

Quality Assurance in On-line Education

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ABSTRACT

Online education constitutes an important component in the continuous growth / development of higher education and adult education. Its quality largely depends on the design rules and the evaluation standards of the programs as a whole as well as the study courses as component parts. The need to ensure the quality of online courses is a current issue. The paper proposes a system of standards, criteria and performance indicators for the design and internal evaluation of on-line courses on e-learning platforms, based on the own experience and good European and world practice.

Keywords: on-line, course, quality, e-learning, evaluation, standards, performance, indicators, distance, learning, Moodle, statistical, analysis, student, perception, assessment.

1. INTRODUCTION

The development of information and communications technology from the last decade has led to fundamental changes in educational practice, leading to the introduction of modern teaching and learning methods. E-learning has emerged in response to the need for learning and refinement in a modern, dynamic world where the information is updated every second, every person, regardless of age and occupation, being obliged to learn and improve continuously. Internet technologies, new Information and Communication Technologies (ICTs) have revolutionized all areas of social and professional life, including learning, education. Due to their massive use in everyday life, new technologies allow an emancipation in the people capacity to learn, favoring a spontaneous tendency towards meta-knowledge and assuming the learning process.

Educational practice has shifted from a closed, teacher-controlled pedagogical approach to an open, transparent, integrated society that supports the student's initiative, facilitating collaboration, personal skills, and lifelong learning. Putting the student at the heart of this new training paradigm, there is a fundamental change in education from content-based learning to context-based learning.

Classical face-to-face education has not lost its actuality or value. It remains for both present and future generations as precious. It should only be updated, supplemented with new tools, special possibilities offered by the information and communication system provided by the Internet, the media, the contemporary ICT tools. Initial training is and will continue to be a priority in the future in the form of presence for young people studying and wanting to learn the fundamentals of science,

especially if it is medicine, engineering, philosophy - sciences requiring a multidisciplinary and very profound training before to pursue purely professional training in a narrow field. The foundation is also necessary for a rapid reorientation to new specialties, demanded by the ever-changing market.

Part-time studies and distance learning have emerged as systems dictated by certain economic conditions, first and foremost, the need to continue work and education. This system is constantly developing. Statistical data on the composition of full-time and part-time studies over the last 25 years in TUM speaks explicitly about the importance of this initial training course for specialists with higher education, including for engineering fields. During these years there have been dramatic changes in higher education: there have been major falls in the number of engineers enrolled in the 1990-2000 period, followed by a real explosion with the doubling or even tripling of the quota in 2006-2010, after that, to be reduced to the level of the 90's. However, there was a perfect stability of the share of students enrolled in part-time studies, which within TUM is 28-35 percent.

Master study programs in Moldovan universities are offered now only full-time and can be followed by people who live and work in Chisinau. By remote (part-time) studies, it would be possible to expand the area, to cover the needs of a considerable number of people working outside the capital, including outside the country. The same situation occurs in doctoral schools.

Undoubtedly, there is a need for distance learning for adults, for people who already have a specialty, have jobs, but for the advancement and deepening of knowledge need additional studies, that can be organized more conveniently in the form of distance learning. The person studies at the proper time and at the place where there are necessary conditions and time to do so, without interrupting the basic activity. The person can choose and study the necessary courses and modules corresponding to his or her personal capabilities.

TUM's practice shows us that students enrolled in the engineering programs at the beginning of the second year are starting to look for a job (whether they have financial problems or because of professional reasons). At the four-year study, practically everyone has a job whose program very rarely correlates with the faculty's curriculum. In this context, the mixed form of organization of studies (the concept of blended learning) is a great solution.

Under these circumstances, courses that can be studied online are welcome. These are highly appreciated by students from all cycles and study forms.

The term of online learning is used in many different ways. It generally refers to a method of providing educational information via the Internet [8]. These can range from downloadable content (such as digital textbooks, video or audio) through informal delivery (such as online open courses - MOOCs) to fully structured online courses that include assessments and a qualification. In this work, the online learning will be perceived / understood in this latest form.

Online learning frees the education from the time and space constraints of face-to-face teaching. Nevertheless, learning online and traditional classroom learning are not opposed. Online learning should be seen as a different teaching and learning method that can be used alone (distance and part-time learning) or to complement blended learning [8].

Online learning has many common sides with the "classic" one, but also many specific differences that need to be considered, especially at the design stage.

Study materials for online or part-time education differ from traditional ones, given some key issues [5, 8, 12, 13]: in full-time education, the teacher is the central component of the education system, other learning resources having the secondary role. In online education and part-time

education, teaching and, implicitly, direct contact with the teacher are replaced by an individual study with the support of study materials, instructions and the tutoring system. Thus, the teacher is provided with materials designed and tailored to the individual study and by a tutor who systematically provides remote educational support and periodically face to face.

Thus, study materials for online education must fully replace the role of the teacher. They must explicitly: define what is to be learned; provide the necessary information to browse the topics; present examples and explanations, ask questions and introduce individual work tasks; generate student-tutorial interactions and periodically provide self-evaluation with the necessary feedback.

Therefore, designing or converting a traditional course into one online learning is done by considering the following structural elements: learning objectives, study approach recommendations, previous knowledge testing, learning tasks, feedback to study activities, examples, Self-evaluation tests, multimedia elements, and links in hypertext. The content of a course will be divided into subjects / study units that facilitate gradual and structured learning within a defined time unit and end by self-assessment or road mapping.

The success or failure of online learning will depend in a large extent on the quality of its components, primarily on the extent to which the developer of the course has complied with its specific requirements. The quality / performance standards on which the assessment of these courses is based must reflect the above-mentioned requirements.

In appreciating the quality of online courses a special role belongs to students / learners – the central partners of any educational process.

The purpose of this study is to provide creators of educational materials, a system of standards that can effectively guide them in designing or transforming classical study materials into study materials specific to online education as well as a tool for evaluating the quality of online courses by their beneficiaries.

2. BIBLIOGRAPHIC ANALYSIS OF QUALITY ASSURANCE IN ONLINE EDUCATION

From the above, it is clear that when evaluating online programs and courses, the general standards and criteria developed for the evaluation of classical courses and programs will be supplemented with specific standards and indicators reflecting student-platform, student-tutor and student-student aspects of communication / interaction, technical aspects, etc.,

Undoubtedly, online courses have to meet the general requirements defined by the “Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG)”, adopted at the Bergen Summit (2005) and subsequently presented at the Erevan Summit [1]. This reference document proposes a set of 10 standards and guidelines for internal and external quality assurance in European higher education. ESG does not set quality standards nor imposes how the quality assurance processes should be implemented, but provides guidance, covering dimensions that are vital to the quality of educational supply and learning environments in higher education in general, defines a common framework for quality assurance systems in terms of learning and teaching at European, national and institutional levels.

In another European reference document [2], the ESG requirements are addressed through engineering education. ENAEE (European Network for Engineering Accreditation) standards for

accrediting engineer-training programs [2] are described in terms of student workload requirements (in ECTS credits), learning outcomes and training control. It specifies that students' workload requirements and learning outcomes should respect the general framework for qualifications in the European Education Area (CC-EHEA), the competencies being expressed by generic descriptors for each cycle. Training management requirements are in line with standards and guidelines for quality assurance in the European Higher Education Area (ESG).

At national level, each state, adhering to the Bologna process, has committed itself to promoting the requirements of the ESG and CC-EHEA general framework, adopting its own standards systems for the evaluation and accreditation of study programs. Thus, the National Agency for Quality Assurance in Vocational Education in the Republic of Moldova (NAQAVE) [3] has developed a system of standards, criteria and performance indicators for the internal evaluation of study programs as a whole, with separate headings for initial professional training and adults' training. In the fifth part of the RAQAHE Guide (Romanian Agency for Quality Assurance in Higher Education) [4] there are nominated standards, criteria and specific performance indicators for the external evaluation of study programs in distance learning. A separate chapter of this heading is dedicated to the requirements of e-learning platforms used as support for distance learning programs.

As far as the fundamental requirements regarding the quality of education, the policy of the state and of the tendering institutions are concerned, the education services will be the same regardless of the type of programs and the way of delivery - full-time, part-time, online or blended learning. At the same time, as mentioned above, there are significant differences between e-learning and campus education. To address these differences were required adjustments to the design and evaluation methods of these programs and courses. For example, in 2006, the Swedish National Higher Education Assessment Agency [5], initiating the evaluation of distance learning programs, identifies five aspects of high quality of e-learning: information and communication technology, structure planning, teachers' skills, adjusting students' needs, infrastructure and organization. In the coming years, we see an explosive development of standards-based systems specializing in designing and evaluating online programs and courses for both distance and blended education [7-11].

Ensuring the quality of the study courses - the basic components of the curriculum for both full-time, distance, or blended-learning education, as well as continuous training, is the responsibility of the educational service providers [1].

Most universities have developed their own standards systems, guides to good practice on designing and evaluating courses for online education [7, 9, 10, 11]. In [7] we find an exemplary model of standards' systems designed to evaluate online courses provided by Penn State University (USA) for distance learning. These standards place a strong emphasis on accessibility, utility, ease of navigation within the course, information security. One of the most complicated issues in distance learning - competency assessment; it is widely addressed in the Good Practice Guide, developed at the command of the Academic Patented Consortium of Texas State (USA) [8]. The same interest represents the system of standards [9], property of the consortium mentioned. Similar systems of specialized standards apply to universities in the UK, Canada, Australia [10], South Africa [11] and many other countries that have developed distance learning or blended-education courses.

As far as the education system in the Republic of Moldova is concerned, the Education Code provides for the organization of full-time, part-time and distance studies for all three cycles of higher education. By the order of the Minister of Education of May 2016, it was adopted the Framework

Regulation on Organization and Deployment of Distance Higher Education in the first cycle I - Bachelor's and cycle II - Master's Degree and Adult Formation in Higher Education Institutions [12]. This specifies concrete requirements, including the provision of students with teaching materials, delineation of study activities that can be offered online (individual study, self-evaluation, planned tutorial) and activities taking place in the university campus with attendance (seminars, laboratory works, final assessment of the competences of the students accumulated at the units of course). The study process is based on methodological and didactic materials that are especially adapted to the specifics of distance learning: information guides, multimedia interactive courses, electronic courses, self-test systems, special teaching materials that can be disseminated through both E-learning platforms and Internet, and intranet networks, accessible on different terminals (computer, tablet, smartphone, etc.). It will also be mentioned that the ANACIP Guidelines for External Evaluation of Bachelor, Higher Education Programs [3] specify within the "Teaching-Learning Process" standard, criterion 3.1.3, the importance of using ICT (2 out of 100 points are awarded), but without specifying the relevant indicators and evidence to be considered to meet this standard. Good practice guides, developed by Moldovan universities, focus on practical recommendations on course design, the use of the various tools provided by the Moodle e-learning platform, and only a limited number of prescriptions on the assessment of the courses developed. For example, [13] includes an evaluation list comprising 17 questions, which in most of them are related to the structure of the course developed. The current study comes to fill this shortcoming.

3. SYSTEM OF THE ONLINE COURSES EVALUATION

During an institutional research project, using the practical experience of the project team in the field of teacher training on the design of e-learning courses accumulated over more than 7 years and the good practices mentioned in Chapter I, it has been developed an academic system of standards, criteria and performance indicators (SICP) that has as its fields of use:

- Online courses design for online and blended education
- To define the requirements regarding the content of didactic materials in teacher training programs - course creators and tutors;
- Evaluation of e-learning courses in order to accept their placement on TUM learning platforms,
- Evaluating modules in order to recognize them as study units relevant to adult learning programs,
- Evaluation of the pretending courses at "TUM Quality Label", the TUM Senate Award, and the recognition of the status of the published methodical work.

The SCIP TUM system comprises three types of standards and indicators (fig.1):

- Educational, which defines the scientific content of the material presented,
- Structural, which are specific to the online course,
- Providing online course support.

The eight evaluation standards (STEs) included in the SCIP TUM system have common descriptors with those defined by NAQAVE / ESG / EURO-ACE standards for evaluating study programs (Figure 2). At the same time, it should be mentioned that the NAQAVE standards "Student

social insurance" and "External program quality assurance" from the SCIP TUM list were omitted as little relevant for the evaluation of courses or modules. These include indicators that are only appreciable at program or institution level.

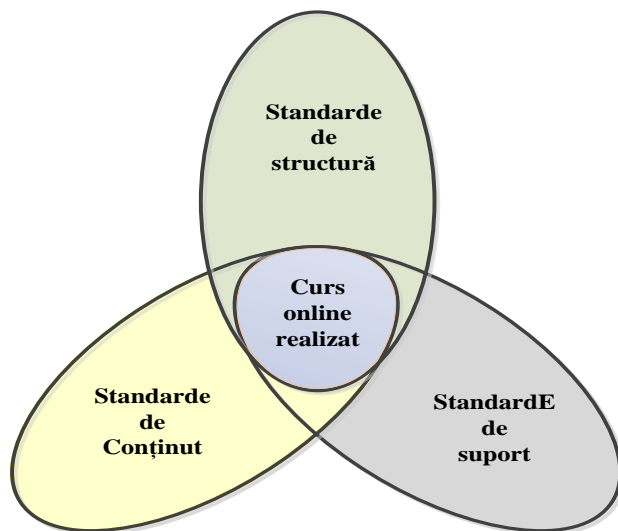


Figure 1. Quality Assessment Standards of the online courses

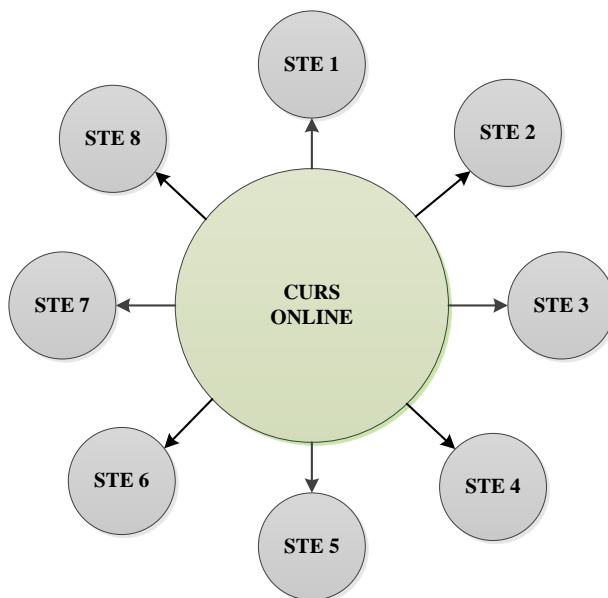


Figure. 2 Standards for assessing the quality of online courses: STE 1 – Policies for quality assurance, STE 2 - Course design, STE 3 – Teaching-learning - student-centered assessment, STE 4 - Admission, course, certification, STE 5 – Academic staff, STE 6 - Learning Resources and Students’

Support, STE 7 - Information Management, STE 8 - Continuous Monitoring and Periodic Evaluation of the Course

For each of the 8 standards there were defined from 1 to 5 evaluation criteria (in general 19) and performance indicators: from 1 to 5 for each criterion, in general 46 indicators.

The overall structure of the SCIP TUM system is shown in Figure 3. Performance indicators have been defined based on two basic principles: significance (importance) for course quality increasing and measurability – to be measurable quantitatively or qualitatively and documented.

Below, as an example, is presented the list of evaluation criteria in the "Course design" standard, which also includes the criteria descriptors:

- Course Description: The course overview is made clear to students at the beginning of the course,
- Analytical program: Students have easy access to the analytical curriculum,
- Learning objectives and purposes: Learning objectives and purposes describe what students can do after successful completion of the course,
- Training materials: Training materials enable students to achieve the declared learning skills.
- Course Technologies: The course technologies support student achievement of course objectives, achievement of declared competencies.

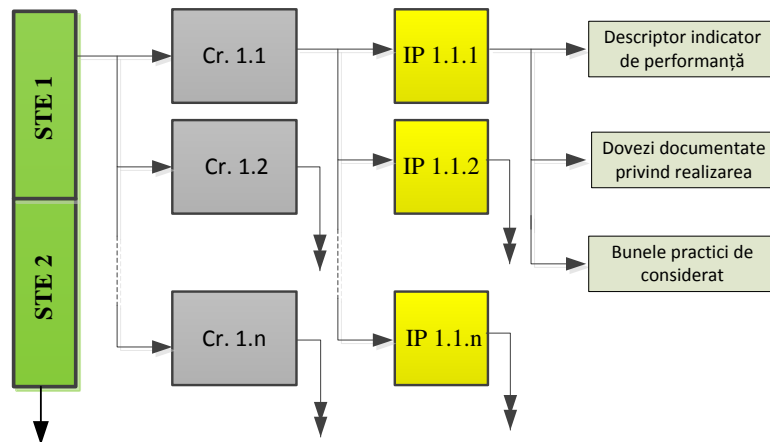


Figure.3 SCIP UTM structure: ST-standard, Cr - evaluation criterion, IP - performance indicator

Each standard is accompanied by a descriptor that coincides with the description of that NAQAVE standard. Criteria and performance indicators, in turn, are accompanied by a description of the evidence of achievement, which must be presented to the assessor. An example of structure for the "Training Materials" criterion is shown in Table 1. In order to increase the utility of SCIP useful tips and good practice references for that chapter accompany each criterion.

The SCIP standards in that way were discussed and approved by the TUM Senate, after which the electronic learning platform [www.http://elearning.utm.md/moodle](http://elearning.utm.md/moodle) was placed on the university's website for use as university rules.

The system was tested by evaluating a set of 14 e-learning courses developed during the 2013-2016 period and taught in the TUM electrical engineering and metrology programs, as well as selective questioning of the students enrolled in the courses as well as of the teachers from Training courses for Tutor Creators within TUM. Most of the detected inconsistencies are related to the lack or incompleteness of information for students.

4. THE QUALITY OF ONLINE COURSES IN THE STUDENTS PERCEPTION

Of the eight online quality assessment standards included in SCIP UTM, three are directly related to students: teaching / learning, course structure and student support. There are many factors that can influence students' online learning experiences. These factors can only be defined experimentally, based on a statistical analysis of the questioning of students participating in the process.

Table 1. Structure of the "training materials" evaluation criterion of SCIP TUM

Cr.2.4 Training materials: Training materials allow students to reach learning skills declared.		
2.4.1 The training materials contribute to the objectives and skills of the course.		
2.4.2 Both the purpose of instructional materials and the way materials are to be used for learning activities are clearly explained.	Complete course in electronic format. University policy regarding the use of third-party materials. Appropriate evidence is provided for the use of copyrighted material, as appropriate.	The course respects the University's policies for the use of third-party copyrighted material. It is the responsibility of course developers to ensure that the use of these materials follows university policy.
2.4.3 Instructive materials are current and varied.		
2.4.4 The distinction between obligatory and optional materials is clearly explained.		
2.4.5 All the training materials used in the course are properly quoted in the university policy.		

In order to identify students' perception of the quality of online courses, the (research) team turned to qualitative research, analyzing the views of students who participated in the online courses on Moodle's platform. In this study, 65 students enrolled in the online courses took part. Qualitative research provides an understanding of circumstances or a phenomenon that describes the situation rather than determines the cause and effect [14] [15].

The data collection was based on a questionnaire [16] distributed through the Moodle platform of the Technical University of Moldova in January – July 2017. The questionnaire contains closed questions with easy ticking. Answers to the questions were evaluated using a Likert-type scale in five points, with 5 points awarded to the rating – totally agree, 4 – agreement, 3 – indefinite, 2 – disagreement, 1 – total disagreement. Also, open questions were included, the role of these questions is to provide the possibility of improving response variants. To ensure the veracity of the answers, the questionnaire was anonymous. For this type of survey, the questions are used, short, simple. And this criterion has been met.

The questionnaire is grouped around seven major dimensions: 1. personal data, 2. educational aspects, 3. technical and ergonomic aspects, 4. graphics and multimedia, 5. the activity of the teachers / tutors in the training process, 6. the overall appreciation of the course and on-line training, 7. general online course evaluation.

To make sure that the data collection tool meets our objectives and that questions are not a source of confusion, a pre-investigation was carried out on a sample of 15 people. This has made it possible to make significant improvements in rephrasing questions, identifying words that can confuse or correcting the final questionnaire format so that it becomes a more effective tool.

The sample for this study was made up of 65 students enrolled in online learning courses. The students participated in the online survey on the Moodle platform of the Technical University of Moldova [16]. At the end, 65 questionnaires were completed. The data were analyzed to respond to research questions and cross the similarities and differences between participants.

To analyze the answers given during the study, we adapted the grounded theory method. Specifically, in this study, we proceed as follows:

- First we identify the codes by collecting the terms used by participants to describe the criteria for assessing the quality of online courses. Thus, we obtain a list of terms that include different views expressed in different ways.
- Secondly, we group similar content terms to find common concepts. Therefore, we have gathered them to create the categories – spontaneous entities proposed by participants as important for assessing the quality of online courses. For each category, the most representative view was found.

Each participant chose his current status. Finally, the following groups of participants were obtained:

students (with daily frequency studies); students (low frequency study); masters.

Thus, in the end, the following groups were obtained:

master students – 35 persons; low-frequency students – 10 people; students in the day education form – 20 persons; 46 participants also studied / completed other training courses through the UTM e-Learning platform; 19 participants did not study / have completed other training courses through UTM e-Learning platform.

The results of the categorization and finding the criteria for evaluating the quality of the online courses in the perception of the students

The sample the data were collected in a table whose lines make up the status of the participant and whose columns are the answers to the questions in the questionnaire.

Answers to questions were analyzed using the Correspondence Analysis method that describes the relationship between two categories variables and the relationships between their categories (association relationships).

Correspondence Analysis (CA) is based on contingency table analysis through row and column profiles [17]. The line profiles correspond to the relative frequencies of the different criteria mentioned by each group of participants with different status.

Dimensions are graphically represented to visualize relationships between variables. The CA results were generated using the following code in the RStudio program [18]:

```
data <- read.table("C:/Users/user/Desktop/Sondaj_UTM.txt ", header=TRUE,sep="\t",
na.strings="NA", dec="," , strip.white=TRUE)
summary(data)
library(FactoMineR)
res = textual (data,num.text=4,contingence.by=1)
res$nb.words
descfreq(res$cont.table,proba=0.2)
res = CA(res$cont.table)
plot.CA(res,invisible="col")
```

After the correspondence analysis a geometric visual representation (perceptual map) of the complex relation between the categorical variables occurred, in which the categories with similar distributions occupy close positions, and the categories with different distributions are placed in distant positions.

Below are the results of the Correspondence Analysis (CA) and the observations for each question in the survey:

Question 1: "What I appreciate most of this course"

Masters have appreciated the structure of the online course, accessibility of information, useful information, online evaluation of the possibility of working at distance and the knowledge obtained at the end of the course.

Students with low-frequency studies appreciated the most useful information, teacher activity and the convenience of working at a distance. According to the graphical representation in figure 1, convenience was highly appreciated by this group of students, less by master students and with students daily frequency.

Students with full-time studies have appreciated the teacher, teaching, course content and accessibility of information.

Question 2: "What I dislike in this course"

According to the statistical analysis made by the master students they dislike the platform interface, the large amount of information, a little interactivity, the feeling of isolation.

Students with low-frequency studies deprive the platform interface and repeat recording errors

Most students with daily frequency do not dislike anything but a very small number mentioned that there are few practical lessons.

Question 3: "What were the main technical difficulties that I faced"

Among the main technical difficulties, the master students mentioned the low speed of navigation, the platform sometimes did not work. For students with distance learning it was difficult to create a new account after losing their password, the platform did not work sometimes, the low speed of navigation. Full-time learning students have encountered difficulties uploading high volume files, and they also mentioned that the platform did not work sometimes.

Question 4: "Proposals to improve the course from a technical point of view"

Most Masters have proposed increasing navigation speed and a more attractive interface to the site.

Students with low frequency have the same proposals. While students with daily frequency are proposing to improve the method of uploading high volume files and a more attractive interface to the site.

Question 5: "Objections / proposals to teachers / tutors in the online training process"

The Master's objections are delayed feedback from the teacher and little interaction in the online environment. They would like to have more online communication between course participants and teachers.

Graduate students need more practical lessons, online communication, and teacher feedback.

Students with daily frequency point out that their online course teacher is excellent and would like more online interaction.

When asked if distance learning provides better assimilation of knowledge, 78% master students confirmed the fact, and 22% denied it. The same answers are also found in low-frequency students. 75% of students with daily frequency responded affirmatively.

General course evaluation

Students with daily frequency appreciated the on-line course they graduated with a maximum mark of 10, most of the masters rated 9 and a large proportion of low-frequency students rated it with a grade 8 (Figure 6). The lowest appreciation was the grade 7 that was given by a very small number of survey participants.

The results obtained were examined, then grouped into two major areas. These areas have been positive experiences and negative experiences with online education.

Positive experiences included: easy access to information, online assessment methods, the convenience of learning distance. Negative experiences included: platform interface, high volume of information, low navigation speed, heavy upload of high volume files, delayed instructor feedback, technical support unavailable from the instructor, and a sense of isolation.

The factors that attributed to the positive experiences of the participants were: easy access to computers and the Internet, structure of well-designed course, spontaneous records after evaluations and flexible time for online courses. The factors that attributed to the negative experiences of the

participants were: insufficient time to assimilate information or lack of feedback from the instructor; Monotonous training methods, lack of technical support, lack of interpersonal communication, and poorly designed course interface.

The data collection and analysis provided answers to the following research questions: (1) What is the experience of students receiving online education? (2) How do students perceive the quality of online courses in their experiences? (3) What factors have formed the students' online education? (4) How do these factors contribute to the quality of online education?

5. CONCLUSIONS AND RECOMMENDATIONS

1. Online education is an important component in the continuous growth / development of higher education and adult learning.
2. The quality of online courses is determined by a number of specific factors, such as the presence of multiple student teaching materials, solved problems with detailed explanations, individual papers with clear indications on how to present, self-evaluation activities, to get advice, help, and consultation in synchronous and asynchronous terms from the tutor or teacher.
3. A system with 8 standards, 19 criteria and 46 performance indicators was developed for the evaluation and design of e-learning courses in the frame of distance learning, low-frequency or blended learning programs. The developed system of standards meets the SEG, EURO-ACE as well as specific quality requirements specified in p.2
4. The system was tested by evaluating a set of 14 e-learning courses developed and taught in TUM's electrical engineering and metrology programs as well as selective questioning of students enrolled in courses and of teachers from training courses of course makers at TUM.
5. The result of questioning a sample of 65 students from different categories (students with low-frequency studies, students with daily frequency, masters) found that students would want more online communication and feedback from the teacher. Many respondents also mentioned the amount of information on the course, and it is recommended to review the information in online courses. However, this does not mean that the platform administrator should be reserved to ensure the quality of online education. More importantly, the Administrator must provide enough support for participants, improve platform layout, and provide permanent access to the Moodle platform. The findings of this study will allow institutions offering online courses to evaluate their programs and to provide an effective online teaching.

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