemplify the way these new developments are operationalised in ICT-based innovative approaches for education.
Self- and peer-assessment at the micro-level: towards portfolio assessment

In a related article (Valcke, 1999, this conference) we have already presented a first example in which self-assessment and peer-assessment have a central place: the competency-based curriculum of the Dutch open University.

In this paragraph we present a number of examples of innovative ICT-based learning environments in which self- and/or peer-assessment play a central role. We structure these examples along a variety of very different interpretations of ‘self- and peer-assessment’. The reader will notice that we use the concepts of self- and peer-evaluation interchangeably. This is in line with current practice where these two approaches most of the time are adopted simultaneously. Moreover, both alternative approaches build to a certain degree on the same theoretical foundations (Slavin, 1995).

Self-assessment: check your own mastery

In this first interpretation, learners are given an assessment tool with which they can test their individual mastery of – e.g., pre-requisite – knowledge. The results of the assessment stay with the students, are not recorded, are not used for the further learning process. This kind of self-assessment helps learners to orient them on the learning process in order to check whether they are ‘ready’ for the new things coming.

The URL [http://www.dpi.state.nc.us/tap/basic.htm](http://www.dpi.state.nc.us/tap/basic.htm) shows an example of this approach: the BASIC Technology Competencies for Educators Self-Assessment Tool. This sample assessment tool was developed by NC technology educators in cooperation with the Instructional Technology Division of NCDPI. It contains supporting skills to mastering the required technology competencies and aligns the technology competencies with the student Computer Skills curriculum and the Information Skills curriculum. It may be adapted for local use. The tests cover the topics:

- Computer operations skills
- Setup, maintenance and troubleshooting
- Word processing / introductory desktop publishing
- Databases
- Networking
- Etc.

The following URLs [http://www.cam.ac.uk/cs/courses/coursedesc/tys.html](http://www.cam.ac.uk/cs/courses/coursedesc/tys.html) and [http://www.webproject.org/info/survey.shtml](http://www.webproject.org/info/survey.shtml) present a set of self-assessment tools related to a variety of ICT-skills. And to assess the readiness of your institute to embrace technology you can use the StaR Chart approach: [http://www.ceoforum.org/starchart.cfm](http://www.ceoforum.org/starchart.cfm).

This kind of self-assessment can also guide the process of finding the right entry level. The following URL [http://www.fullerton.edu/testing/elm.htm](http://www.fullerton.edu/testing/elm.htm) is a good example. Learners can detect what their mastery level is in mathematics, in order to continue the training.

A further variant for this approach is found on [http://www.wgu.edu/wgu/self_assessment.asp](http://www.wgu.edu/wgu/self_assessment.asp). Here, students are presented with a checklist to control whether they are able to study independently, at a distance or taking on-line courses.
**Self-assessment to guide the further learning process**

This approach gives students the means to control their mastery of the consecutive steps in the learner process. The teacher/facilitator offers tests to check whether the topics dealt with previously are adequately understood in order to follow the new topics. The following URL of the James Cook University, Department of Computer Science, in relation to the course ‘Programming Methodology’ is a good example of this approach:


In the medical field, we can refer to a special issue of Postgraduate Medical Journal that included a large number of Self Assessment Questions in Medicine. These questions present fine examples of case-based approaches for medical professionals and students in this field.

**Self- and peer-assessment as a new competency**

When discussing the constructivist base of self- and peer-assessment, we especially had this interpretation of self-assessment in mind. In this approach self-assessment and peer-assessment build upon objectives pursued in the learning situation. They are considered as meta-cognitive skills to be developed (cf. also http://ericps.ed.uiuc.edu/npin/respar/texts/home/metacog.html).

A very good example of this approach is found in the SAPHE-project: Self-Assessment in Professional Higher Education. Over the last three years this project has been introducing and developing self assessment within the disciplines of law and social work in four different types of higher education institution. The work of this project builds on the famous Dearing report that was presented in May 1996 to look at the future of higher education and what we could expect of graduates. The report identified four key skills are identified that graduates need to acquire. These skills are identified in the report as: numeracy, the use of information technology, learning to learn and communication. The latter two, concerning learning to learn and communication are central to self-assessment and link closely with the aims of the Saphe project which are to:

- develop, pilot and evaluate a variety of self and peer assessment tools
- explore the relationship between self assessment techniques and course content
- develop staff and student skills of self reflection and self monitoring.

Thomas (1999) views self-assessment as a way of improving student learning by facilitating discussion and communication between learners and facilitators (students and staff). This implies that assessment criteria are made explicit and that students are encouraged to understand, discuss and use these criteria. Self-assessment builds upon such collaboration. As such, self-assessment is a two-fold process: the definition and discussion of the criteria and the use of these criteria in making judgements and the consecutive discussion. Boud (1991, p.6) states in this context: “Self assessment requires students to think critically about what they are learning, to identify appropriate standards of performance and to apply them to their own work. Self assessment encourages students to look to themselves and to other sources to determine what criteria should be used in judging their work rather than being dependent solely on their teachers or other authorities”.

Thomas (1999) indicates that she concentrated on the use of self and peer assessment to improve student learning rather than on student's grading their own work or marking their own exams. This has been implemented in a variety of ways (see Hinett and Thomas, 1999). Students have read drafts of each others assignments, next give feedback on their own work and each
others' work. In some cases their own evaluation has been assessed by the institution, through course work and assignments. The project also includes examples of students' critical evaluation of their work being included as one of the marking criteria. In one instance students have submitted work for formal assessment where they propose a mark or grade.

What has this to do with ICT based innovation? In a large number of innovative ICT-based approaches we perceive that students are involved in synchronous and a-synchronous interaction that focuses upon this kind of this discussions. It is no longer the teacher/facilitator that defines that criteria, standards, objectives, etc. He/she supports the process during which students interact with one another to clarify these issues and to reach a consensus.

Some examples:

- The following URL refers to an interesting UK-site that uses the result of the SAPHE Project (Self Assessment in Professional and Higher Education Project): http://www.swap.ac.uk/approaches/Assessment2.aspx  
  http://www.bris.ac.uk/Depts/Education/saphe.htm
  These sites show how higher education teachers are helped with examples and especially a strategy to develop the self-evaluation skills in learners.
- The following URL stresses the gradual building up of the self-assessment skill: http://www.eduplace.com/rdg/res/assess/index.html
  The URL discusses why students are involved in this process as active partners, presents a number of self-assessment methods (writing conferences discussion (whole-class or small-group) reflection logs weekly self-evaluations self-assessment checklists and inventories teacher-student interviews).
- Another example is found within the University of Colorado (Denver) for the course ‘Instructional Development and Production’ (http://carbon.cudenver.edu/~jeslow/ID5102.html). This sites gives an insight in the complete procedures should follow. We give an extract from this procedure that builds upon a combination of on-line work, synchronous communication and face-to-face meetings:

  1. Choose an instructional problem that can reasonably be addressed with a text/graphic product of the type described above. This will be a confined problem as the product is limited.
  2. Apply an instructional design model to developing the product.
  3. Develop the product. The prototype is due Sept. 27; the final version is due Oct. 11.
  4. Write a report (approximately 2 pages) which addresses the criteria described in the Instructional Design Rubric.
  5. Complete a self evaluation using a copy of the class Instructional Design Rubric.
  6. Complete a self evaluation using a copy of the Graphics Product Rubric that we will develop as a class on Sept. 27.
  7. Have two class peers evaluate your finished text/graphic product and instructional design report on Oct. 11.
  8. Evaluate two peer assignments using the two class rubrics (Instructional Design Rubric and the Graphics Product Rubric). Sign your name on the bottom of their forms.
  9. Revise the product and report based on all evaluations.”

**Self-assessment to earn credits**

There is a growing tendency to offer professionals and students tools to test their mastery (acquired through learning and/or experience) and to earn credits.

The following URL is an example of this approach:

http://www3.aaos.org/product/examtoc.cfm

In this example, the American Academy of Orthopaedic Surgeons offers a number of self-evaluation resources that results in the acquisition of credits.
Another interesting example is the NCC's Self Assessment Program that is offered as a home study program that allows nurses to continue their professional education and earn continuing education credit at the same time. Learning and assessment are integrated in this online provision:

http://www.nccnet.org/public/pages/index.cfm?pageid=1

**Self-assessment as a professional attitude**

A number of professional organisations (lawyers, surgeons, orthopaedics, ...) offer self-assessment tools for their member to help them to continue their development. In view of the growing demand for lifelong learning opportunities this is an attractive alternative approach. The following URL gives an example taken from the orthopaedics field:


**Self-assessment and peer-assessment tools**

For a number of approaches towards self- and peer-assessment, tools are needed. On the internet a variety of tools can be found. We just present some examples to guide your further search.

- [http://userwww.sfsu.edu/~scmahony/lowell/DHSwksp1.html#Assessment](http://userwww.sfsu.edu/~scmahony/lowell/DHSwksp1.html#Assessment) and [http://www.mashell.com/~parr5/techno/tools.html](http://www.mashell.com/~parr5/techno/tools.html) help you to explore a variety of ICT (self-)assessment tools. Most of the tools discussed link the use of the tools to grading.


This URL discusses the tool SAMaker (Self-Assessment Maker) that is a free tool to produce a WWW-based self-assessment. Next to this tool there is also LessonMaker that helps to include multiple self-assessments within any HTML document. LessonMaker is a tool that automatically constructs the embedded self-assessments.


**Portfolio assessment**

What is the result of self- and peer assessment: A very large set of products, reflections, process details, draft versions, comments of peers and experts, etc. And how can learners, instructors and institutes be sure that this information is used in a structured way to come to reliable conclusions about student performance?

Current ICT-based assessment reflects a new approach that gives an answer to the former question: the electronic portfolios. A very elaborated example of electronic portfolios is found at the Education Faculty of the University of Amsterdam (http://portfolioinfo.efa.nl/).

The concept "portfolio" has been borrowed from the architects and artists field. These professionals are only able to give evidence of their mastery of the necessary skills by showing the products and judgements of experts. They keep these in a folder, called a "portfolio". The ideas of this "folder" has been adapted to higher education in general. Learners "collect" during their learning process evidence of their mastery of the knowledge and skills they are required to learn. The electronic portfolios are used to store all this information on a server. The folder can include: reproductions, statements, lesson plans, products resulting from practical
assignments, projects, video registration of their practical work (lessons, presentations). This complete folder grounds the gradual build up of the skills and competencies. But the portfolio also contains explicit evaluative information: comments of peers, self-reflections, evaluations by experts, teachers, tutors, etc.

To structure the portfolio, the students receive an electronic template. This can include that they have to write e.g. an overall general reflection at the end of the process (called the Integrative Assessment). The format includes furthermore: the assessment procedure, guide-lines for self-evaluation, assessment criteria, extra assignments, a simulated critical event, etc.).

This short description might suggest that "portfolios" are only used as "storage devices". This is not correct. They are explicitly used for three major purposes:

1. Probing: monitoring, argumentations, evoking feedback;
2. Proving: external authorities can get admission to check the progress of the student; to check the final/specific mastery (e.g., a future job provider);
3. Sharing: to share, exchange a knowledge base among co-learners.

Check out the "digitally enriched language learning environment" of the Catholic University of Leuven (Belgium), to learn about another application of an electronic portfolio: http://millennium.arts.kuleuven.ac.be/delle/tour2.htm. Check out the following websites to learn more about portfolio tools, approaches and studies:

- http://electronicportfolios.com/portfolios.html
- http://owl.webster.edu/eportfolio/resources.html

E-learning courses: the new challenges for evaluation

With the growth in e-learning and the widening involvement of students in on-line courses, there is a growing concern about the quality of learning in this new setting. This concern is not only found at micro-level where teacher and student perspectives might be pre-dominant. Especially at meso- and at macro-level, questions are asked about the impact of this new mediation of learning on the quality of learning.

In a recent overview of the Galecia-project, the authors present and discuss a variety of instruments that have been used to evaluate e-learning courses (Galecia, 2002):

- http://www.pierce.ctc.edu/Distance/general/quiz.php3
- http://www.users.csbsju.edu/~tcreed/adapt/desrv1.html
  These instrument especially help to check whether you as a student are ready to start studying at a distance and/or on-line.
  This approach gives the researcher an insight on the actual experiences of students while studying in an e-learning environment.
- http://www.iddl.vt.edu/handbook/wsurvey.html
  This instrument helps to gather - a posteriori - information of the students about their experiences with the course.
  This instrument is also documented with the descriptive results of its administration in the year 2000.
**Performance indicators**

This first dimension ask to define beforehand in a concrete and operational way the how we can observe that learner perform in a specific way. This implies that the developers of an on-line course, know exactly what they expect as a result from the learning experience. This might sound easy if we focus only on very restricted sets of declarative knowledge (dates, facts, concepts, …).

Typical "indicators" of the mastery of this kind of knowledge can be found in the answers to factual questions, multiple choice questions, etc.

But it gets more difficult if we focus on procedural knowledge and skills. A very difficult issue is e.g., the evaluation of the impact on the development of knowledge construction skills. Numerous on-line course include discussion groups that are expected to foster cognitive growth, collaborative skills, problem solving skills, … But how can we evaluate this? And do these collaborative e-learning environments have a positive impact?

In a recent study Schellens & Valcke (2002) researched the evaluation of knowledge construction skills in a-synchronous discussion groups. The key difficulty in this study was to find good "indicators" of knowledge construction. They derived such indicators from two theoretical models. Figure 3 depicts the hierarchical structure in the "indicators" for the consecutive phases of cognitive processing, based on the models of Fahy et al. (2000) and Veerman & Veldhuis-Diermanse (2001).

![Figure 3: Hierarchical structure in levels of cognitive processing](image)

These "indicators" were used to analyse the actual input of learners in the discussion groups to qualify their cognitive processing. The coding of the discussion transcripts was not a straightforward exercise. It took a lot of time to gather sufficient data to be able to come to conclusions. Moreover, a clear procedure had to be adopted to guarantee reliable and valid results.
As this example illustrates, instructors and institutes should be careful when stating high-end objectives when adopting e-learning. Evaluating these high-level objectives, implies an high-end investment in the evaluation process.

**From variables to performance indicators**

How to develop performance indicators? Figure 4 shows how we can derive from a set of variables a number of performance indicators. The figure shows the breakdown of the variables that are put forward in designing and implementing an e-learning environment. We can find these variables in the list of objectives of a course, project, package, … Figure 4 especially stresses the very different performance indicators that can result from adopting the different points of views that are related to the actors in the e-learning context.

The list of variables that can be involved in an evaluation at micro- or meso-level reflects the variables and processes that are central in a instructional context:

- Learner
  - Characteristics
  - Support
- Instructor
  - Characteristics
  - Support

*Figure 4: From variables to performance indicators*
• Teaching activities
  • Objectives (declarative, procedural, metacognitive)
  • Learning content
  • Media use (representations such as text, graphics, animations, video, interaction, …)
  • Evaluation
  • Teaching strategy (collaborative strategy, reading, solving cases/problems, answering questions, …)
• Learning activities
  • Independent activities
  • Activities resulting from teaching strategies
• Context
  • Context involvement
  • Expert involvement
  • Provisions in context (at home, learning centre, classroom, …)

In relation to each variable/process in the former list efficacy, efficiency and satisfaction can be evaluated and this from a variety of perspectives depending on the view of a particular actor: student, teacher, tutor, expert, designer, manager, investor, parent, …

Designing the chain "Variable - variable breakdown - actor view - indicator value" is not an obvious exercise. It is comparable to the design of research instruments in quantitative and/or qualitative research studies. The moment an operational indicator value has been determined, it is easy to formulate a question that can be presented to the actor involved in the evaluation study.

**ICT-Tools as sources for evaluation data**

E-learning is delivered through a variety of tools. Recently, most institutes have implemented environments specific ICT-environments that support the implementation of on-line courses; e.g., BlackBoard, Web-CT, Teletop, EduBox, … These specific software tools offer a number of special advantages when it comes to evaluation. The actual use of the environment can be monitored. It is e.g., to grab all the key strokes and to use this information to analyse the actual use of the e-learning environment. The Catholic University of Leuven presents a clear example of this approach. In a recent evaluation study researchers (Buelens et al, 2002) have analysed the log-files that registered all the key strokes of users of the Blackboard -environment. They distinguished between three clusters didactic uses of the e-learning environment. Figure 5 represents the proportions of didactic usages during the first and second semester of 2001-2002.
The classification in figure 1 reveals that of the 571 courses, the majority is "document oriented", i.e., focused on the distribution of information and resources about the course or supporting the course content (powerpoint slides, agenda, rostering, news, frequently asked questions, etcetera). This picture remains consistent during both semesters. Initially the researchers were rather disappointed with these results. Their assumptions about the potential of the e-learning environment to foster innovative teaching and learning approaches were not confirmed by these data. The data show that the e-learning environment did rather reinforce existing traditional educational practices. Although remarks can be made as to the way these data have to be interpreted, the example shows how interesting results can be obtained from such very objective and readily available sources of data.

Conclusions

In this article we focused upon developments in assessment and evaluation. Innovative approaches towards ICT use in education seem to reflect new models of 'learning'. We especially focused on self-, peer- and portfolio-assessment in this perspective and the more constructivist views on learning.

At a more general level, we presented an overview of current approaches to the evaluation of e-learning courses. In this context we stressed the importance of performance indicators to monitor the impact of e-learning initiatives.

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