

# QUEST: A Contest-Based Approach to Technology-Enhanced Active Learning in Higher Education

ELENA VERDÚ, LUISA M. REGUERAS, MARÍA JESÚS VERDÚ, MARÍA ÁNGELES PÉREZ  
AND JUAN PABLO DE CASTRO

Department of Theory of Signal, Communications and Telematic Engineering  
University of Valladolid  
ETSI Telecomunicación, Camino del Cementerio s/n, 47011 Valladolid  
SPAIN

*Abstract:* - Active learning methodologies represent, nowadays, one of the most important tools in order to face the change that is taking place in university education. Information and Communication Technologies (ICT) can enhance this type of methodology, since they allow cooperative work and, both, distance and blended learning. QUEST (Quest Environment for Self-managed Training), an innovative system for active learning, is an approach to it. The system presents individual and group work environments in which several “challenges” are proposed as a contest. Therefore, the tasks must be achieved in a time-constrained way and, once submitted, are rewarded by means of a variable scoring system. QUEST is being applied, as a pilot project, in different university courses belonging to, both, Arts and Science degrees. The aim is to adapt a set of subjects of the current curriculum to the new educational model of the European Higher Education Area. The article describes the project and the system QUEST and analyses some of the results from the learning experiences.

*Key-Words:* - Active learning, E-learning, Competitive learning, Collaborative learning

## 1 Introduction

The European Union is moving further and faster, and this progress is taken place in all fields, including education, which is one of the pillars of any society.

In the field of education, it must be highlighted the work oriented to establish Common Reference Frameworks, which will contribute to an increase in the transparency of the education system and, thus, naturally, allow an increase in the mobility of European students. It is necessary to use commonly agreed reference principles, criteria and indicators, and to focus on models and practices for quality assurance, quality indicators and self-evaluation approaches. This is what is called a Common Quality Assurance Framework.

A Common Quality Assurance Framework needs also to be complemented by a European Credit Transfer System (ECTS) aimed at promoting transparency, comparability, transferability and recognition of competences and/or qualifications, among different countries and at different levels.

Over the last years, most European universities have been working in order to successfully introduce the ECTS at a higher education level, thus contributing to turn the European Higher Education Area into a close reality.

Although it was initially designed to facilitate European mobility, nowadays there are a lot of efforts

centred on methodological aspects. Five years ago, on the 23rd of January 2001, Julia González, a promoter of the ECTS from the European Commission, during the celebration of a workshop, highlighted the need for a deep change in the role of the teacher. According to her, the teacher should not be the person who provides an absolute truth, but, instead, should turn into a driving force within the learning process. The aim is for the teacher to show the students to learn on their own which is, nowadays, one of the most valuable and demanded capabilities in any competitive labour market such as the European one.

The redefining of the role of the teacher in such a student-centred system will bring an educational model where the traditional lessons in the classroom decrease at the same time that other activities, like the field work or the individual tutorship, acquire a higher relevance.

A main asset is the use of active methodologies that contribute to develop in the students the capacity to actively research and undertake prominent roles and leadership in their own learning process, facing the resolution of problems with their own resources.

The effectiveness of a learning process is achieved when its results are lasting and transferable to other situations. In this sense, different studies have shown an important improvement on long term retention of that learnt when active learning techniques are

introduced into the learning process [1] [2]. Moreover, other studies have revealed interesting results in terms of student responsiveness and satisfaction, as well as a significant correlation between the use of active learning exercises and final exam scores [3] [2].

It also has to be taken into account that the implementation of an education model based on active methodologies is not an easy task, as a number of difficulties usually arise. Some of these difficulties are: the rejection of new methods by, both, the students and the teachers; the number of students in each class; and, even, the current layout of the classrooms that is more suitable for taking notes than doing group work.

Another fact is that the use of the Information and Communication Technologies (ICT) opens a lot of possibilities with regard to the implementation of active methodologies, as they allow the development of remote cooperative activities, where the role of the teacher can be easily adapted to the new model in which the students must actively lead their learning process [4].

For a complete application of these techniques to a course, most of the current university courses should experience a deep change to adapt themselves to the new learning model. However, this change can be done step by step, gradually introducing new methodologies, tools and concepts into the current reality.

This article firstly introduces a project of application of active e-learning to higher education. This pilot project represents a step forward in the implementation of the new educational model. It then describes an innovative system for interactive education that has been named QUEST (*Quest Environment for Self-managed Training*), which is the core tool of the project. Finally it analyses some of the results from the learning experiences.

## 2 The Pilot Project

The project deals with the application of some innovative ICT-based methodologies to the learning process. The main objective is to offer a dynamic and changing environment in which students are content generators and participate in the learning process in an active way. Therefore, the final aim is the improvement of the learning process itself.

### 2.1 Educational context

The project involves different university courses belonging to both Arts and technical studies. It is

specifically being applied in a group of subjects of different degrees and diplomas given in the University of Valladolid: Degree in Telecommunications Engineering, Diploma in Telecommunications Engineering (several specialities), Degree in Translation and Interpreting and Degree in French Studies.

Most of these courses count with less than 50 students enrolled and are given by only one teacher; however, there are also some courses with more than 100 students enrolled and given by more than one teacher (exactly, by two teachers). In addition, there are core, compulsory and optional subjects.

In short, we have taken into account in the choice of the scenario for the pilot project, among others, all the aspects previously mentioned, in order to count with a sufficiently varied subject spectrum. The final objective is to be able to validate the system in a wide environment and set both general and particular conclusions for the different study cases.

### 2.2 Educational methodology

A dynamic learning environment, based on telematics, and cooperative and competitive workshops, are two main keys of the proposed methodology. It also pursues the development of inquiry, documentation and critical analysis abilities, while raising the level of involvement and communication between students and teachers.

The system can be used in both face-to-face environments and distance learning. In fact, in this project, the system has been integrated as a tool inside a blended learning environment.

Discouragement is one of the top negative factors in this kind of computer-supported learning systems when these are used in distance or blended learning. This can lead students to respond with "minimal effort". Another adverse aspect is the great dedication needed by the tutors to keep students interested and motivated.

Therefore, a hybrid system of tutorship and peer-review is proposed to help manage those problems. Of course, several control techniques have been included for guiding the system towards its learning objectives.

The characteristics of the methodology are the following:

- Dynamic: the students' tasks are rewarded by means of a variable scoring system, which obeys a set of rules designed to prevent negative effects as plagiarism, nepotism, disinterest or lack of motivation. Therefore, besides the dynamism of the telematic communication tools, such as forums or e-mail, the variable scoring system

increases the feeling of change and dynamism considerably.

- Competitive: it is modelled on a contest. The workshop mainly counts with competitiveness, collaboration and social acknowledgment as motivation mechanism and look forward to the strengthening of these abilities in the student's academic work. Hence, workshop sessions are organized as a contest with its corresponding scoring and ranking.
- Collaborative: the system is, although mainly competitive, also collaborative, since it allows the work in teams.
- Students' active participation: students are content generators, not only by answering but also by proposing questions. In most traditional environments, the questions and problems are proposed by the teacher. In QUEST challenges can be also submitted, and the corresponding answers pre-assessed, by the students, who will be rewarded depending on the quality of the tasks done. This can result in an enrichment of the learning process by means of collaboration and involvement.

### 3 The system QUEST

QUEST has been implemented as a module which can be integrated into the e-learning platform Moodle. This platform is based on the World Wide Web, available as free open source software and allows the use of content with several types of formats. In this way, the system is accessible from every computer provided with Internet access and, hence, can be used in the classroom, at home or in a cybercafé.

#### 3.1 General description

The system presents both individual and group work environments in which several intellectual "challenges" or questions are proposed to the students. Those challenges must be solved in a time-constrained way.

When the teacher creates a contest, it should be decided if students have to team up in pairs, threes, fours, etc or to work individually. In any case, there is always an individual ranking, besides the teams score.

The challenges can be submitted by the teacher and, as it has been mentioned before, also by the students.

If a challenge is proposed by a student, the teacher must approve it before the task is presented to the

other students. The student who is the author of the challenge should pre-assess all the corresponding answers, and will be rewarded depending on the quality of the tasks done. Of course, the teacher should approve the assessments done by the student or change the assessment.

The students' tasks, once submitted, are rewarded by means of a variable scoring system, which is described in the following section.

As shown in Fig. 1, QUEST system shows all the time the current summarized ranking with a direct access to a detailed scoring board. There are individual and team classifications. Moreover, in the main area of the screen all challenges proposed by teachers or students are shown.

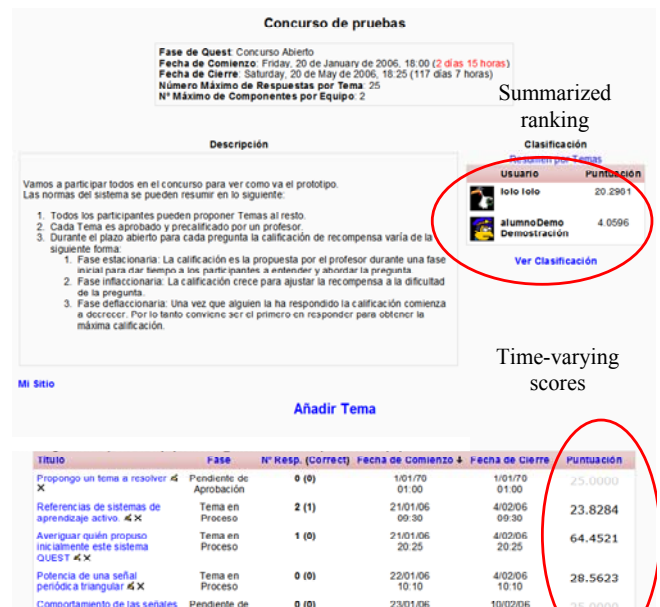


Fig. 1. Main screen of QUEST system in which challenges proposed by students and teachers are shown as well as a summarized ranking.

Although the challenges proposed by students are approved and scored by the teacher, it is possible to configure the system to allow automatic approvals. In fact, an important design point is the flexibility: the teacher has a lot of ways to use the system, the maximum and minimum score can be changed, the number of answers to be accepted can also be configured, etc.

Since the time when the challenge is created until the end of the process, the challenge goes through different phases and states. On one hand, challenges can be on a set of states as follows:

- Approval pending: the challenge has been proposed by a student but a teacher has not approved it yet.
- Start pending: each challenge has a start date and an end date. Answers can be received only during

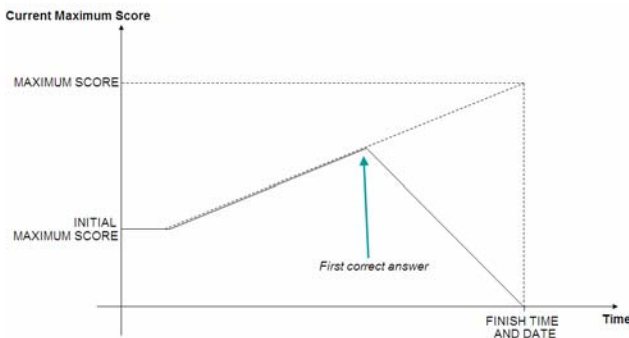
the intermediate period. Besides, before the start date, only who proposed the challenge and/or the teacher can access it.

- In progress: the challenge is fully active; answers are received and scoring is varying.
- Closed: the time to answer is over, and no more answers are allowed. The students can read all submissions and the correspondent assessments but they remain anonymous. The objective is that the student can learn from the answers of other students but preserving their anonymity.

On the other hand, every challenge in progress has a life-cycle dependent on the variable scoring system.

### 3.2 The scoring system

Fig. 2 shows the scoring function, which shapes a life-cycle for the challenges. The teacher, when creating the contest, sets a group of parameters that determine the variation of the score. These parameters are: the date and time of start, the date and time of finish, the initial maximum score and the final maximum score. It is also possible to define an initial period of invariable scoring.



**Fig. 2.** Variation of the maximum obtainable score.

Students get a percentage of the current maximum score as a mark for the answer given.

Therefore, the life-cycle of a challenge is as follows:

- Stationary phase: score remains as proposed by the teacher (the initial maximum score in Fig. 2) during a period of time to allow students to understand and to take in the task.
- Inflationary phase: score grows to adjust the reward to the difficulty. It is assumed that the lack of correct answers means that the difficulty is higher than the reward.
- Deflationary phase: once a challenge is correctly answered, the score starts decreasing so that only the student who has been the first to answer can obtain the maximum score.

Students do not necessarily obtain the whole current maximum score, but only a percentage of it, as a

mark for the answer given. That percentage is calculated according to the assessment, as described in the next section.

### 3.3 The assessment

The final mark obtained by a student in the contest is the sum of the marks for every challenge.

If the challenge has not been proposed by the student, the mark depends on:

- The value of the maximum score at the moment of the answer.
- The assessment result: it could range from 50% to 100% of the current maximum score for the correct answers. If the result is below 50% the system considers that the answer is wrong.
- The scores obtained by other members of the team (only if teams exist): every member of the team gets a percentage of the mark obtained by the student or students who answer the challenge.

The teacher can, at any time, modify the marks awarded by the system.

The assessment is made on the basis of a group of criteria that should be established by the teacher when creating the contest. These criteria are known in advance by all students. There are two sets of assessment criteria, to be defined: one to assess the answers and another one to assess the challenges proposed by the students. In any case, the set defined can include as many criteria or elements as the teacher likes; and the values for each criterion defined can be binary ('yes' or 'not' for example) or have a wider range (from 0 to 5 for example). Besides, the weight of each criterion can be changed, since the system automatically assigns the same weight to each of them. Finally, comments can be introduced for each assessment criterion.

## 4 Evaluation of Learning Experiences

### 4.1 Evaluation methodology

Besides analyzing the data registered by the system, a questionnaire is used in order to pick up the suggestions and evaluation results.

The questionnaire includes aspects related to:

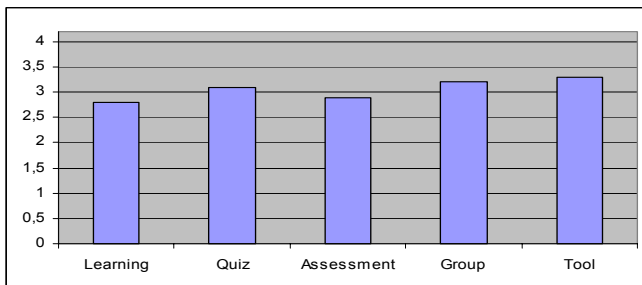
- Learning with QUEST: Do the students like to learn by means of this new type of learning? Does this system help, motivate, and encourage the students to study? Which is the level of learning? And the level of motivation, adaptation to the environment, level of collaboration, work load...?

- The proposed challenges: Are the tasks in line with the aims of the course? What about the quality, difficulty, clarity, usefulness and length of the task?
- Assessments: Have the assessments of the answers and challenges suggested by the students been precise? Which is the difficulty and interest of assessing the other students?
- Teams: What are the advantages of working in teams? Have the cooperation and contribution among the members of the team helped the students' progress to improve?
- Tools: How are the suitability, design, difficulty, usefulness, clarity, use and operation of the QUEST tool? What do the students prefer or miss in the tools used in the system?

**4.2 Analysis of student satisfaction**

The first to analyze in order to know if the system is successful is the level of students' satisfaction.

In general terms, the experience has been positively evaluated and the main results are summarized in Fig. 3, where the average score assigned to each item (in a scale from 1 to 5) is represented.



**Fig. 3.** Level of students' satisfaction.

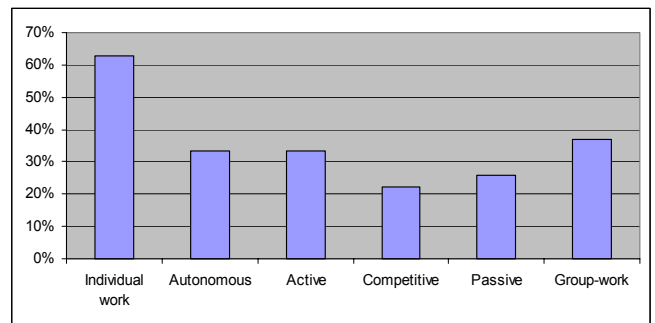
The results indicate that learners are satisfied with this new learning method. Most learners think that the tasks are appropriate for the aims of the course and are presented in a clear and concise manner. According to their answers, the students find that the proposed challenges are adequate or very adequate (80%), highly useful (85%) and suitable in duration (88%). From this data, it is deduced that the quality of the challenges is satisfactory.

The students also appreciate positively the group-work. They feel that the cooperation and interaction with their contest partners are important features in the learning process.

Moreover, the students have very positively evaluated the QUEST tool. In short, they like the possibility of competing with their contest partners in order to come up with challenges and improve their

positions in the ranking. However, they also think that the score system of QUEST is unfair since it is favourable to the students with fewer courses and that the competitiveness causes stress. Besides, this learning method involves devoting a lot more time to the daily study.

Finally, it is interesting to examine the students' profile. Fig. 4 shows that individual work is preferred to group work even though many students admit the advantages of working in group. The fact is that most of them feel more comfortable with individual work and prefer group work only for special tasks.



**Fig. 4.** Students' profile.

Comparing student-centred systems to traditional teacher-centred systems, most students (74%) do not like their passive role. However, only 33% of students like participating and having an active role. This apparent contradiction has an explication: on one hand it is what students think that is right to do, and on the other what they really like doing. They are not used to participating in an active way and, therefore, many of them feel uncomfortable taking an active role. This is the purpose of QUEST methodology; it has been designed to change this feeling and, finally, achieve a more active role of the student.

**5 Conclusions**

In this article, the telematic system QUEST has been described, which has been designed to be used as a tool for an active learning methodology. The system is still being tested as a pilot project whose aim is to adapt a set of subjects of the current programmes to the new educational model of the European Higher Education Area.

The following results and contributions are expected:

- QUEST: it is, firstly, a "potential" new module for Moodle and, secondly, an innovative tool for interaction and cooperative work based on the ICT, which can be applied to courses of different natures. QUEST makes it possible to:

- Develop students' abilities in investigation, documentation and critic analysis.
- Promote the participation and the communication among the students and with their teachers.
- A new teaching-learning strategy and the corresponding adapted assessment method, based on active methodologies and the system QUEST.
- Innovative strategies as those related to the partial assessment of the students carried out by their classmates, which can be very useful if the teacher instructs them properly to achieve this assessment task.
- A learning approach based on work groups and the autonomous learning of the student, guided by the teacher.
- Teachers trained in the use of new methodologies which intend to allow the students to acquire the characteristics required by the new professional profiles, such as active, autonomous, strategic, reflective and cooperative abilities.
- Methods to estimate the workload in order to effectively calculate the total work carried out by the student, which is required by the ECTS.

The results of the preliminary evaluation show that most participants are satisfied with QUEST. In brief, the QUEST system presents for the students several positive aspects:

- It makes the learning more active and dynamic. Some students have even said that they feel more motivated to be able to think for themselves and try to apply the concepts studied.
- A continuous effort is encouraged. In the traditional learning process, the students usually study only before the exams. With a methodology like that proposed in QUEST, they feel more motivated to study during the entire course.
- It provides independence from space and time. QUEST allows to follow the course from outside the classroom.
- The quality of the challenges is high. The students think that the challenges are interesting, clear and in line with the objectives of the subject.

However, the students also highlight some negative aspects, like an excess of competitiveness, an increase of work volume and some think that it is unfair because some students have access to Internet from home, while others do not. This last negative impression is stronger in those cases in which the teacher limits the number of answers which are accepted by the system and, therefore, assessed. In any case, the results obtained show that 81.5% of the students accessed to the system from home, and this figure is expected to increase in the very near future.

In a few months time, the system QUEST will be available in multiple languages including Arabic, Polish, German, French and Russian, as well as the different languages spoken in the regions in Spain. This is possible thanks to native speakers from our university, who have volunteered to translate it from Spanish into their mother tongues. This could be also considered as a sign of success.

Other future projects in the short term are focused on the improvement of the telematic system and of the methodology used which will be materialised in a new version of the QUEST tool.

This new version will offer features such as assessment forms customized for each challenge, peer-to-peer assessment, a more detailed presentation of the evolution of each challenge proposed or the analysis of performance and diagnosis of potential problems related to a heavy workload.

Finally, the system is also planned to be used in a higher number of university courses in future academic years.

## Acknowledgement

The authors gratefully acknowledge "la Consejería de Educación de la Junta de Castilla y León" (Education Authority of the Regional Government of Castilla y León) for its financial support in this work.

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