EFFECTIVE USE OF E-TOOLS IN EDUCATION: THE IMPORTANCE OF QUALITY

Mieke Vandewaetere*

Excellence Centre for Distance Learning, University College KATHO,
Dept. Teacher Training, Beernegemstraat 10, 8700 Tielt, Belgium,
ITEC, Interdisciplinary research on Technology, Education and Communication,
K.U. Leuven – Campus Kortrijk, E. Sabbelaan 53, 8500 Kortrijk, Belgium

Received 28 August 2008, accepted 14 September 2008

Abstract. When considering e-tools, we often think too much of innovative applications- whether they can have a direct implementation in education or not. Often, e-tools are seen as novelties, people are enthusiastic about them or not, and some try applying them as a separate tool or subsequently change from an already familiar tool to a new tool. However, when we want e-tools to be durable and that applications of such tools offer possibilities in education, we need a certain kind of quality standard. A strong link between innovation and quality is inevitably needed. This study gives an overview of determining criteria for the effective use of e-tools, for both students and teachers. Additionally to this research, several suggestions are formulated for the development of a pedagogical-didactical quality measure for the use of e-tools.

Keywords. E-tools in education; quality of e-tools; didactical use of e-tools.

Short title of the paper. The didactical quality of e-tools.

**Corresponding author,*
email: mieke.vandewaetere@kuleuven-kortrijk.be, phone: +32(0)56 246111

Introduction

During the last decade, the use and implementation of e-learning or electronic learning became a fully-fledged research area and also the use of e-tools has largely intensified. More and more, learners are being prepared for living and working in the digital era [1] and e-learning in the 21st century has many faces. As a consequence, many users are overwhelmed by this technology and are rather reticent about the umpteenth new tool or application that has been launched as the ultimate application in the field of e-learning.

The area of e-learning applications has recently evolved from processes that are more focused on the distribution of information to processes where collaboration and reflection are central themes [1]. These changes in e-learning only have become possible by a continuous interaction between technical and didactical innovations in e-learning. As Ehlers [2] states, "technological applications changed from rather low innovative (traditional media) to high innovative applications, such as Web 2.0 applications. Also, pedagogical dimensions were revalued from low innovations (reaching old goals with old methods) to high innovations (reaching new goals with new methods)".

1. Computer-based learning environments

Computer-based learning environments offer learners a large spectrum of supporting applications. These applications, often imbedded in open learning environments, are developed to support learners in their learning process According to Clarebout & Elen [2], a distinction is possible between embedded software, such as feedback and the information structure in learning materials, and non-embedded software where the initiative for use depends largely on the user. Non-embedded software can be considered as added to the learning environment. This non-embedded software is often described as tools.

To have a clear wording and specification of e-tools, we can look at the categorisation suggested by Jonassen [3]. This author categorises e-tools as being part of an instructional design model for so-called constructivist learning environments. The goal of these learning environments is to encourage problem-solving and conceptual development. This occurs by confronting learners with ill-defined problems. Jonassen's system comprises the following categories.

1. Information resources. These sources offer just-in-time information which helps the learner to solve the problem. An example of this is access to the Internet.

2. Cognitive tools. These are tools that support the learner in visualising, organising, automatising or replacing thinking skills. Information maps are an example of cognitive tools.

3. Knowledge modelling tools. These tools make the understanding of the problem explicit and foster learners' reflection on their learning process. Questions like "what do I know? " and "What does it mean?" can characterise knowledge modelling tools.

4. Performance support tools. They support the cognitive functions necessary for performing a task, such as arithmetic and data-storage. By using these tools, learners can concentrate more on higher-order cognitive processes.

5. Information gathering tools. Such tools help learners in searching for certain information so that learners can stay focused on the problem solving process.

6. Conversation and collaboration tools. Social interaction is an important aspect in the learning process. Learning can be simplified by lending support to a discussion forum, a knowledge building community and a community of learners. This includes tools like e-mail, wikis, weblogs and etc.

It is obvious that the most widely known e-tools can be placed under the category of conversation and collaboration tools. Still, most electronic learning environments (ELOs) have enough possibilities to relate to other categories of e-tools, for example, the construction of a trial assessment in an electronic learning environment as support for reflecting on the learning process (tools for knowledge modeling). Other examples could be the assignment of making a mindmap (cognitive tools) or increasing information skills by integrating goal-oriented search tasks on the Internet (information gathering tools).

2. Effective use of e-tools in computer-based learning environments

Offering e-tools is one thing, however, the effective use of them is an absolutely different issue, and that is where problems often arise. A possible cause of these problems stems from the transition from pen-and-paper learning materials into web-based learning materials. The way the existing course materials are turned into web-based materials often prevents an effective and efficient use of e-tools. Most instructors, coaches or teachers simply import or drop their pen-and-paper courses into an electronic learning environment and consider the "e" of e-learning as fulfilled. However, e-learning does not only comprises electronic learning or ELO-supported learning, but also presupposes an efficient learning process. In a great number of cases people get stuck with the regular applications of e-learning, without considering the didactical approach to e-learning or the process of efficient e-learning. That is why e-learning could expand to e^2-learning or efficient e-learning.

The use of ELOs supposes a high level of learner control and the possibility that learners regulate their own learning [4]. This implies the selection of the most suitable tools to support this learning process. In creating electronic learning environments, teachers or coaches have to bear in mind several things, namely:

i) the process of tool use;
ii) the motivation for using tools;
iii) possible individual differences between learners;
iv) the efficiency and intensity that learners use the tool.

In a review of the research literature focusing on the factors influencing the use of e-tools, Clarebout and Elen [3] distinguish four possible factors. The first factor can be described as student's characteristics. According to Elen [5], several characteristics of students will influence the use of tool. However, scientific research does not yield univocal conclusions. The second factor that can influence the use of e-tools is the task and working method. Less detailed tasks will require a wider use of e-tools and tasks that give the learner a large amount of self-control will allow integrating and using more supporting tools. However, researchers have to consider the possible interaction effects between working method, learner characteristics and tool use in interpreting the inconsistent results that are frequently reported.

Explicit encouraging of using a tool is considered as a third factor influencing the effective application of

e-tools. This process of encouraging includes giving advice and support, and appropriate instructions or teasers to trigger students when making assignments. Hereagain, interaction effect can have influence at this point [6]: the explicit encouraging of using e-tools is supposed only to have effect on active learners, but not on passive learners. Yet, learning style is a possibly moderating variable. Finally, the nature of the tool itself is considered as the fourth influencing factor. Of all tool categories that are comprised in Jonassen's above-mentioned system, the performance support tools (arithmetic tools and data-storage) and information gathering tools have been most frequently used by students [7]. Nevertheless, only the purpose of the tool and the type of support that the tool offers is considered. More inherent characteristics such as the tool quality have not been discussed in literature, as far as it is known. As Ehlers [8] states, we have to bear in mind that the quality of a learning process cannot be captured in terms of something that is offered via a learning environment to the learner, which is similar to a unidirectional approach of e-learning. Quality of a learning process can rather be described as a process of coproduction and interaction between the learner and the learning environment. This is a more multidirectional approach to e-learning. To put it differently, it is the learner who defines to what extent the learning environment can be considered as successful and in what way the e-tools will be effectively used. The provider of the learning process, the teacher, trainer or coach, however, can assure that a maximally suitable and high-qualitative learning environment will be created in which the chance for success is optimized.

Ehlers [9] states that, according to learners, the quality concept comprises more than only instructional of technological interface design. Based on a large-scaled survey, Ehlers was able to distinguish seven quality fields, briefly described in table 1 [9].

Table 1. Ehlers' quality fields

Quality field	Description
Instructor support	Includes a two-way interaction, in which the learner not only receives feedback but also gives feedback to the instructor. This field also includes active support of the learning process and individual support.
Collaboration	Consists of active creation of knowledge, group activities, possibilities for online discussion, etc.
Technology	Adaptability and personalisation are the core words. As well, learner must have the possibility for synchronous communication (e.g. chat, videoconferencing) and consulting the e-course materials off-line.
Costs and benefits	This is closely related to the expectations learners have. The higher the expectations, the higher the benefits and the lower the costs should be. The costs and efforts that are expected from learners have to be in subjective proportion to the benefits that are related to the course. However, this depends on learners to a high extent.
Information transparency	The main questions at this point are as follows: do learners get advice before they start the course? Who is the helpdesk in case of technical problems? What is the main goal of the course? An overview of the course also improves the quality.
Course structure	Providing a manual or workshop to introduce the learning environment heightens the quality of the learning process. Also, providing intervening tests and/or assessments via the electronic learning environment is a positive factor.
Didactics	This category often overlaps with the previously described categories and comprises the following features: extending the learning environment with access to background materials, presentation materials, goal-oriented structuring of the course, the fact that the e-course cannot be considered as an appendix of a pen-and-paper course, feedback on the learning process by offering assessments and tests, and the availability of individualised tasks.

Other studies [9; 10] also distinguish several dimensions that are determining the success of electronic learning environments, such as the information quality, system quality, quality of service, system use, user satisfaction and net profit.

The elements above can clearly be in aid of a needs analysis. Needs often are classified in two categories: needs referring to the content and needs referring to the organization. Often, these needs analyses are made from the e-tools developers' point of view. As a result, there is a difference between theoretical quality of e-tools and the experienced quality. Table 2 gives an overview.

Table 2. Types of quality

Factor	Theoretical quality	Practical quality
evaluator	developers	users
influence of context	context independent	context dependent
evaluation	cognitive	cognitive/affective
attitudes	positive or no influence	positive/negative
beliefs	positive or no influence	positive/negative

The quality of e-tools and of e-learning environments as evaluated by the users (instructors and learners) is largely dependent on the context and goals. Besides cognitive factors, there are affective factors that play a role in the evaluation of tools (e.g., motivation, openness for new things). The frequently undervalued influence of attitudes and beliefs is often not considered when analyzing the quality of e-learning.

When we want e-learning to be revalued to e^2-learning (efficient electronic learning), we have to bear in mind two additional issues. First, there are the pedagogical-didactical needs, or questioning what an instructor wants to reach by means of the electronic offering of learning materials. If the answer on this question can only be formulated from the point of the organization (e.g. the teachers have to start applying e-learning; there is no other option as the license has been bought etc.), then e-learning has probably little chance to succeed. However, if an instructor is eager to support or enhance the learning process by using e-tools, then this motivation increases the chance of an effective and successful use of the applications, both for the instructor and the learners. A second group of needs are technological by nature. Technological foreknowledge and requirements and an eventual lack of such are one of the main thresholds preventing users to start using e-learning of building up an ELO.

The central question in the below-presented research is what kind of requirements - didactical and technological- an e-tool has to comply with in order to realize a positive attitude of users that leads to an effective use of the tool. This question is set both with instructors and with learners. The following sections describe the method of data collection, the results and conclusions. Further research is discussed and the last section offers an overview comprising guidelines and possibilities for qualitative implementation of e-tools in course design.

3. Methodology

3.1. Participants. All students and lecturers of the University College KATHO (Belgium) were considered as eligible for the research, since all of them have experience with on-line learning environment (based on Blackboard®) that is used in education offered by KATHO. KATHO has seven departments, offering 18 practice-oriented basis trainings, with 34 specialisations (bachelor degree). The students and lecturers came from all departments. The questionnaire was placed in the KATHO on-line learning environment. In a period of 10 days, 25 lecturers and 316 students answered the questionnaire.

3.2. Materials. The questionnaire was divided into two parts. In the first part, technical aspects that may influence the effective use of e-tools were listed. The second part gave an overview of didactical aspects. Participants were asked to give their personal top three in both lists. They had to indicate what they considered as the three most important technical and didactical criteria that e-tools should meet to be effectively used. Participants also had the possibility to add new criteria.

3.3. Procedure. All students and lecturers received an e-mail with the aim of the research and a link to the questionnaire. In order to bring about a univocal interpretation of the e-tool concept, a short description was given before the start of the questionnaire. Participants had to fill in the questionnaire at once and were prompted when they left one or more items blank.

4. Results

4.1. Technical aspects. According to the lecturers, there are three most important technical aspects, namely: in the first place, the tool has to be simple in use (68% of all respondents); second, it has to be time-saving (52% of the respondents); third, it has to reduce the amount of paper (36% of the respondents). The students pointed out the following factors: simplicity of the tool (55% of the respondents) stands first; the fact that a tool has to be free of advertising (44% of the respondents) was chosen as second, and thirdly, the tool has to work fast (39% of the respondents). The eye-catching fact found by the research is that both the students and lecturers are willing to work with several applications, and only few respondents (16% of the lecturers and 12% of the students) emphasized that it is vitally necessary that the tool can be integrated in other programs or learning environments. The language in which the tool is offered (Dutch interface) is important for only 1/4 of the lecturers (24%) and students (23%). Extensions of possibilities to personalise tools are highly valued by tool developers, but less by the users: only 8% of the lecturers and 10% of the students consider personalisation as a condition for effective tool use. Table 3 gives the values (percent of users that placed the criterion in their top three) for each technical criterion.

Table 3. Technical criteria and importance according to lecturers and students

Technical aspects	Lecturers, (%)	Students, (%)
offline use	0	10,71
simplicity	68,00	55,09
no high memory required	4,00	16,71
fast download	0	20,89
integration in other software	16,00	12,27
free of adverts	32,00	43,60
Dutch interface	24,00	22,72
fast	28,00	39,43
simple navigation	28,00	16,97
time saving	52,00	33,94
less paper	36,00	25,85
no fast connection required	8,00	4,70
personalisation/extensions	8,00	10,18
other	0	0,26

The additional criteria given by students were mainly individual and are summarized in Table 4. From the results it is obvious that a "good" tool has to be simple in use in the first place.

Table 4. Technical criteria – individual additional comments

Technical aspects. Individual comments by users
- One can choose his/her own user name and password.
- The tool has to be clear, especially for people using the tool for the first time.
- Memory of use, e.g., task search, auto-fill etc.
- Content can be copied to other programs (e.g. text editing programs).
- The tool does not take up too much space/memory.
- The tool must work without problems. Sufficient information has to be provided, e.g. a conveniently arranged manual.
- The tool is easily accessible.
- An amusing interface is always good.
- The tool may not cause conflicts with other software.
- The tool is reliable (no crashes).
- The tool is always available.
- The tool has to be universal and can be available for other schools and institutions.
- The tool can be used on other platforms (e.g., Linux).

4.2. Didactical aspects. According to the lecturers, in the top three of didactical aspects the following two criteria share the first place: a tool has to foster interactivity and has to lead to a more efficient collaboration (both aspects have won 44% of the respondents' replies). For the lecturers, a tool also has to lead to more simplified communication (40% of the respondents). The students place a more efficient collaboration on the first place (51%), followed by more simple communication (48%) and on the third place is the flexible supply of learning materials (47%). Obviously, both groups consider the support of communication and the flexibility of the learning process as the most important criteria when evaluating e-tools. The aspect whether a tool was successfully used by peers (lecturers or students) previously in other situations or courses (good practice) or not has little influence on the use of an e-tool (lecturers - 8%; students- 11%). The attitude of other lecturers or other students also has little impact on the effective use of a tool (lecturers- 20%; students- 12%). Using a tool only because it will enhance the course or learning materials to a higher level is important only for 1/4 of the lecturers (28%) and one fifth of the students (18%). Again, this fact emphasizes the necessity for a pedagogical-didactical justification of the implementation of e-tools – it cannot be limited to mere using the tool just because such a tool exists. Table 5 gives the values (percent of users that placed the criterion in their top three) for each pedagogical-didactical criterion.

Table 5. Pedagogical-didactical criteria and importance according to lecturers and students

Pedagogical-didactical aspects	lecturers, (%)	students, (%)
more simple communication	40,00	47,52
flexible learning materials	36,00	47,26
more simple assessment	12,00	14,36
more interactive	44,00	37,60
requires no training	28,00	34,47
higher level of working	28,00	18,02
course exceeding didactical goals	24,00	20,10
easy transformation from pp to e-content	12,00	10,71
successful use in other courses	8,00	11,23
positive attitude of users	20,00	11,75
more efficient collaboration	44,00	50,65
other	0	0,78

The additional didactical criteria that were provided were mostly content-related and are represented in Table 6. It is apparent that from a pedagogical-didactical perspective the flexibility of communication and the learning process are crucial. The main function of e-tools is supportive.

Table 6. Pedagogical-didactical criteria – individual additional comments

Didactical aspects. Individual comments by users
- "Doing new things in new ways" (Marc Prensky).
- On the one hand, the relation between instructor and learner is more intense (interactive), on the other hand, one can develop a more clearly structured self-study package.
- A tool has to establish good communication between the provider and the receiver.
- Tools help to understand the course better. They give you the feeling that you are not alone and that support is always available. They also give the possibility to participate actively in the learning process.
- The content of a tool has to be up-to-date; it cannot comprise any outdated information.
- The tool may not be laborious, but has to be effective in use.
- Not only exercises and solution can be provided, but also courses and handbooks can be available (e.g., pdf, e-book)
- School and instructors has to use the tool logically and consistently, so that the learners do not have to look at several places if they have missed anything.
- Subjective opinions are less possible.
- Thanks to e-tools, one can work always/everywhere. You are not limited to a particular time.
- The tool supports the course materials.
- A tool may not be obliging, only supportive for those who really want to use it.

5. Conclusions

This study takes a first step toward a more interactive collaboration between developers or providers of e-tools and electronic learning environments on the one hand and the users of these applications on the other hand. Lecturers and students of the University College KATHO were interviewed about what they considered as most important criteria in order to effectively use an e-tool. Criteria were divided into technical and didactical criteria. According to lecturers, a good e-tool is easy to use, is time-saving and helps to reduce the amount of paper. Also, e-tools should support an interactive learning process and lead to a more efficient and simple communication. According to students, an e-tool has to be easy to use, has to work fast and has to be free of advertising. Moreover, encouraging an efficient collaboration and simple communication is a necessity to function as a good tool. Learners also expect that a good tool makes it possible to offer the learning materials in a flexible way (*anytime anywhere* content).

The main conclusion of this research is that as far as the technical aspects are concerned, the learners and instructors have low expectations and demands. Features as software compatibility, integration in other software, interface design, etc. are considered as nice to have, but not need to have. They are not considered as necessary in order to qualify the e-tool as a good tool. Closely interrelated with this is the KISS-rule: "keep it short and simple" or "keep it stupidly simple". When considering the pedagogical-didactical aspects, communication-related criteria take a prominent place. Tools serve for supporting and enhancing the communication and have to make the learning process more flexible. Related to the didactical criteria expectations are rather high, and exactly these criteria are often considered as less important when implementing e-tools.

6. Discussion discussions

What determines whether e-learning in an organisation or institution can become successful or not? This question is at the basis of many debates and research concerning the quality of e-learning. Still, the quality concept is often looked at unilaterally, from the view of the developers, and needs analyses often are performed from an organisational point of view. Questions that are posited refer to the content that will be offered (what?) and the method of offering (how?). In both questions and their answers, the content is often subservient to the tools that will be used. In many situations, a tool is selected first, after which the possibilities of the tool are explored and instructors search how they can incorporate the tool as much as possible. This can be considered as a top-down approach: from the tool to the content. A more valuable approach, resulting in a greater chance to effective e-learning is the bottom-up approach. With this approach, instructors ask how they can improve their course materials, how they can enhance the quality of the learning process by modifying their course. Based on the didactical needs for the course modification, instructors can select which tools suit the best in order to reach their goals. This bottom-up approach starts from the didactical point of view en puts the content and didactical methods first.

There should be an interaction between the possibilities and features of e-tools and the content. If the learning materials are of that kind that it is more efficient to offer them in pen and paper, there is no sense in trying to fit in these materials in an electronic learning environment. Based on the technological and pedagogical-didactical needs of users, e-tools have to be further developed, optimised and adapted, and, vice versa, based on more refined e-tools, pedagogical-didactical methods can be evaluated, adjusted or completed. The important and necessary issue is a continuous interaction between technical innovations and pedagogical-didactical innovations. This calls for a new way of thinking for both the tool developers and instructors. E-tools developers should think about the needs of instructors or learners and ask themselves which learning-related goals can be reached by using the tool. It could be as well useful if instructors and learners think more like developers and ask how the tool can be improved. Alternatively, they can participate in discussions on software improvement. By doing so, users

and instructors learn how to reflect critically on their use of tools, can interact with other users that are more or less advanced in using the tool and have the possibility for a broader and more intense use of e-tools. Such discussions may be useful for tool developers as well. By having a direct contact with the base (i.e. the users), tool developers can promptly improve e-tools. Based on users' real-life positive or negative experiences with e-tools or some aspects and parts of those, it is easier to adapt e-tools in a user-oriented way.

Electronic learning environments and e-tools are becoming more oriented towards the learner and ask for active feedback by the users of the learning environments. As a consequence, there is strong need for a pedagogical-didactical support when implementing e-tools and when transforming pen-and-paper courses into electronic learning materials. The use of a tool because such a tool exists is not enough and there is a need for a structured approach when one wants to start using e-learning of implementing e-tools in a highly qualitative and well-considered way. Related to this, we can refer to the Technology Acceptance Model (TAM [11]). This model states that the intention of effective use of a tool largely depends on the evaluation or appraisal of the tool use. Usability can be related to the technical quality criteria, the usefulness of the tool is comparable with the didactical criteria. Fig. 1 shows a completion of the TAM-model, adjusted for the quality concept.

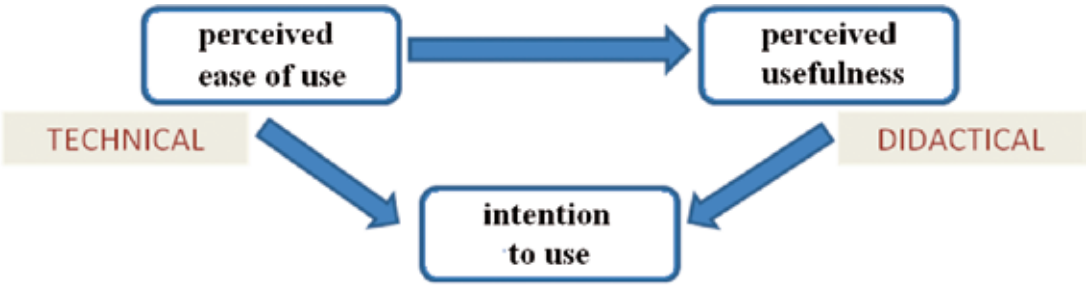

Fig. 1. Completion of the Technology Acceptance Model, adapted for quality.

It is worth paying attention to the gap between what an electronic learning environment can offer and the expectations that the users have to this environment in terms of didactical and technical criteria. Indeed, recent research shows that there is still a large discrepancy between desires and wishes of the users and what technology can offer [12].

Based on the definition of Ehlers' quality construct [1], the following section contains the material consists of suggestions (specific for higher education with electronic learning environment) to improve the quality of the e-learning process, based on a pedagogical-didactical point of view. Obviously, not all quality fields will be equally represented because some applications are still in the stage of development, testing or evaluation. The overview below (see Tables 7 to 14) should not be considered as a standard or fixed approach, but rather as providing guidelines with possibilities to reflect when evaluating the quality of electronic learning materials. Also, this overview of practical implementations offers a window on the broad range of possibilities that exist to go further than simply import pen-and-paper materials into an electronic learning environment.

Table 7. Practical implementation of theoretical quality constructs – Support provided by the instructor

Quality field 1: Support by the instructor	
Possibility for two-way interaction	
WHAT?	Learners do not only receive feedback but also send feedback to the instructor of the course.
HOW?	By means of intermediate assessments of tests, questioning the course content. This can help the instructor in the further refinement and improvement of the learning materials for following learners.
Moderation of the learning process	
WHAT?	Active moderation of the learning process in a communicative way.
HOW?	Discussion forum in the ELO with a forum "questions to the instructor".
Learner-oriented interaction versus content-oriented interaction	
WHAT?	The learner-oriented interaction puts more emphasis on the personal learning process of the learner, while the content-oriented interaction focuses on the communication between the instructor and the learner.
HOW?	Both types of interaction can be obtained via discussion fora. By asking directed questions (by the instructor) the learners will be able to start a reflection process.
Individualised learner support	
WHAT?	Focuses on the specific needs of the learners and foresees additional information according to the interests of the learner(s).
HOW?	A page with links, additional documents or organising theme-based videoconferences with active participation of the learners.

Table 8. Practical implementation of theoretical quality constructs – Collaboration and communication in the course

Quality field 2: Collaboration and communication in the course	
Social collaboration	
WHAT?	An online course should focus on collaboration with other learners, experts, mentors or instructors.
HOW?	On-line group discussions (chat, videoconferencing, mail-newsgroups etc.).
Discursive collaboration	
WHAT?	Collaboration where the emphasis is not on the social aspect, but rather on the actively creating knowledge.
HOW?	Group work via weblogs, creating wiki's, websites, making movies, developing a manual (also possible with the pen-and-paper approach).

Table 9. Practical implementation of theoretical quality constructs – Technology

Quality field 3: Technology	
Adaptability and personalization	
WHAT?	Can the learning environment be adapted according to the personal preferences of the user? Also providing the facility that after logging in the users can start where they logged out the last time.
HOW?	Most electronic environments offer a broad range of personalisation facilities (e.g., colors, lay-out, adding figures etc.). Both for the instructor and for the learner.
Possibilities for synchronous communication	
WHAT?	Does the learning environment have a synchronous communication facility?
HOW?	Use references to communication tools (chat tools) in the links-page of the electronic learning environment.
Availability of content	
WHAT?	The learning material should be available in several formats (preferably in pdf-format). The learners should have the possibility to download the materials on their own computer and consult the materials offline.
HOW?	Protected text editing documents of creating documents in portable document format (pdf). Large files can be zipped in maps.

Table 10. Practical implementation of theoretical quality constructs – Costs, expectations, benefits

Quality field 4: Costs, expectations and benefits	
Expectation of individualization	
WHAT?	The expectations that the learners have regarding the flexibility of online learning and its individualised aspects, concerning the content as well as the support and guidance.
HOW?	Permanent announcement on the electronic learning environment gives the learner an overview of what he/she can expect. Make sure that the learners' expectations fit closely to the content that an instructor can and wants to offer (downsize if necessary).
Individual non-economic costs	
WHAT?	The efforts that are required from the learners to stay motivated and concentrated for a course with a strong individualised route.
HOW?	Posting announcements on the electronic learning environment, on a regularly basis, encouraging e-mails to all learners halfway the course, before an exam etc.
Economic costs	
WHAT?	Financial costs.
HOW?	A link to the Internet providers that offer cheap(er) rates for instructors and learners.
Practical advantages	
WHAT?	Learners expect practical advantages of online learning in their daily lives.
HOW?	A page with links to interesting websites, a weblog with applications of the course content, stories of the graduated learners, best practices etc.
Interest in the use of the course and media	
WHAT?	Learners are not only interested in the content but also in the e-tools that support the learning process.
HOW?	Maximum integration of e-tools in the tasks, assignments, group work etc. A diverse stock of best practices based on the feedback from the previous learners, the previous experiences.

Table 11. Practical implementation of theoretical quality constructs – Information transparency

Quality field 5: Information transparency	
Support and advice	
WHAT?	Important dimension of subjective evaluation of the quality is the type of support that the learners receive before they start working in the electronic learning environment.
HOW?	Providing a demo session with the introduction of the course, where the most important functionalities of several tools are discussed. It is better to make the learners learning by doing instead of giving them a paper manual.
Information concerning the organization	
WHAT?	Learners consider it important to have background information and especially to know where they can find particular parts of the course, e.g., training forms, exam regulations, contact information of the co-learners and representatives, links to relevant websites, the course schedule etc. This information can be provided in the electronic learning environment via e-tools. It has to be clearly presented where and how the learner can access this information.
HOW?	A search function on the general (home) website, a search function for the course website, separate intranet for the learners, structured outline of the materials (per course, per year, per target group, per month etc.)
Information concerning the goals and content	
WHAT?	Learners prefer detailed information for each course that will be offered electronically.
HOW?	Regular update of the study information documents, course documents, ECTS-files has to be available in the electronic learning environment or on the website.

Table 12. Practical implementation of theoretical quality constructs – Course structure

Quality field 6: Course structure	
Personal support of the learning process	
WHAT?	The importance of personalised and individualised course support.
HOW?	Via additional contents, extending an adaptive learning route or referring to other information sources. Being available by e-mail or by synchronous communication tools (e.g., live chat sessions between the instructors and the learners).
Introduction to technical aspects and content	
WHAT?	This is strongly related to "support and advise" in Quality field 5: information transparency. Here, the content is also discussed.
HOW?	At the beginning of an e-learning course, a face-to-face meeting can be organised for the instructor and the learners. At this meeting, the learners can be split into groups, additional questions can be asked and a demonstration of course content can be offered.
Assessment	
WHAT?	The possibility of online assessment.
HOW?	By means of interim assessments, the instructors can demonstrate the type of questions that learners can expect at the examination. The learners receive (electronic) feedback for the outcome. Alternatively, the score for the interim online assessment can add up for the general summative score.

Table 13. Practical implementation of theoretical quality constructs – Didactics

Quality field 7: Didactics. Part 1	
Background materials	
WHAT?	The importance of access to the background materials. This aspect has already been discussed more than once in the above-mentioned quality fields. This fact emphasizes particular importance that the learners expect from this feature.
HOW?	A page with links to other information sources, stimulation information processing skills by integrating search tasks in the assignments, organising a theme evening or a videoconference with the experts, a live chat session with the experts with the possibility of asking questions to the experts, instructors or learners.
Multimedia enriched presentation materials	
WHAT?	Many learners express their need for the learning materials that are enriched with a broad range of multimedia.
HOW?	Integration of audio, movies, authentic texts etc. in the learning materials. The reference to the multimedia enriched materials on every page of the course or in every learning object does not yield the desired effect. It is better to evaluate the existing assignments and the content to what extent these materials can be offered differently. For example, describing a movie fragment is also possible by creating a link to a video-sharing channel where that movie or fragment is available. Also, the description of a sound can be described equally well by integrating an audio file in the learning environment.
Structured and goal-oriented course materials	
WHAT?	Arranging the course materials according to the goals that the instructor wants to achieve with that course, and not arranging the materials according by the content of chapters.
HOW?	When constructing a new course, an overview of the goals that have to and may be reached can be created (basic goals and extended goals). On the basis of this overview, a course can be built up. As soon as the course materials are available, each chapter/part may comprise an overview of the goals that are targeted at in this particular chapter/ part. This is also possible at the end of each chapter/ part where the learners get an overview of what they are expected to know/learn/be able to do/etc. after studying that part.

Table 14. Practical implementation of theoretical quality constructs – Didactics

Quality field 7: Didactics. Part 2	
Support of (life long) learning	
WHAT?	Working in and with an electronic learning environment must learners allow to acquire specific learning skills and become more experienced in their competencies for lifelong learning.
HOW?	Stimulating information processing skills by teaching the learners how to search efficiently, how to deal with the large amount of available information, teach them how they can process and summarise this information (e.g., by making mindmaps, concept cards or diagrams).
Feedback on learning progress	
WHAT?	Integration of interim assignments in the learning environment as support and feedback on the learning process.
HOW?	The stipulation here is that the learners also receive feedback for the scores of the assignments. Rather than giving a rough score (e.g., a number), the trainer can choose to provide qualitative feedback with personal comments. Another possibility is to let the learners make a short reflection task following every assignment they have to hand in. The question for such a reflection task could be, for example: what do you like in this assignment? what are your strong and weak points in this assignment? how could you lower or increase the score etc. In this way, the learners often gain new insights into their own learning styles. Such insights are necessary in order to revise the assignment and adjust it before handing in.
Individualised tasks	
WHAT?	Tasks that are developed to meet the needs of individual learners.
HOW?	The development of individualised learning routes. By screening the results or by providing substantial feedback, the instructor can position learners on the scale and give them appropriate tasks. The differentiation in the electronic learning environment is simpler that integrating differentiation in a classroom-situation, since e-learning itself is already a more individualised process. Starting with similar individualised learning routes and the development of additional supporting materials (for all learners) requires a great effort from the instructor.

Acknowledgements
The author would like to thank the Department of Teacher Training, KATHO PHO Tielt.

References

[1] Ehlers, U.-D. (2007). *Competencies for Achieving High Quality in E-Learning.* Presentation at ICL 2007 Conference, Villach (Austria).
[2] Clarebout, G., & Elen, J. (2006). Tool use in computer-based learning environments: towards a research framework. *Computers in Human Behavior, 22,* 389-411.
[3] Jonassen, D. H. (1999). Designing constructivist learning environments. In C. M. Reigeluth (Ed.), *Instructional-design theories and models. A new paradigm of Instructional Theory* (Vol. II, pp. 215-239). Mahwah, NJ: Lawrence Erlbaum.
[4] Hannafin, M. (1995). Open-ended learning environments: Foundations, assumptions, and implications for automated design. In R. D. Tennyson & A. E. Barron (Eds.), *Automating instructional design: Computer-based development and delivery tools* (pp. 101-129). Berlin: Springer.
[5] Elen, J. (1995). *Blocks on the road to instructional design prescriptions.* Leuven: University Press.
[6] Lee, Y. B., & Lehman, J. D. (1993). Instructional cueing in hypermedia: a study with active and passive learners. *Journal of Educational Multimedia and Hypermedia, 2*, 25-37.
[7] Oliver, K. M., & Hannafin, M. J. (2000). Student management of web-based hypermedia resources during open-ended problem solving. *The Journal of Educational Research, 94,* 75-92.
[8] Ehlers, U.-D. (2004). Quality in e-learning from a learner's perspective. *European Journal of Open, Distance and E-Learning,* 2004/I.
[9] Wang, Y.-S., Wang, H-Y., & Shee, D. Y. (2007). Measuring e-learning systems success in an organizational context: Scale development and validation. *Computers in Human Behavior, 23,* 1792-1808.
[10] DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: a ten-year update. *Journal of Management Information Systems, 19(4),* 9-30.
[11] Saadé, R., & Bahli, B. (2005). The impact of cognitive absorption on perceived usefulness and perceived ease of use in on-line learning: An extension of the technology acceptance model. *Information & Management, 42(2),* 261-386.
[12] Cardoso, V., & Bidarra, J. (2007). Open and Distance Learning: Does IT (Still) Matter? *European Journal of Open, Distance and E-Learning,* 2007/I.