Comparative analysis of assessment methods in e-learning

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Abstract

This paper combines the results of desk and field research about assessment methods that were held in the frame of a European project - CRITON (www.criton.eu) – is a Lifelong Learning Programme funded by European Comission. The aim of the undertaken research was the study of different assessment methods used in e-learning environments around Europe. The results of this research lead both to the definition of the most widely used assessment practices in 6 different European countries (Germany, Austria, Lithuania, Greece, Finland and Sweden) and to the role of these practices in the prediction of e-learners' final performance. The main outcome of the project is a web based platform that records e-learners' progress and provides tools for identifying students at risk.

Keywords: Assessment methods, e-learning, desk & field research

Introduction

Assessment is an ongoing process that involves planning, discussion, consensus building, reflection, measuring, analyzing and improving based on data and artifacts gathered about a learning objective. Any assessment is linked to critical questions, such as:

- *Why* do we measure?
- *What* do we are measuring?
- *How* do we measure it?
- *How much* do we need to measure?
- *When* do we measure it?

Assessment is in the core of the project CRITON (www.criton.eu). CRITON is a transnational cooperation project to enhance the learning process in distance education systems and e-learning, using assessment methods for predicting e-learners' progress and to improve evaluation methods leading to better learning outcomes and more personalized learning.

The project consists of seven partners from six different countries of Europe (Greece, Austria, Finland, Lithuania, Sweden and Germany). This paper presents the findings of the survey about different assessment methods used in e-learning environment in order to define the most widely used assessment practices in Austria, Lithuania, Germany and Greece (since Finish and Swedish partners couldn't collect an appropriate number of data) which can provide accurate measure of student performance in e-learning.

The research questions of the study were:

- Which are the most widely used educational assessment methods in Austria, Lithuania, Germany, Finland, Sweden, Greece and why?
- What are the particular features of assessment methods used in e-learning environments in Austria, Lithuania, Germany, Finland, Sweden and Greece?

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— Which assessment methods in e-learning environments have added value for students and teachers?
— Which e-assessment formats just focus on testing the acquisition of declarative knowledge and which provide much deeper insights, for both the student and the teacher?
— How can feedback influence student achievement in e-learning?
— Which are the conditions under the type of assessment that supports students' progress in an e-learning environment?

Methodological Approach

In order to describe the specific needs of the partners regarding assessment, both qualitative and quantitative data are necessary. Questionnaires for all educational levels (primary and secondary education questionnaire, higher and adult education; VET) and for all tutors have been collected through the website *Surveymonkey* [https://www.surveymonkey.com/]. The survey has 4 months duration and took place between 20/05/2013 and 15/09/2013.

The following Table shows the received questionnaires per country and per educational level.

Table 1. Survey Population per country and educational level

	PRIMARY & SECONDARY	HIGHER & ADULT LEARNING	VET	TUTORS
FINLAND	2	0	0	1
GERMANY	1	23	16	6
AUSTRIA	2	33	0	5
LITHUANIA	19	77	24	89
GREECE	51	821	29	65
SWEDEN	2	0	0	2
TOTAL	**77**	**954**	**69**	**168**

Approach to analyzing the data

Data have been obtained in a form suitable for statistical processing, either through the statistical package SPSS or Microsoft Excel software. According to the type of data, descriptive statistic conducted through frequency tables and graphs for all variables and comments were made on the results. Further statistical analysis was performed through contingency tables and statistical test X^2 in order to detect and comment the characteristics that affect the choices and preferences of survey respondents.
Particular attention was paid to the variables which have multiple responses [for example, in SPSS there is a distinct option in Analyze menu for these variables].
Consistency tests of Chi Square are possible only when the sample is large enough and enough combinations of variables categories [i.e. cells in crosstab tables] have several entries. If this doesn't hold, the results can be interpreted as simple indications of the correlations between variables.

Recommended assessment methods per educational level

Primary education

Previous research (Chen & Macredie, 2004; McDonald, 2002; Bransford et al., 2000) has shown that assessment concepts and methods which are more suitable for this level of education are: multiple choice question (MCQ), True/false, Short answers, E-portfolio, Group work, Tables and charts, Diagnostic assessment, Formative assessment, Observation in fora, wikis, weblogs. From all these assessment methods, e-portfolio, which is a deliberate choice of electronic documents and certificates is one of the most important for primary level of education.
According to the findings of this field research, students in primary educational level are comfortable with computer based assignments. Multiple Choice Questions are both the predominant and the preferred assessment format followed by Short Answer question type, sentence builders and tables and charts exercises. Moreover, all students who have been chosen Tables and charts exercises were girls and also, mainly girls have been chosen Voice responses, Drag and drop and Games as their preferable e-assessment format.
Tutors in primary education prefer to construct e-portfolio as evidence of work undertaken, but rather limited, while its use is divided between formal assessment and other formative and supplementary purposes.

Secondary education

According to desk research (Brewer, 2004; Grendler, 2003; McDonald, 2002) assessment concepts and methods which are more suitable for this level of education are: Multiple choice question (MCQ), True/false, Short answers, E-portfolio, Group work, Tables and charts, Diagnostic assessment, Formative assessment, Observation in fora, wikis, weblogs. From all these assessment methods, group work is the most interesting for secondary level of education, since it features a collaborative approach to learning, with a strong emphasis on analysis and discussion.
Findings of field research shows that, 13-15 years old students are fully comfortable with computer based assignments. But, three out of four 16-18 years old students (in the case of Greece) are not fully comfortable with computer based assignments. Moreover, contingency tables from data show that Voice responses and Tables and charts exercises have been chosen only by 16-18 years old students, while animated quizzes and Word match have been chosen only by 13-15 years old students. The use of e-portfolio in secondary educational level is limited, even though secondary students believe it is quite helpful. We have the same finding for peer-assessment. It is not a common method in secondary level of education, although more than 50% believe it is quite useful.

Higher and Adult education

Assessment concepts and methods which are more suitable for this level of education (McMahon, 2010; Beale, 2007; Khom, 2005) are: Multiple choice question (MCQ), True/false, Short answers, E-portfolio, Group work, Diagnostic assessment, Formative assessment, Observation in fora, wikis, weblogs, Feedback. From all these assessment methods and concepts, feedback is the most interesting for higher and adult level of

education, since adult learners need comments on their work that will show them how to move on to the next stage of achievement.
After all, according to the findings of field research those who ODL programs are usually in their most productive age and usually attend a relevant program to their occupation – more determined in their decision to study and more committed to learning.
Naturally, there are large differences on the characteristics (age, working status and type of work) of the samples that reflect the different cultures of the countries that participate in this research. For instance, Greek learners concentrate in order to understand the topic but Germans in order to pass the exam. That is why in Germany, learners give less attention to feedback, read it more carefully in case of a bad mark, in comparison with learners from other countries, and they think it does not help them understand and learn in e-learning environment and, half the times, it never leads to discussion with their teacher. But almost all learners are comfortable with computer based assignments.
Besides that, in all countries, learners in higher and adult education recognize as the predominant assessment type in e-learning environment MCQ, short answers formats and drag and drop menus, which are preferred because they are more interactive and participants have the feeling of being more challenged and not just completing an exercise. Some participants like the combination of pre-formulated answers and free answers. E-portfolio is not in common use, although many participants recognise its usefulness. Greece and Lithuania do not use as frequently peer assessment as German and Austria.

Vocational Education and Training (VET)

According to desk research (Lombardi, 2007; Nunes & McPherson, 2006; Modritscher & Sindler, 2005; Raith, 2004), assessment concepts and methods which are more suitable for this level of education are: Short answers, E-portfolio, Peer-assessment, Diagnostic assessment, Formative assessment, Summative assessment, Observation in fora, wikis, weblogs, Authentic learning, Feedback. From all these assessment methods and concepts authentic and active learning is the most important aspect for VET learners. It means that the teacher offers knowledge and competences in a meaningful, real-life context or in a relevant professional environment. Examples of this context are the daily teaching practice or a case-based and problem-based learning environment.
According to the findings of field research, there are large differences on the characteristics (age, working status and type of work) of the samples that reflect the different cultures of the countries that participate in this research. For instance, In Lithuania, the majority of learners in Vocational Education and Training are under 25 years old, while in Germany, learners in VET are, on average, older. Women are the majority of learners in Greece and Germany but not in Lithuania. Another significant difference across Greece and Lithuania is the educational level of learners in VET, since the vast majority of them in Greece have already a University degree.
It is also impressive that learners in Lithuania use e-portfolio twice as much they use it in Greece and three times they use it in Germany. Furthermore, German learners always use peer assessment.
Additionally, it appears that most VET learners in Europe read carefully feedback in e-learning environment in the case of either a good or a bad mark and believe that feedback helps them to understand and learn considerably. However feedback does not prompt discussion with the tutor most of the times. Finally, in VET multiple choice

questions are both the predominant and the preferred assessment format, followed by short answer question type and tables and charts exercises.

Final Conclusions and Recommendations

The aim of this paper was to study different assessment methods used in e-learning environments in order to define the most widely used assessment practices, and to help the partners improve the practices they currently apply, and as a consequence, to improve the quality of e-learning they provide.
In the light of the findings of both desk and field research, we found many similarities among the the most widely used assessment practices in different levels of education.
Learners in all levels of education (primary, secondary, higher, adult, VET) recognize as the predominant assessment type in e-learning environment: multiple choice question (MCQ), short answers, games, drag and drop, tables and charts.
But still, the most preferable assessment format is **MCQ**. This result agrees with the previous literature. MCQ is very effective assessment technique and suits well for both exact sciences and humanities and suits better for some learners (for example, working men). It often require less time to administer for a given amount of material than would tests requiring written responses. MCQs do not require a teacher to interpret answers and can be more focused and objective in an e-learning environment, and they are familiar to adult learners. Majority of tutors consider MCQ to be one of the strongest predictors of overall student performance compared with other forms of evaluation and they promote active participation in education and provide better material comprehension. The most serious disadvantage of MCQ according to the respondents is the limitedness in types of knowledge that can be assessed by using it and a probability of guessing the right answer. That is why we recommend MCQ but only in a more innovative way. Innovations in the multiple-choice category for online settings can include new response actions not common in paper-and-pencil settings, such as clicking on an area of a graphical image, and can also include new media, such as distractors that are sound clips.
We also recommend **Short answer question type,** which is considered good to assess the basic knowledge and understanding of a topic before more in-depth assessment and also develop critical thought, demand clarity in the answer, test the learner's expression ability and assists him in developing a personal writing style. It is a type which prevents cheating and guessing and relatively easy to set in comparison to many assessment methods.
We recommend **Games,** which are more attractive, more interactive and more flexible way of assessment, while experience and practice incorporation are achieved effectively in a way which activate multiple skills. Game-based assessment can help teachers to personalize learning, to better motivate students, and to instill conceptual understanding and knowledge transfer.
Furthermore, we recommend **Tables and charts exercises** because they can help for better data visualization. However, learners need to know how to interpret the data and the way it is presented.
Additionally, a lot of tutors select to use many different formats of assessment, because they consider that –by this manner- final results are more safe, objective and reliable, while assessment can be more interested. This result agrees with the conceptual

classification of assessment in desk research about **multiple assessment methods**, which can enhance reliability.

Another critical finding of field research is that the majority of tutors **measure contribution of the learners to discussion groups**, which also comes to an agreement with the conceptual classification of assessment in field research, about observations in fora, wikis, weblogs, group work, since e-learning requires students to interact with other students in the chat room.

According to field research, results are more divided for the use of **e-portfolio** as evidence of work undertaken, since no more than half the tutors use it, while its use is divided between formal assessment and other formative and supplementary purposes. E-Portfolios are not used frequently and if it is used the usefulness is unclear and assessed differently. More focus should be put into information about usefulness of e-portfolios in adult education and higher education.

More so, respondents rarely use **peer assessment** and do not measure high importance to it. Although peer assessment is seen as quite useful by most learners in the study population, the majority of learners never or rarely use it. This needs more elaboration in adult education.

However, field research shows that the students do pay more attention to **feedback** by the tutor. This suggests that students rather expect helpful and correct advice from the tutors, than from other students. This could correspond to the trend of 'bulimic education' where the students only learn to pass as test. Our recommendation about feedback in blended learning, which is becoming the dominant way of e-learning, is that feedback should lead to conversations with the teacher or tutor. Furthermore, in case of a wrong answer the feedback should be based on a specific topic from their educational material.

All these findings comes in an agreement with the following recommendations for upgrading the assessment formats:

- ✓ The creation of a topic bank [of different assessments' formats] , as a product of a team work
- ✓ The decrease of the size with simultaneous increase of the number of assignments
- ✓ The use of assessment formats through intelligent interactive applications for ipad, iphone.
- ✓ The combination of various assessment formats gives rise to more effective and objective assessment, with higher learner's participation.

References

Beale, S. (2007). *Blogs, reflective practice and student-centered learning*, Advanced Interaction Group School of Computer Science, University of Birmingham. Retrieved April 29, from http://www.bcs.org/upload/pdf/ewic_hc07_sppaper1.pdf

Bransford J.D., Brown A. & Cocking R. (2000) *How People Learn: Mind, Brain, Experience and School, Expanded Edition*. National Academy Press, Washington, DC.

Brewer, C.A. (2004). Near real-time assessment of student learning and understanding in Biology courses. *Bioscience*, *54*, pp. 1034–1039.

Chen, S.Y. & Macredie, R.D. (2004). Cognitive modeling of student learning in web-based instructional programs. *International Journal of Human-Computer Interaction*, *17*, pp. 375–402.

Davi, A., Frydenberg, M. & Gulati, G.J. (2007). Blogging Across the Disciplines: Integrating Technology to Enhance Liberal Learning. *MERLOT Journal of Online Learning and Teaching 3*(3).

Drexler, W., Dawson, K. & Ferdig, R.E. (2006). Collaborative blogging as a means to develop elementary expository writing skills. *Electronic Journal for Integration of Technology in*

Education, *6*, pp. 140-150.
Gredler, M.E. (2003). Games and simulations and their relationship to learning. In: *Educational Technology Research and Development*, pp. 571-582.
Gronlund, N. E. (2003). *Assessment of Student Achievement*. New York: Pearson Education, Inc.
Justham, D. & Timmons, S. (2005). An evaluation of using a web-based statistics test to teach statistics to post- registration nursing students. *Nurse Education Today, 25*, pp. 156–163.
Khom, W. (2006). *E-Testing. Die konsequente Fortführung von e-Learning.* bit Media.
Lombardi, M. (2007). *Authentic Learning for the 21st Century: An Overview*. ELI Paper. EDUCAUSE.
McDonald, M. E. (2002). Developing Multiple-Choice Items. In *Systematic Assessment of Learning Outcomes* (pp. 83–120). Sudbury, MA: Jones and Bartlett Publishers.
McMahon, M. (2010). Ponderers, Sloggers, Slackers and More: Understanding the profiles of studebloggers to help promote academic self-regulation. In C.H. Steel, M.J. Keppell, P. Gerbic & S. Housego (Eds.), *Curriculum, technology & transformation for an unknown future. Proceedings ascilite Sydney 2010* (pp.620-629). Retrieved April 20, from http://ascilite.org.au/conferences/sydney10/procs/Mcmahon-full.pdf
Mödritscher, F. & Sindler, A. (2005). Quizzes are not enough to reach high-levellearning objectives. In: *Proceedings of the World Conference on Educational Multimedia, Hypermedia & Telecommunications (ED-MEDIA 2005)*, Montreal, Canada, pp. 3275-3278.
Nunes, M. & McPherson, M. (2006). Learning support in online constructivist environments in information systems. *HEA-ICS Electronic Journal*, *5*(2). 1-11.
Raith, A. (2004). *E-Testing im österreichischen Hochschulbereich - eine Chance?* Donau-Universität Krems.

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