



TEEM'19

TECHNOLOGICAL ECOSYSTEMS FOR
ENHANCING MULTICULTURALITY
LEÓN 16-18 OCTOBER 2019

teemconference.eu



Proceedings
TEEM'19

Seventh International Conference on Technological Ecosystems for Enhancing Multiculturality

León, Spain
October 16th – 18th, 2019

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TEEM'19 is organized by the Robotics Group of the Universidad de León and
Research GRoup in InterAction and eLearning (GRIAL) of the Universidad de Salamanca



Seventh International Conference on Technological Ecosystems for Enhancing Multiculturality
(TEEM'19)
Robotics Group
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The Association for Computing Machinery (ACM)
2 Penn Plaza, Suite 701
New York New York 10121-0701

ISBN: 978-1-4503-7191-9

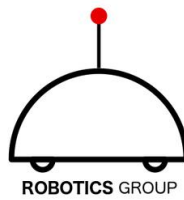
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TEEM 2019 Preface

Dear readers,

This book gathers the works carried out by an important number of researchers in the context of TEEM Conference 2019. The seventh edition of this International Conference on Technological Ecosystem for Enhancing Multiculturality – TEEM, as every two years, takes place outside its birth home, Salamanca. This year TEEM takes place at León (North West of Spain), organized by the Robotics research group of the University of León, that this year is celebrating its 40 anniversary [1].

Since the first edition in 2013, TEEM conference has grown with the aim of developing a research community around the application of ICT in different fields towards to contribute in the Knowledge Society [2]. This goal is achieved thanks to researchers from different areas and always keeping in mind the idea of a conference where Ph.D students can evolve [3-9], by posing their works, exchanging ideas with their peers and being mentored by other researchers all over the world. In addition, the conference will consider other stakeholders of the research landscape as research projects and companies.

TEEM Conference has grown in both quality and quantity of research works. The first and second edition were held at Salamanca with 83 and 102 accepted full papers and several special issues published in well-ranked journals [10-25]. After that, the conference took place out of Salamanca, at Porto (Portugal), beginning a sequence that has a hosting institution one year and the next one returns to Salamanca. The third edition published 90 full papers with some associated journals [26-29]. In the fourth edition (2016) the number of contributions grew up reaching 165 accepted papers (from 235 submissions) and several journals [30, 31]. In 2017 the conference was hold at Cadiz with 84 accepted papers over 109 submissions and also a special issue [32]. TEEM 2018, the last edition, was held in Salamanca with 151 full papers accepted from the 243 submissions received, it has three special issues associated in different journals [33-35]. The present edition has had 215 submission from which 148 full papers were accepted, that is, there is a 31,17% rejection rate. These papers have involved 468 authors from 29 countries. TEEM2019 has 8 special issues associated in journals and it is structured in the following topics:

- Track 1. Computational thinking and robotics in education
- Track 2. Engineering Education addressing Professional Challenges
- Track 3. Evaluation in education and guidance
- Track 4. Bridging the diversity gap in STEM
- Track 5. Learning Analytics: The End of the Beginning
- Track 6. Merging new Technologies with Health Sciences Education and Practice
- Track 7. Advances on Sustainable Development in Higher Education
- Track 8. Implementation of Qualitative and Mixed Methods Researches
- Track 9. Supercomputing education: Thinking in parallel
- Track 10. Teacher Education for ICT integration in classroom
- Track 11. Smart Learning
- Track 12. Educational Innovation
- Track 13. Uncertainty in Digital Humanities
- Track 14. 10th International Workshop on Software Engineering for E-learning (ISELEAR'19)
- Track 15. Communication, Education and Social Media
- Track 16. Doctoral Consortium

Most of these topics have being explored in the different conference editions and tracks change each year, this year two new initiatives have been very welcome. These are track 4, regarding the diversity in STEM and track 9, that deals with the use of Supercomputers in education. It should be also noted that, as in other editions, results from several projects are presented during the conference, such as H2020 WYRED project (netWorked Youth Research for Empowerment in the Digital society) [36-39] or the RoboSTEAM Erasmus Project [40].

We would like to thank the authors attending the conference because we learned from you as much you learned from us; the steering and scientific committees for their work and suggestions; the track chairs for their effort attending to authors and checking that everything is right in their tracks; the sponsors for their products and economic support, and specially the Robotics and GRIAL Research groups teams for supporting the conference process. Also, it is necessary to mention the University of León and ACM for helping us in this amazing experience. We hope to see you all next year in Salamanca again.

Miguel Á. Conde, Francisco J. Rodríguez-Sedano, Camino Fernández-Llamas and Francisco J. García-Peñalvo (coeditors of TEEM2019 Proceedings)

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SMART LEARNING



Review Tasks of the Course's Contents

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ABSTRACT

In this paper some reinforcement tasks are presented: review the concepts learned during the course through videos from other academic institutions, questionnaires and smart games. It is required by the teacher, a careful process of selection based on criteria such as the level of knowledge, examples of real applications, video length, and clarity of mathematical development. After watching the material, a final form must be completed by the students to focus on the milestones. Students have access to the material at the end of the course, small groups can watch videos that last approximately 3 minutes, from their smart phones using the wireless network. The questions to answer seek to identify the level of understanding of the concepts used and to identify the weaknesses of each subject. Thus, the viewing around 10 videos allow reviewing the most important issues of the course's content. It is motivating the review of the topics in a simple and fast way because the confidence level of the student increases before the final test. The strategy for the development of games in the classroom should be voluntary, anonymous, with a reduced cost of time. Kahoot and Socrative are used to review concepts of the course. The quiz let diagnose weak points on the learning process in the classroom.

CCS Concepts

K.3 [Computer and Education]: Computer Uses in Education. Collaborative learning, distance learning. – Information and communications technology (ICT).

Keywords

Video; Quick Response (QR) codes; Teamwork; Questionnaire; Quiz.

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TEEM'19, October 16–18, 2019, León, Spain
© 2019 Association for Computing Machinery.
ACM ISBN 978-1-4503-7191-9/19/10...\$15.00
<https://doi.org/10.1145/3362789.3362845>

ACM Reference format:

Teresa Parra-Santos, Ivana Milanovic, José M. Molina-Jordá, Lucila-Paola Maiorano-Lauria and J. Rubén Pérez-Domínguez. 2019. Review Tasks of the Course's Contents. In *Proceedings of the Seventh International Conference on Technological Ecosystems for Enhancing Multiculturality (TEEM 2019) (León, Spain, October 16-18, 2019)*, ACM, New York, NY, USA, 6 pages. <https://doi.org/10.1145/3362789.3362845>

1. Introduction

As part of the technical training in college, a mobile device is a tool that allows following online courses from top universities, watch videos or tutorials about laboratory practice (M-learning). Multimedia materials allow not only to understand concepts, but to identify its applications in the real world.

It is commonly known that the student's attention decreases in traditional classes because of fatigue or the difficulty of the subject. It is proposed to use for a few minutes the mobile devices to access, via QR codes, to multimedia material that will be discussed and will reinforce the review of the issue. This allows not only an increase understanding, but to identify whether it is an already learned aspect or it requires still further study. The aim is to support the learning process and to provide easy access to useful material.

This paper describes the methodology used to make final revision in the subject of Fluid Mechanics at the University of Valladolid. Seminars are carried out using QR codes (Quick Response codes) to display short videos on the fundamental concepts of matter collected by Parra et al [1-3].

Popular platforms of student response systems (SRS) are Socrative, Quizlet, Poll Everywhere, among others. Two applications were used to complete questionnaires in the classroom at the end of the course in a seminar.

This project is a collaboration of the University of Alicante, where activities have already been conducted using QR codes [4], and the University of Hartford (USA). The methodology is easily transferable to other subjects.

Generation of quick response codes can be made from multiple web servers.

To create a QR code can be used websites such as: <http://www.qrcode.es/es/generador-qr-code/>,

<http://qrcode.kaywa.com/> or <https://www.the-qrcode-generator.com/>. This project has used massively QRSTUFF. [5].

2. Methodology

2.1 Manage of Quick Response Codes

When the generator is used without a previous registration, static codes are generated. However, when registering, it is possible to obtain dynamic codes that allow statistics of hits on the web using the code. The usage is as simple as entering a website address (URL) and download the generated code.

There are also many applications for mobile devices that read rapid response codes, such as: Inigma, QR Droid or Quickmark. The application recommended to the students was SCAN_ME [6].

Scanning a code from the QR reader application allows immediate access to the URL indicated without typing long addresses or reducing it to a relatively short addresses using for instance <https://bitly.com/shorten/> [7].

2.2 Use of Quick Response Codes

The learning process allows the frequent use of mobile devices (M-learning) to promote student interaction and enhance their own learning construction. In the actual experience, the use of QR codes is proposed to expedite the access to academic videos of different subjects of Fluid Mechanics.

The Horizon Report (2008) [8] believes that smartphones are one of the emerging technologies that will have more weight in the future teaching process. In this case, it is intended to develop activities of less than 3 minutes that serve to keep the interest and recuperate the attention of students in a subject that can be monotonous for the long mathematical developments.

QR codes are not a tool in the educational context, but help to open a wide range of opportunities to improve student-centered learning. These codes are a link that connects the real applications with the theoretical aspect.

3. Results

3.1 Sample of Materials Used

There is a wide variety of material available on the web. This material must be classified by themes and videos should be selected with a suitable length based on the efficient review of the fundamental concepts of each subject. These materials are offered under the Creative Commons licenses by different institutions such as the Universities of Stanford, Maryland, Calgary or MIT.

Table 1 is a representative sample videos visualization techniques fluid movement. These videos show descriptions of the same phenomena but they are told from different points of view, including real applications, laboratory experiments and numerical models. All this contributes to a faster and deeper

understanding of the concepts and to identify whether it is an aspect to continue studying or has already been properly assimilated.

It has been found that students do not show any difficulty viewing videos in English. A minority uses the option of subtitles available in most educational YouTube channels.

Table 1. Sample of videos used in the aula

Subject	QR code
Pathlines, Streamlines, Streakline Calgary University	
http://bit.ly/1mQJmBZ	
Pathlines, Streamlines, Streakline	
http://bit.ly/1Qsdhbh	
Pathlines and Streamlines, University of Maryland	
http://bit.ly/1KB0O9n	

Streamlines and
Streakline

Stanford University

<http://bit.ly/2175laE>



Table 2. Sample of long length videos

Subject	QR code
Introduction to Fluid Mechanics	
http://bit.ly/1nfjZFY	
Turbulent Flows by Professor C. J. Chen	
http://bit.ly/1UiEgKm	

Students are encouraged to watch at home longer material with lectures by other institutions. See Table 2 for samples of lectures.

3.2 Questionnaire of the Final Revision

This section describes the final questionnaire to fill up a few days before the final test. As a supplement to the last seminar, the questionnaire asks about the important concepts of subject. Experience shows that students are better prepared to test because they have been able to locate weaknesses that should be improved.

There are three different approaches to conduct a questionnaire review of the contents of the subject. The first method is a questionnaire made with google and that can be done by the student from home before the exam. The anonymous

results of the students are visualized by the teacher in an Excel, Parra et al. [8].

The second way to review is a multi-response questionnaire conducted in Socrative to perform in the classroom, in real time students and teachers see the correct answers and the percentage of students who have answered each answer. This allows the teacher to review concepts that may have been poorly understood. Parra [9] shows the experience of the use of Socrative questionnaires for the review of the subject. Other possible Student Response Systems are: Quiz Socket, Poll Everywhere, Menterimeter, ...

The third option is the use of Kahoot! to reproduce the same questions but with the incentive of the competitive nature of the game.

This form had 13 questions with closed answer and 3 questions with open answer. All of them were classified into 4 themes of subject. See figure 1 for a sample of the questions.

The form was available at the end of the course. The realization of the form requires a few minutes. It has been found that students appreciate having a tool that allows locate aspects that must be reviewed.

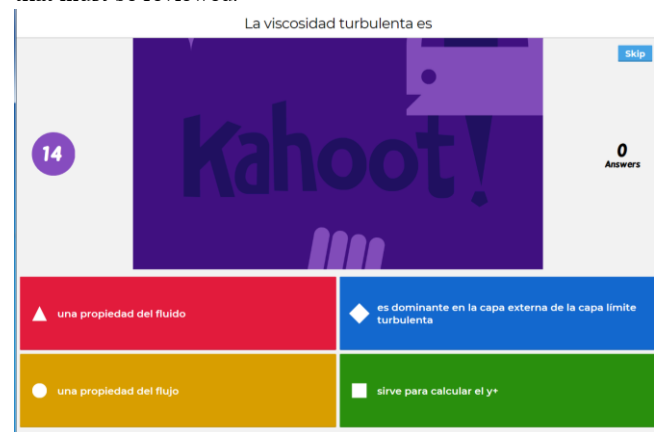


Figure 1: Sample of one part of the questionnaire

3.3 Method based on Competitive Games

The methods used for the Game based Student Response Systems were Kahoot and Socrative, [9]. The teacher launches from his computer the game that is projected on a large screen. Students connect with their mobile devices to a web page (<https://kahoot.it/>) or (<https://www.socrative.com/>) where they enter the course code and a nickname that allows them to participate anonymously.

The objective for the student is to answer correctly in a matter of a few seconds. Latter the classroom screen shows the statistical performance of the answers and the teacher can review the concepts involved with the question. It is a useful precursor that motivates students to solve some doubts.

4. Evidence of success

4.1 Results of the Questionnaire

Figure 3 presents the results of the success rate of students after participating anonymous in the contest. The responses were collected in an Excel file. It is evident that question 3 requests further explanation because of its low success rate.

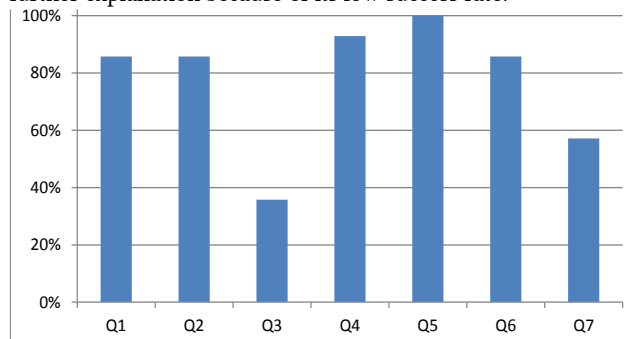


Figure 3: Percentage of success on the questionnaire of revision

4.2 Feedback from students

At the end of the course, a survey asks the students about the utility of different teaching methodologies. When the students were asked about the utility of the videos to understand better the subject, more than 70% were agree with the statement, see figure 4.

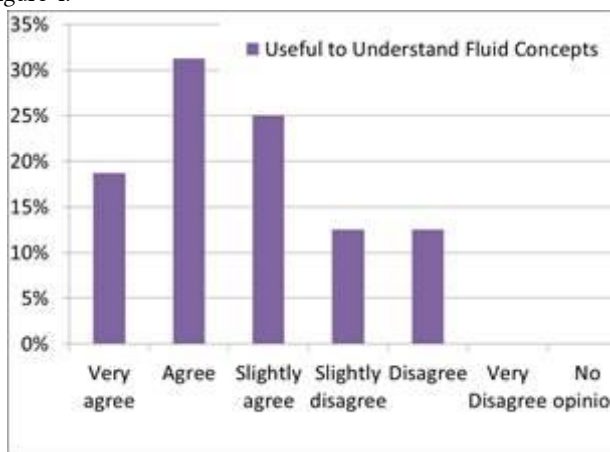


Figure 4. Perception of the utility of videos to understand the concepts.

Table 3 shows the data of students of the two groups, those who had the Kahoot! experience and those who did not, indicating the percentage of students submitted to the exam, percentage of those who passed the written test, the average value of the grade and the variance in each group.

Table 3. Statistical data of the groups participating in the experience

	Review with <i>Kahoot!</i>	Review without <i>Kahoot!</i>
Enrolled Students	100	83
Examined Students	66%	73%
Success rate of examined students	58%	46%
Average Grade	4.962	4.565
Grade variance	3.610	3.689

The statistical analysis of the results reveals no influence on the motivation to take the exam, among the students who made the review of the subject participating in the contest and those who did not. Even though the review increases the participation in class, asking questions related to the topics of the contest. Although both groups show similar variance in their grades, the average scores of the group that reviewed the subject through the Kahoot! was 8% higher, with the rate of passing the exam 12 points higher than that of the group without a competition.

5. Conclusions

The virtual environment facilitates participation in a less intimidating environment than the classroom. In addition, anonymity in implementing refresher forms is vital to ensure successful learning.

The viewing of videos of different sources aids to improving understanding. The orientation of the teacher is fundamental in the selection of the material and the development of questionnaires that let identify weaknesses before the final test.

The multimedia material developed by other institutions, is a support and reinforcement to lectures and laboratory sessions of the subject. This kind of material, ranging from courses, curiosities to industrial infrastructures is a link between theoretical concepts and practical applications of these concepts. An important percentage of students consider the watching of videos help the understanding of concepts.

The use in the classroom of learning based on games has increased its popularity in recent years. Although the concept of questionnaire in higher education is not new, since it has served as an evaluation tool, its use in the classroom in a context of play or competition has a direct impact on different aspects such as: participation in the classroom and attention to the development of the activity, perception in the progress of the learning process, commitment to the dedication to the subject and interest in deepening applications of the theoretical concepts.

ACKNOWLEDGMENTS

The authors thankfully acknowledge the University of Valladolid for the projects of Educational Innovation (ref. PID/2018/122).

Teresa Parra and José M. Molina would like to acknowledge University of Alicante for support through the project

INTERMAT V (INTERdisciplinary network for research on MATerials) (2015/2016) VI (2016-2017) and VII (2017-18).

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ISBN 978-1-4503-7191-9

