Course Evaluation in e-Learning by a Comparative Analysis of Two or More e-Learning Courses

Goran Bubaš, Igor Balaban, Nina Begičević
Faculty of Organization and Informatics, University of Zagreb
Pavlinska 2, 42000 Varaždin, Croatia
{goran.bubas, igor.balaban, nina.begicevic}@foi.hr

Abstract. *This paper presents an overview of quality and usability evaluation in e-learning. At the same time, it shows a method for evaluating e-courses by comparing the attributes of two (or more) e-courses using a detailed checklist. In this empirical study, several groups of students evaluated two e-courses with an evaluation survey consisting of a large set of quality and usability related attributes. The results of the evaluation indicated that this kind of comparative analyses of e-course attributes can increase the insight of designers and evaluators regarding the elements of e-courses that need improvement. Furthermore, the use of comparative analysis provides a more qualitative view if selected attributes of two e-courses are inspected side by side after a quantitative analysis of the results of evaluation with a survey. However, it was also found that the results of students' surveys are partly dependent on the context and modality of such comparative evaluation.*

Keywords: e-learning, evaluation, survey, usability, quality assessment

1. Introduction

Despite considerable difficulty in research methodology, most studies find that distance courses are comparable to traditional face-to-face courses regarding various measures of course effectiveness such as learning outcomes, student attitudes and overall student satisfaction [29]. In fact, one meta-analytic study confirmed that distance education is comparable to traditional teaching when students' grades are used as a measure of course performance [33]. Therefore, the adoption of e-learning is one of the key goals at universities where courses can be delivered fully online or as a combination of classroom teaching and use of additional online educational content, self-assessment tools and/or communication tools like internal e-mail and discussion forums. For instance, a survey of 19 universities in Australia revealed that all of them used some kind of e-learning system [25].

E-learning systems provide students with (a) easier access to course materials, (b) the opportunity to check how they have been progressing through the course, and (c) the potential for online interaction with the instructor and other participants in the course. However, the use of the Internet in education means that the teaching staff have to receive additional training, and newly developed online courses have to prove that they are of comparable quality to traditional courses [32]. Also, in some cases inexperienced participants in online courses may need additional instruction and could encounter technical problems when they have to use courseware tools (for instance, see: [8]).

Even though e-learning is not likely to entirely replace traditional training in organizational settings, new generations of workers who are more familiar with computers and the Internet could accept this type of training with more ease and less resistance, especially if the quality of learning materials is more representative of "rich media" and characterized by good instructional design [12].

Evaluation of e-learning systems is an important factor of the effectiveness of e-learning and student satisfaction, as well as of the overall quality of the instructional process. Evaluation in e-learning can be performed regarding the following factors: (a) the related processes at the institutional level [17], (b) the e-learning platform(s) that can be used [26], (c) the pedagogy of course design [11], (d) the usability of e-learning systems and course modules [3], and the more subjective evaluations of course design elements by the participants in the course [5]. It must be noted that some of the issues regarding the evaluation of e-learning systems can be resolved with the use of standards for e-learning technologies [36] and the use of the quality review process for e-learning courses [9]. Still, traditional experimental and quasi-experimental methods are difficult to use in course evaluation plans because of the large number of variables in the related research environment and complexity of choice between numerous elements and aspects of online courses that may be selected for evaluation [16].

In this paper the students' survey method is analyzed regarding its effectiveness for the evaluation of e-courses used in a blended learning environment. The survey was developed as a general evaluation tool with the intention of assessing and improving the quality and usability related attributes that should be present in most e-courses. Except for data collection, the survey items were designed to be used by course developers to identify the elements that they could include/improve in their e-courses. To make the survey more applicable to different types of blended/hybrid learning environments, including the use of non-moderated courses, items that measure the pedagogical aspects of an online course and the interaction with the instructor/mentor were not included in the survey. Because of the subjectivity of students' course evaluation surveys, a comparative data analysis method is proposed in this paper to provide more opportunities to interpret the results of the evaluation of various attributes of e-courses.

2. Evaluation of quality of e-learning systems

It is common that educational institutions plan and implement procedures for the evaluation of the quality of e-learning. For instance, one study identified 24 benchmarks that address the roles of the institution, administration, faculty, and students that are essential to ensure quality in Internet-based distance education [28]. Two important benchmarks that resulted from this study were related to (1) the guidelines regarding standards for course development, design, and delivery, and (2) the evaluation used to improve the teaching/learning process. There have been several attempts to develop sets of criteria or instruments to evaluate e-learning at the level of individual courses. Most of these have been oriented towards somewhat different aspects of e-learning quality evaluation. Some of them focus on the instructional design of e-learning courses [14] while others deal with more diverse elements of online course quality evaluation [18], [34].

McGorry [18] examined the distance education and information technology literature in an attempt to develop a model to measure the quality of learning in online courses. The resulting model simultaneously addresses the quality related issues of flexibility, responsiveness, interaction, student learning, technical support, technology, and student satisfaction. Sonwalkar [34] observed the elements of online learning within the structure of a “learning cube” and proposed an instrument to evaluate online courses based on the following elements: the five functional learning styles - apprenticeship, incidental, inductive, deductive, and discovery (x-axis); the six media elements - text, graphics, audio, video, animation, and simulation (y-axis); finally, the third axis of the cube (the z-axis) represented the interactive aspects of learning.

Pond [31] examined the issue of quality assurance and accreditation and supported the evaluation of educational programs and courses in the context of student experience, the so-called learner-centered evaluation of quality. Arbaugh [4] analyzed the research literature on technology adoption, computer-mediated communication, and general distance education, identifying five general factors that may influence student learning in, and satisfaction with, Internet-based courses: perceived usefulness of the course, flexibility, interaction, student experience, and engagement.

Barbera [6] addressed quality in virtual learning environments in the context of educational institutions and criticized the design of e-learning courses which was based mostly on technological and not on pedagogical aspects. Zaharias [39] concluded that there was a lack of empirical validation of methods and instruments/techniques for the quality evaluation of e-learning courses and proposed a holistic conceptual framework for the quality of e-learning courses which takes into account both cognitive and affective quality parameters. In this framework, quality is viewed as the integration of *instructional design* (interactivity, content & resources, media use, learning strategies design, instructional feedback, instructional assessment and learner guidance & support), *usability* (navigation, learnability, accessibility, consistency and visual design) and *motivation to learn* (attention, relevance, confidence, satisfaction).

Chua and Dyson [10] proposed that the ISO 9126 model be used for the evaluation of e-learning systems regarding the following software quality characteristics (and sub-characteristics): *functionality* (suitability, accurateness, interoperability, security); *reliability* (maturity, fault tolerance, recoverability); *usability* (understandability, learnability, operability, attractiveness); *efficiency* (time behavior, resource utilization); *maintainability* (stability, analyzability, changeability, testability); *portability* (adaptability, instalability, conformance, replaceability). It should be noted that a specialized quality standard ISO/IEC 19796-1 for learning, education, and training was developed to assure that quality in e-learning is adequately managed/assessed, and that a detailed list of success factors for quality adoption of this standard was provided by Pawlowski [27].

3. Usability of e-learning systems

Usability engineering of e-learning systems is directed toward optimizing the user experience regarding two main aspects: technical usability and pedagogical usability [21]. A usability evaluation instrument may integrate elements related to usability heuristics with the guidelines and principles for web design, visual design, and instructional design [23]. The usability evaluation can be performed by inspection methods, user-based methods, and by scenario-driven heuristic methods [35].

The usability evaluation of the learning environment and tools can be supplemented with the evaluation of elements related to instructional design, as well as with the evaluation of the situations in which learning occurs, learner attributes and tasks/activities, instructor activities, and social dynamics [19]. For instance, the level of computer competency of students affects their evaluation of the usability of the e-learning system [20].

Ardito *et al.* [3] have identified the following dimensions of the usability of online courses with a detailed list of usability criteria for both dimensions:

- *E-learning platform usability* (visualization of tools and elements of the e-learning platform; multimediality and hypermediality; application proactivity and error prevention; supportiveness for authoring and learning; supportiveness for communication, personalization and access; structural adequacy regarding intended learning activities; technology adequacy);
- *E-learning module usability* (visualization of lessons; multimediality and hypermediality in content delivery; adequacy, customization and personalization of learning activities; effectiveness of module design and support for students’ activities.

Georgiakakis *et al.* [13] emphasize that the usability criteria for learning management systems (LMS) (e.g. how easy it is to learn and comprehend; efficiency in feature realization; efficiency in navigation; error tolerance; pleasantness to use) should be applied to the elements of the following categorization of LMS features:

- *Course management* (creation, customization, administration and monitoring of courses);
- *Class management* (user management, team building, projects assignments, etc.);
- *Communication tools* (e-mail, chat, discussion forums, audio/video-conferencing, news, file and application sharing, whiteboard, etc.);
- *Student tools* (private and public annotations, highlights, bookmarks, log of personal history, etc.);
- *Content management* (authoring, delivery and file management);
- *Assessment tools* (quizzes, tests, project deliverables, self-assessment exercises, etc.);
- *School management* (records, absences, grades, student registrations, financial administration, etc.).

Pipan *et al.* [30] have developed a model for the assessment of the usability of learning management systems by combining multiple criteria evaluation and usability evaluation. They grouped the evaluation criteria into the following categories of attributes:

- *Student's learning environment* (ease of use, communication, functional environment and help);
- *System, technology and standards* (technological independence, security and privacy, licensing and hosting, standards support);
- *Tutoring and didactics* (course development, activity tracking, assessment).

Most quality evaluation systems are related to the processes at the institutional level and to the attributes of the e-learning platform(s), while the usability evaluation in e-learning is oriented predominantly toward the learning management system(s). However, the quality and usability related features that most directly influence the learning outcomes are those of the e-learning courses and their modules. The evaluation of online courses not only contributes to quality and usability, but is also an important element of diverse models of instructional design [24] and can be performed at different phases of the development of e-learning courses [22]. There have been several attempts to develop comprehensive sets of criteria for the evaluation of online courses (see: [1], [38], [2]). This paper presents below the use of the students' survey method that can be used for the quality and usability evaluation and improvement at the level of individual courses.

4. Problem

The main problem for the empirical part of this study was to develop a survey method for the detailed evaluation of various attributes of e-learning courses that would enable greater insight into the course elements that needed improvement. The intention was to investigate whether a comparison of two different e-courses with the use of such a survey would provide more information regarding different aspects of their quality and usability. Also, it was considered important to test if the evaluation of two courses would produce similar results when the evaluation was performed by a group of students who attended both online courses and evaluated them at the same time, and, in the other case, when the evaluation was performed separately for the two courses by two different groups of students. For this purpose, a survey was designed which consisted of 69 items related to course content, potential activities within the course (assessment, communication), usability and technology. The items for the survey were chosen with the following principles in mind: (a) the attribute could be important for the outcomes of learning in a blended/hybrid learning environment; (b) there is great likelihood that the attribute would be present in an average online course; (c) the attribute is significant for the quality of instruction and the usability of the e-learning system.

6. Method

The survey method was used to evaluate the various attributes of two online courses by different groups of students who used the online courses in a hybrid learning environment. Average ratings of different categories of the attributes were then analyzed and a comparison was made of the two courses regarding those categories of the course elements that were important for both learning environments.

6.1. Subjects

The survey was administered to several different groups of students at the end of the hybrid university course in which they had access to the e-course that was evaluated. Two groups of subjects attended the hybrid university courses "Informatics" (N=120) and "Psychology and the Internet" (N=72) in the 2005/2006 academic year. One more group of subjects attended the hybrid university course "Informatics" (N=261) in the 2006/2007 academic year. Finally, a small group of subjects attended the university courses "Informatics" and "Business Communication" (N=19) in the 2005/2006 academic year. The students who attended the course "Informatics" used an e-course with the same name ("Informatics") predominantly outside class. In the academic year 2005/2006 the e-course "Informatics" was delivered by courseware named *E-Learner* and in the following 2006/2007 academic year the e-course "Informatics" was delivered over the *Moodle* courseware platform. The students who attended the hybrid course "Psychology and the Internet" used an e-course "Online communication" predominantly during class hours in the computer room at their college. This e-course was based on a learning content management system developed at the Faculty of Organization and Informatics. Finally, the small group of students who attended the university courses "Informatics" and "Business Communication" used both the e-course "Informatics" and the e-course "Online communication" predominantly outside class. In all of the groups, the subjects were students of the Faculty of Organization and Informatics, University of Zagreb. Their age was 18-24 years; about 75% of them were male and 25% female.

6.2. Instrument

The 69 items of the e-course evaluation survey were grouped into the following categories of attributes: (i) educational content; (ii) assessment and self-assessment of knowledge; (iii) multimedia and user-interface; (iv) communication; (v) personalization; (vi) directedness toward providing support to the users; (vii) technical elements and prerequisites for the use of the system; (viii) general characteristics (for a detailed presentation of the survey, see: [7]). The subjects responded on a 1-5 Likert-type scale ranging from 1 - *"completely untrue"* to 5 - *"completely true"*.

6.3. Data analysis

The data analysis was performed by calculating the arithmetic means of the subjects' responses for the selected items of the survey in relation to two e-courses: "Informatics" and "Online communication". The data on average ratings of selected categories of survey items (course attributes) are graphically displayed in Figures 1, 2, 3 and 4. The arithmetic means were also calculated for comparative evaluation of these two courses using a bipolar rating scale for the survey items of the same content. These data are presented in Figure 5.

7. Results of data analysis

In Figure 1, the results of the evaluation of two e-courses "Informatics" (N=120) and "Online communication" (N=72) are compared regarding the following attributes related to the *educational content*: instructions are present for the use of the content and for the learning activities; the structure and logical organization of the content is good; the content is related to students' needs; the content follows the syllabus; there is sufficient content regarding the learning goals of the students; the content is understandable; the text and illustrations are current; the text is well illustrated; there are useful links to other web resources; participants can choose their learning content and activities. The data presented in Figure 1 were collected from two different groups of subjects who rated the two e-courses separately. It can be observed that the e-course "Online communication" received a slightly higher average rating for most of the content related attributes.

In Figure 2, the e-courses "Informatics" and "Online communication" are compared regarding the attributes that are associated with *directedness toward providing support to the users*. It can be observed that in this case most of the attributes are rated slightly higher for the e-course "Informatics", for instance the attributes: support for users ("help") is available; there is a "bulletin board" or "news"; there is a FAQ web page; participants can receive online help and support; participants can converse in the forum/chat within the course, etc. Since "Informatics" was a moderated e-course, and "Online communication" was non-moderated and self-paced, these differences were visible in the outcome of the evaluation of these attributes related to the usability of the e-learning system.

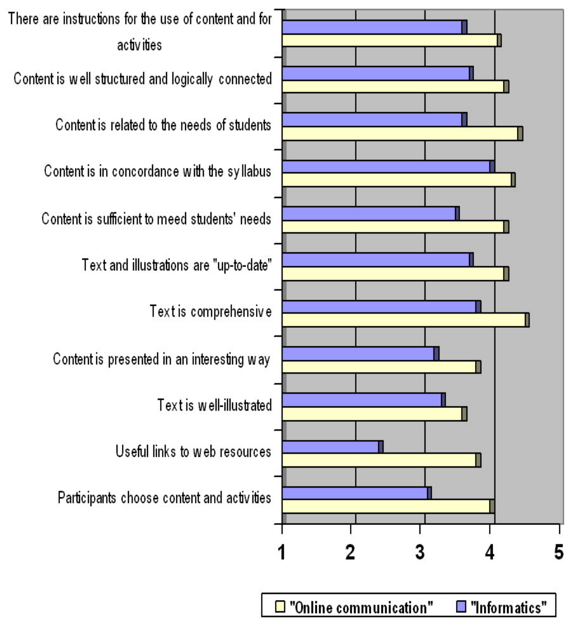

Fig. 1. The results of the evaluation of the quality of the attributes of the e-courses "Informatics" (N=120) and "Online communication" (N=72) related to the category *content of the course.*

The data presented in Figure 3 compare the e-courses regarding the attributes associated with the *technical elements and prerequisites for the use of the e-learning system*. It can be observed that the e-course "Informatics" was rated more favorably regarding the attributes "participants are informed of the preferred browser for the use of the online course" and "preferred display resolution is advised". However, the "Online communication" e-course was rated more favorably regarding the following usability attributes: "to use the online course participants do not need specific technology (software, plugins)"; "the technical system is stable (there are no software bugs, computer crashes, etc.)"; "it is not difficult to read the text and perceive visualizations in the online course"; "the use of the online course is intuitive". It must be noted that the comparative analysis of the e-courses "Informatics" and "Online communication" regarding the other categories of attributes evaluated by the students' survey could provide a more detailed insight into their various quality and usability related components.

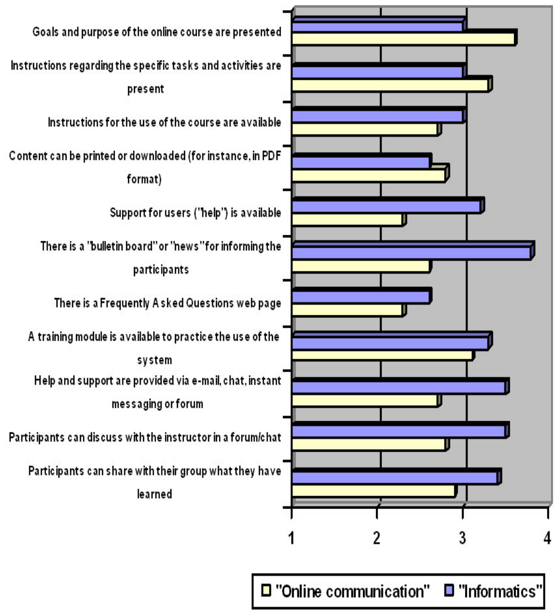

Fig. 2. The results of the evaluation of the quality of the attributes of the e-courses "Informatics" (N=120) and "Online communication" (N=72) related to the category *directedness toward providing support to the users.*

What could course designers and evaluators do with such comparative ratings of e-course attributes? After an analysis of the statistical data on the differences in the evaluations of specific attributes, they could inspect how the selected attributes appear/perform in real settings in both e-courses. For instance, in the case of the e-courses "Informatics" and "Online communication", their designers could consider adding features comparable to the highly rated "news" or "bulleting board" attribute of the e-course "Informatics" to the non-moderated e-course "Online communication" (see data in Figure 2), as well as other quality and usability related attributes that were highly rated for the e-course "Informatics" but which received a comparatively lower rating for the e-course "Online communication". This also works in the other direction. For example, an examination of the highly evaluated attributes of the e-course "Online communication" could be used to gain more insight into ways to improve the ratings of some attributes of the e-course "Informatics" that were rated less favorably. For instance, the differences in the presentation of the educational content could be inspected bearing in mind the evaluation results of the two e-courses presented in Figure 1.

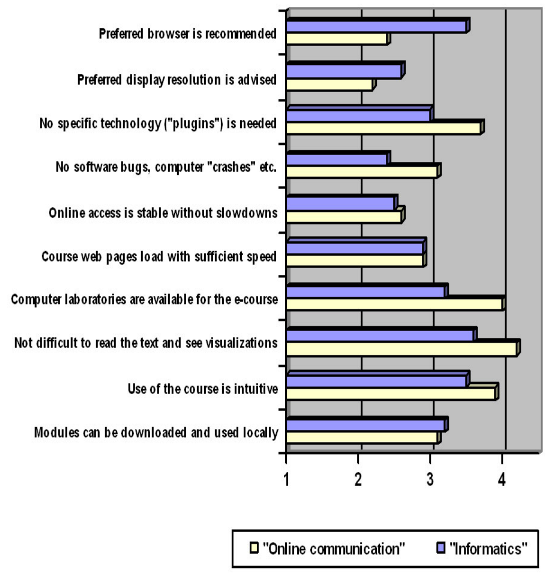

Fig. 3. The results of the evaluation of the quality of the attributes of the e-courses "Informatics" (N=120) and "Online communication" (N=72) related to the category *technical elements and prerequisites for the use of the system.*

7.1. Stability of attribute ratings

During the 2005/2006 academic year, the e-course "Informatics" was used on a courseware platform *eLearner*, and in the 2006/2007 academic year it was used on a *Moodle* platform within the same hybrid university course "Informatics", but with a different group of students. To test the stability of students' evaluations and to assess the results of the technical improvements after transition to the Moodle platform, the evaluation survey was repeated for this e-course. The results of this comparison of average ratings of the attributes of the same e-course on two diverse platforms (and with two different groups of students) indicate that there is a great difference in the performance of Moodle and eLearner regarding the following categories of attributes: "assessment and self-assessment of knowledge"; "use of communication tools"; "technical elements and prerequisites for the use of the system". In fact, there was an improvement with the transition to the Moodle platform when the categories of attributes "assessment and self-assessment of knowledge" and "technical elements and prerequisites for the use of the system" were observed. However, in the case of the categories of attributes "directedness toward providing support to the users" and "use of communication tools", it appeared that the eLearner courseware performed better. But the greatest surprise was to find that for the attributes in the category "content of the course", the e-course "Informatics" on the Moodle platform performed better *even though no changes had been made to the content* of this e-course previously presented on the eLearner platform (see Figure 4). This indicates that the context of the e-course, and not only the quality of a specific set of attributes, has an important impact on evaluation outcomes,

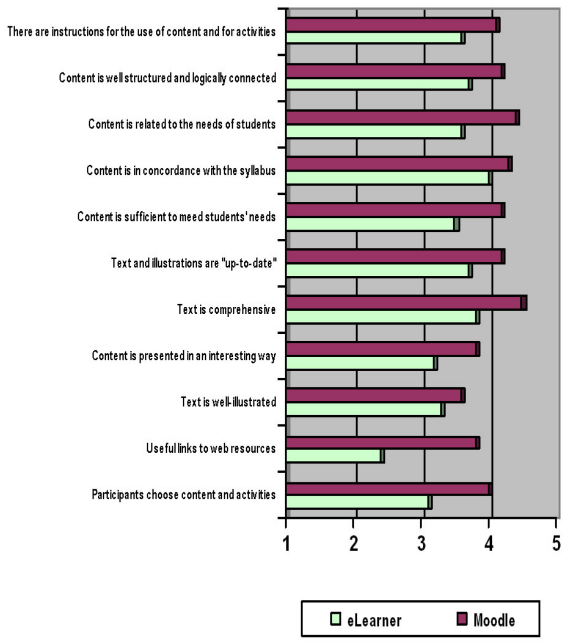

Fig. 4. The results of the evaluation of the quality of the attributes related to the *educational content* of the e-course "Informatics" delivered over the *eLearner* (N=120) and the Moodle (N=261) courseware.

The following factors could have influenced the evaluation of the content of the e-course "Informatics" when different platforms were used in subsequent academic years: the number of students who attended the course; the technical problems with the system and loading speed; the communication and relationship of the instructors with the students; the pedagogy and the overall difficulty of the *hybrid* university course; the quality of off-line instructions for the use of the system; familiarity with the courseware system and its use in other university courses.

7.2. Effect of type of comparison of e-courses

In previous examples, the comparative analysis of e-learning courses was performed on different groups of subjects. In other words, the students who performed the evaluation had experience with only one of the two e-courses which were later compared on the basis of average ratings. Another way to perform the evaluation would be to ask students who had experience of both e-courses to compare them attribute-by-attribute while they access these e-courses. In this way, they could provide responses to the items of the survey while inspecting the specific attributes of both e-courses. This task was performed by a small group of students (N=19) who attended the university courses "Informatics" and "Business Communication". This "focus group" had used the e-courses "Informatics" and "Online communication" predominantly outside class. Their task was to simultaneously access both e-courses and compare the two e-courses attribute-by-attribute while responding to the survey items. The responses were provides by using the following bipolar scale on which the students had to state the degree to which an attribute was better implemented in one of the two courses:

(Informatics) Advantage 2 1 0 1 2 Advantage *(Online comm.)*

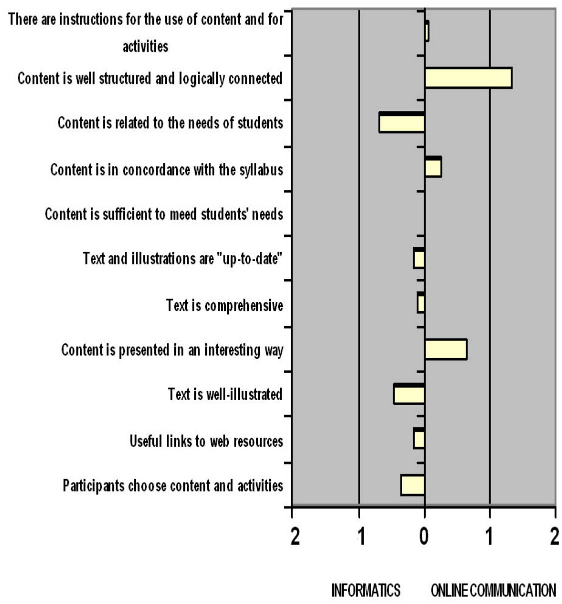

Fig. 5. The results of the comparative ratings of the attributes of the e-courses "Informatics" and "Online communication" related to the category *content of the course* with a single group of students (N=19) and the use of a bipolar response scale.

The results of the comparison of the e-courses regarding the attributes related to the quality of *educational content* are presented in Figure 5. It can be observed that in a comparative evaluation of each attribute in this category, the students of the "focus group" perceived on average that the e-course "Informatics" was slightly more advantageous than the e-course "Online communication" in *more than half* of the attributes. These findings are in contrast to the data presented in Figure 1 that were collected from two different groups of students who evaluated the e-courses separately. In Figure 1, the average ratings for *all* attributes related to the educational content were more favorable for the e-course "Online communication". This indicates that the result of the comparative analysis of e-courses is not affected only by the context in which the e-courses were incorporated in a hybrid university course, but that the method of comparing the course attributes could also have an impact.

Methodologically, it would probably be more appropriate to use student evaluators who had experience with both courses and who would perform the evaluation and comparison attribute-by-attribute while they had access to both e-courses. However, the number of students should preferably be greater for the use of this evaluation method than was the case with the use of the "focus group" of students in this study.

8. Conclusion

This paper presents an overview of quality and usability issues in e-learning and focuses on the evaluation of individual e-courses. A method for the evaluation of e-courses is presented based on a students' survey and a detailed comparative analysis of two or more e-courses. Examination of more than one e-course and the use of more than one group of students in the evaluation procedure can ensure a more objective analysis of the attributes of e-courses (compare: [37], [15]). Examples of data that could be collected with such surveys are presented in Figures 1, 2, and 3 (for more items of the evaluation survey that was used, see: [7]). For each category of attributes, a summative score can be computed from the responses to the representative items of the evaluation survey. This could enable an easy (but not so detailed) comparative analysis of a large number of e-courses at one institution. For instance, Chao *et al.* [9] simultaneously compared 18 e-courses on the basis of the criteria of *course presentation, web design and instructional design* as part of a quality review process at the institutional level.

The data presented in Figure 4 indicate that the context in which the quality and usability evaluations are performed can influence the outcomes of these processes. A systematic effect can be observed in Figure 4 where the same content-related attributes of the e-course "Informatics" were evaluated more favorably by a group of students who had accessed this e-course over a *Moodle* platform in comparison to the evaluations of another group of students who accessed the same content via the *eLearner* courseware.

It must be emphasized that if only two e-courses are compared through the use of a students' survey, this could be performed attribute-by-attribute and by the same group of subjects, as was the case with the data collected using a small "focus group" (N=19) in our study (see Figure 5). However, if the data in Figure 5 are compared to the data in Figure 1, the effects of the context and of the modality of comparative evaluation on the outcomes of this process are evident. While in Figure 1 the e-course "Online communication" received higher average ratings in relation to the e-course "Informatics", the opposite is true in Figure 5 where most attributes of the e-course "Informatics" obtained slightly higher average ratings in the case of a comparative evaluation attribute-by-attribute.

It is suggested that, whenever possible, for the use of the comparative e-course evaluation method presented in this paper, an exemplary e-course should be developed (as a model of quality and usability guided design in e-learning). At the same time, the evaluation should be performed by students with experience of all the e-courses that are compared and where access to these courses is provided while they perform an attribute-by-attribute comparative evaluation.

9. References

[1] ***, *"Criteria for evaluating online courses"*. Southern Regional Education Board's EvaluTech, Educational Resources Evaluation Services. Retrieved 30 May 2007, URL: http://www.evalutech.sreb.org/criteria/online.asp

[2] ***, *"MBU Online Course Evaluation Criteria"*. Missouri Baptist University, St. Louis. Retrieved 30 May 2007, URL:http://www.mobap.edu/academics/distancelearning/Fac_Evaluation_Criteria_for_Online_Courses.pdf

[3] Ardito, C., De Marsico, M., Lanzilotti, R., Levialdi, S., Rossano, V., Tersigni, M. (2004): "Usability of e-learning tools". *Proceedings of the Working Conference on Advanced Visual Interfaces AVI '04* (pp. 80-84), Gallipoli, Italy.

[4] Arbaugh, J. B. (2002): "Managing the on-line classroom: A study of technological and behavioral characteristics of web-based MBA courses". *Journal of High Technology Management Research*, vol. 13, 203–223.

[5] Ausburn, L. (2004): "Course design elements most valued by adult learners in blended online education environments: An American perspective", *Educational Media International*, vol. 41, no. 4, 327-337.

[6] Barbera, E. (2004): "Quality in virtual education environments". *British Journal of Educational Technology*, vol. 35, no. 1, 13-20.

[7] Bubaš, G., Balaban, I., Begičević, N. (2007): "Evaluation of online courses as an element of instructional design: The case of two hybrid university courses". *Proceedings of the Conference Computers in Education, 30th International Convention MIPRO 2007*, Opatija, Croatia, 216-221.

[8] Burgess, L.A. (2003): "WebCT as an e-learning tool: A study of technology students' perceptions". *Journal of Technology Education*, vol. 15, no. 1, 6-11.

[9] Chao, T., Saj, T., Tessier, F. (2006): "Establishing a quality review for online courses", *Educause Quarterly*, issue 2, 32-39.

[10] Chua, B.B., Dyson, L.E. (2004): "Applying the ISO 9126 model to the evaluation of an e-learning system". *Beyond the Comfort Zone: Proceedings of the 21st ASCILITE Conference* (pp. 184-190). Perth, Australia

[11] Dalsgaard, C. (2005). "Pedagogical quality in e-learning: Designing e-learning from a learning theoretical approach". *e-learning and education (eleed)*, issue 1.

[12] Ettinger, A., Holton, V., Blass, E. (2006): "E-learning experiences: What is the future for e-learning?" *Industrial and Commercial Training*, vol. 38, no. 4, 208-212.

[13] Georgiakakis, P., Papasalouros, A., Retalis, S., Siassiakos, K., Papaspyrou, N. (2005): "Evaluating the usability of web-based learning management systems", *THEMES in Education*, vol. 6, no. 1, 45-59.

[14] Johnson, S., Aragon, S. (2002): "An instructional strategy framework for online learning environments". *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*, vol. 2002, no. 1 (pp. 529-536). Montreal, Canada.

[15] Kurtz, G., Sagee, R., Getz-Lengerman, R. (2003): "Alternative online pedagogical models with identical contents: A comparison of two university-level courses". *The Journal of Interactive Online Learning*, vol. 2, no. 1, 1-7.

[16] Mandinach, E.B. (2005): "The development of effective evaluation methods for e-learning: A concept paper and action plan", *Teacher College Record*, vol. 107, no. 8, 1814-1835.

[17] Marshall, S., Mitchell, G. (2004): "Applying SPICE to e-learning: An e-learning maturity model?" *Sixth Australasian Computing Education Conference (ACE2004), Dunedin - Conferences in Research and Practice in Information Technology*, vol. 30, pp. 185-191.

[18] McGorry, S.Y (2003): "Measuring quality in online programs". *The Internet and Higher Education*, vol. 6, issue 2, 159-177.

[19] Mehlenbacher, B., Bennett, L., Bird, T., Ivey, M., Lucas, J., Morton, J., Whitman, L. (2005): "Usable e-learning: A conceptual model for evaluation and design". *Proceedings of HCI International 2005: 11th International Conference on Human-Computer Interaction - Theories, Models, and Processes in HCI* (vol. 4, pp. 1-10). Las Vegas, NV: Mira Digital.

[20] Meiselwitz, G., Trajkovski, G. (2006): "Effects of computer competency on usability and learning experience in online learning environments". *Proceedings of the Seventh ACIS International Conference on Software Engineering, Artificial Intelligence, Networking, and Parallel/Distributed Computing (SNPD'06)* (pp. 339-342). Las vegas, Nevada, USA.

[21] Melis, E., Weber, M. & Andrès, E. (2003): "Lessons for (pedagogic) usability of eLearning systems". *Proceedings of World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education* (pp. 281-284). Chesapeake, VA: AACE.

[22] Melton, R.F. (2002): *"Planning and developing open and distance learning: A quality assurance approach"*, London/New York: RoutledgeFalmer.

[23] Minocha, S., Sharp, H. (2004): "Learner-centred design and evaluation of web-based e-learning environments". *The 7th HCI Educators Workshop: Effective Teaching and Training in HCI*. Preston, United Kingdom. Retrieved 30 May 2007, URL: http://www.ics.heacademy.ac.uk/events/displayevent.php?id=73

[24] Morrison, D. (2003): *"E-learning Strategies: How to get Implementation and Delivery Right the First Time"*. Chichester, West Sussex, England: Wiley.

[25] NCODE LMS Survey. (2004): *"Survey: Learning Management Systems" (February 2004)"*. ACODE the Australasian Council on Open, Distance and E-Learning. Retrieved 30 May 2007, URL:
http://www.acode.edu.au/publications/reports.htm

[26] O'Droma, M.S., Ganchev, I., McDonnell, F. (2006): "Architectural and functional design and evaluation of e-learning VUIS based on the proposed IEEE LTSA reference model". *Internet and Higher Education*, vol. 6, 263-276.

[27] Pawlowski, J. M. (2007): "The Quality Adaptation Model: Adaptation and adoption of the Quality Standard ISO/IEC 19796-1 for learning, education, and training. *Educational Technology & Society*, vol. 10, no. 2, 3-16.

[28] Phipps, R., Merisotis, J., Harvey, M. (2000): *"Quality on the line: Benchmarks for success in internet-based education"*. The Institute for Higher Education Policy, National Education Asssociation, Washington, DC, 2000, Retrieved 30 May 2007, URL: http://www.ihep.com/Pubs/PDF/Quality.pdf

[29] Phipps, R., Merisotis, J. (1999): *"What's the difference? A review of contemporary research on the effectiveness of distance learning in higher education"*, Washington, DC: The Institute for Higher Education Policy,
URL:http://www.ihep.org/Pubs/PDF/Difference.pdf

[30] Pipan, M., Arh, T., Jerman-Blažič, B. (2006): "The Evaluation cycle management - model for the assessment of the usability and applicability of learning management systems". *Is Information Technology Shaping the Future of Higher Education?: Proceedings of the 12th International Conference of European University Information Systems, EUNIS 2006* (pp. 325-332). Tartu, Estonia.

[31] Pond, W. K. (2002): "Twenty-first century education and training: Implications for quality assurance". *The Internet and Higher Education*, vol. 4, 185-192.

[32] Purcel, D.J., Stertz, T.F. (2005): "Effectiveness of and students satisfaction with web-based compared to traditional in-service teacher education courses". *Journal of Industrial Teacher Education*, vol. 42, no. 1.

[33] Schachar, M., Neumann, Y. (2003): "Differences between traditional and distance education academic performances: A meta-analytic approach". *The International Review in Open and Distance Education*, vol. 4, no. 2.

[34] Sonwalkar, N. (2002): "A new methodology for evaluation: The pedagogical rating of online courses", *Syllabus,* vol. 15, no. 6, 18–21.

[35] Triacca, L., Bolchini, D., Botturi, L., Inversini, A. (2004): "MiLE: Systematic usability evaluation for e-learning web applications", *AACE Journal*, vol.12, no. 4.

[36] Varlamis, I., Apostolakis, I. (2006): "The present and the future of standards for e-learning technologies". *Interdisciplinary Journal of Knowledge and Learning Objects*, vol. 2, 59-76.

[37] Walker, R., Baets, W. (2002): "Introducing 'conversational' e-learning to management education: A comparison of student experiences from two MIS courses". *ECIS 2002 The Xth European Conference on Information Systems*. Gdańsk, Poland. Retrieved 30 June 2007, URL: http://is2.lse.ac.uk/asp/aspecis/20020130.pdf

[38] Wright, C.R.: *"Criteria for Evaluating the Quality of Online Courses"*, Grant MacEwan College, Edmonton, Alberta, Canada. Retrieved 30 May 2007, URL: http://www.imd.macewan.ca/imd/documents/onlineEvaluating.doc

[39] Zaharias P. (2005): "E-learning design quality: A holistic conceptual framework". In Howard et al. (Eds.), *Encyclopaedia of Distance Learning*. New York: Idea Group Inc.