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MEMORIA FINAL

Actuaciones Avaladas para la Mejora Docente, Formación del Profesorado y Difusión de Resultados
Modalidad C

Identificación de la actuación	
Código:	AAC_13_006
Título:	USE OF THE ICTS AS A TEACHING TOOL FOR THE STUDENTS' SELF-LEARNING: FORUM OF DISCUSSION

Responsable	
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Correo electrónico:	carolina.mendiguchia@uca.es
Departamento:	Química Analítica

1. Describa la contribución a la actuación de cada uno de los participantes. Copie y pegue las líneas que necesite para contemplarlos a todos y disponga del espacio que necesite.

Apellidos y nombre:	Juan José Pinto Ganfornina
Responsable del proyecto de innovación PI2_12_040, que ha generado los resultados que han sido difundidos. Ha intervenido de forma activa en la elaboración del producto final generado.	

Apellidos y nombre:	Estrella Espada Bellido
Participante en el proyecto de innovación PI2_12_040, que ha generado los resultados que han sido difundidos. Ha intervenido de forma activa en la elaboración del producto final generado.	

Apellidos y nombre:	José Antonio López López
Participante en el proyecto de innovación PI2_12_040, que ha generado los resultados que han sido difundidos. Ha intervenido de forma activa en la elaboración del producto final generado.	

Apellidos y nombre:	Carolina Mendiguchía Martínez
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2. Aporte el producto final generado para la difusión.

Use of the ICTs as a learning tool for the students´self-learning: Forum of discussion

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INTRODUCTION

The European Higher Education Area has promoted depth changes in the Spanish Educational System mainly based on the students' learning and assessment methodologies. In this regard, continuous assessing and self-learning are presented as a key factor for a quality teaching-learning process.
In the last years, ICTs have been presented as a very useful tool to conduct and assess several learning activities mainly based on the use of on-line platforms such as the Virtual Campus. These platforms are usually employed by professors to upload materials and documents which are considered of interest for students. However, among the most powerful tools that can be found in these platforms, the use of discussion forums could be highlighted.
In this work, the use of on-line discussion forum in the subject "Instrumental Techniques for Environmental Analysis", which is taught in the Degree of Environmental Sciences of the University of Cadiz, is presented.
In particular, students were asked through the Virtual Campus for participating in a debate about a topic related to the subject that was selected by professors. The activity was performed twice in the semester with different topics. In all cases, students' participation in forums was required and the frequency and quality of their contributions was evaluated.

COURSE DESIGN

INSTRUMENTAL TECHNIQUES FOR ENVIRONMENTAL ANALYSIS

DEGREE: ENVIRONMENTAL SCIENCES
SEMESTER: 4º SEMESTER
THEORY CLASSES: 32 SESSIONS, ONE HOUR EACH
LABORATORY COURSE: 8 SESSIONS, TWO AND HALF HOUR EACH

THEORETICAL BLOCKS
- WATER ANALYSIS
- AIR ANALYSIS
- SOIL ANALYSIS

ASSESSMENT
- TERMINAL EXAM: 70%
- CONTINUOUS ASSESSMENT: 30%
  - LABORATORY SESSIONS 20%
  - FORUM OF DISCUSSION 10%

FORUM OF DISCUSSION

FORUM 1

WATER: EUTROPHICATION PROBLEM
Viola river crosses along its course a town of 20,000 citizens, poorly industrialized with a wastewater purification system. Moreover, in the lower course of the river crosses an extent agricultural area. A big problem of eutrophication was detected. What chemical parameters would you analyze to know the repercussion and impact of the problem? Which could be the origin? Which analytical technique would you use for the determination of the pollutants? Explain your answers.

- Participation: 87 %
- 100 contributions registered
- Main contributions:
  - importance of human pollution
  - chemical variables to be analysed
  - techniques available
  - debate

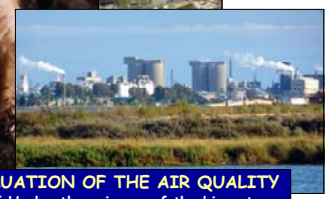
ASSESSMENT CRITERIA

✓ The number of postings, length, frequency and quality of contribution were considered.
✓ It was also taken into account the level of critical thinking and depth of analysis of the topics.
✓ Depending upon the post was completely original or a follow-up to an existing one, the mark was different.
✓ The posts that reflected deep learning and critical thinking were positively assessed.
✓ It must be highlighted that not only the content was evaluated but also the scientific writing style, relevance and originality of the participation.

FORUM 2

WATER: ANTHROPOGENIC EFFECTS IN A BAY
It is well known that in Algeciras´s Bay there are many types of industries. Furthermore, one of the largest containers dock in Europe is located in Algeciras. A study of the water quality of Algeciras is required to evaluate the effect of such activities in the aquatic medium. What parameters should you analyze? Which technique would be the most adequate to determine the different pollutants? Explain your answers.

SOIL: EVALUATION OF SOIL FERTILITY
A farmer needs to know the fertility of a soil to decide what type of cultivation can be done on it. What parameters should be analyzed? What technique would be the most adequate to measure the pollutants? Explain your answers.

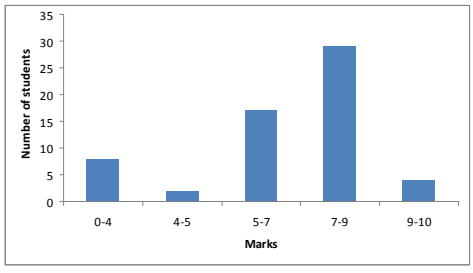


AIR: EVALUATION OF THE AIR QUALITY
In the city of Huelva there is one of the biggest chemical hubs in Andalusia generating such a great quantity of polluting gases emitted into the atmosphere. What parameters should be measured to know the quality of the air of the city? Which technique would you employ to determine each one of the pollutants? How would you evaluate the contamination from each of the emission source? Explain your answers.

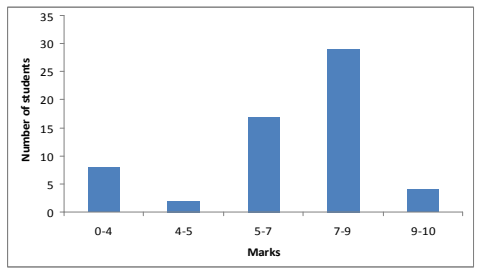
- Participation: 87 %
- 95 contributions registered
- Students participated in more than one forum
- Debates improved in comparison with forum 1

RESULTS

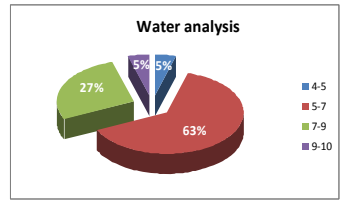
Assessment of the first forum

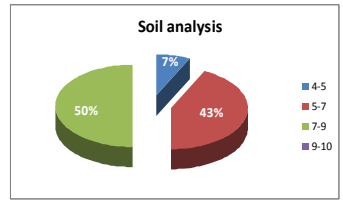


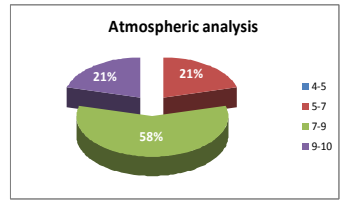
Assessment of the second forum



Assessment of the second forum by topics



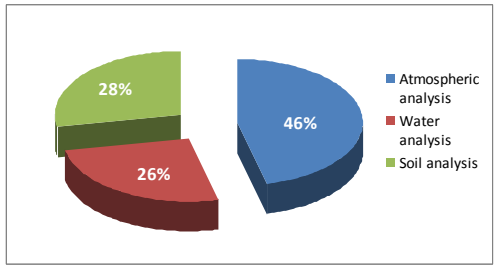




First forum
➢ Six students who didn't participate in the forum had a mark equal to 0.
➢ The assessment's results showed a Gaussian distribution.
➢ Only seven students contributed to the discussion with several and well supported opinions.

Second forum
➢ Eight students didn't participate in the forum.
➢ The biggest proportion of students got marks higher than 7 points.
➢ The best average mark was obtained by students participating in the atmospheric analysis forum.
➢ The students considerably improved their communication skills.

Distribution of participants in the second forum



CONCLUSIONS

➢ Online platforms such as the Virtual Campus in the University of Cadiz appear as a valuable tool to develop and assess self-learning activities.
➢ Forum of discussion has been presented as a good tool to improve the students' communication skills in a scientific style.
➢ Students have maintained up-to-date in the topics related with the subject with the help of the forum.
➢ The assessment of such activity was promising by professors because they got information about the contents of the subject in which students were more interested and also which aspects they would take into account to improve their teaching techniques.
➢ Finally, the online discussion forum has shown as a valuable tool to carry out self-learning activities enabling the assessment of students´ progress in the subject.

The authors acknowledge the "Unidad de Innovación Docente" of Cádiz University for the financial support.

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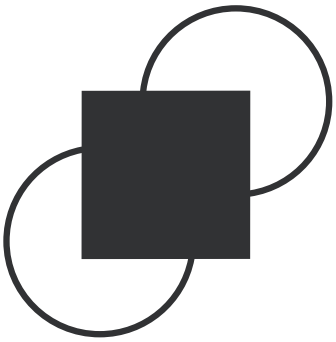

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WELCOME INTRODUCTION

Dear ICERI2012 participants,

It is a privilege to welcome you all to ICERI2012.

In this 5th annual edition of ICERI, we all know that the main purpose of this conference is to promote the interaction with other partners and create an academic debate with experts at international level. We hope that your experience here will provide you a valuable opportunity for you to learn as much as you can, get new ideas and make new contacts.

In fact, the final program has been designed to cover a wide range of interesting topics related to Education, Research and Innovation and to create a discussion platform to exchange ideas and experiences. So we invite you to take this opportunity to enjoy the conference sessions, poster sessions and social activities during these days.

We also wish to take this opportunity to welcome the participants. It is gratifying to have delegates from more than 70 countries with a common interest on education. Thank you for coming to ICERI2012 and for having travelled from far to join us.

This should also be a good occasion for you to explore Madrid. Do not lose the opportunity to enjoy and live this unique city and its surroundings. It has an enormous cultural and historical offer that will make your stay unforgettable.

Finally, we really wish you a very fruitful and successful conference and a pleasant stay in Madrid. Thank you for contributing to ICERI2012!

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CONFERENCE SESSIONS

ORAL SESSIONS, 19th November 2012.

Blended and Mobile Learning
Experiences in Undergraduate Education (1)
University-Industry Cooperation (1)
Accreditation and Quality Assurance
New Challenges in the Higher Education Area (1)
Technology in Engineering Teaching and Learning
Language Learning Innovations (1)

Technology Innovations in Teaching and Learning (1)
Experiences in Undergraduate Education (2)
University-Industry Cooperation (2)
Workplace Learning and Collaborative Learning. WBLQUAL Project
New Challenges in the Higher Education Area (2)
Experiences in Engineering Education
Language Learning Innovations (2)

Technology Innovations in Teaching and Learning (2)
New Trends and Experiences in Education
International Projects
Policy Issues in Education and Research
In-service Training and Professional Development of Teachers (1)
Technology in Health & Life Sciences Teaching and Learning
New Trends in Foreign Languages Education

Technology Innovations in Teaching and Learning (3)
Education practice trends and issues (1)
Generic Skills in Curriculum Design
Global Issues in Education and Research
Pre-service Teacher Experiences (1)
New Trends and Experiences in Health & Life Sciences
Technology in Foreign Languages Teaching and Learning

POSTER SESSIONS, 19th November 2012.

Poster Session 1. Technology in Teaching and Learning and Experiences in Undergraduate education

Poster Session 2. Assessment of Student Learning and Experiences in Primary, Secondary and Post-graduate education

ORAL SESSIONS, 20th November 2012.

Research on Technology in Education
Experiences in Undergraduate Education (3)
New Experiences in Curriculum Design
Diversity Issues in Education and Research
Special Education (1)
Links between Education and Research
New Experiences in Maths & Statistics Education

Web 2.0 and Social Networking
Education practice trends and issues (2)
Accreditation and Quality Assurance: Evaluation and Assessment
Barriers to Learning (1)
Special Education (2)
Technology in Primary & Secondary Education
Experiences in Communications & Media Studies

e-learning Experiences
Education practice trends and issues (3)
Assessment of Student Learning (1)
Barriers to Learning (2)
Teacher Training
Experiences in Primary and Secondary Education (1)
Technology in Business Adm. & Mgmt. Teaching and Learning

e-content Management and Development
Adult and Vocational Education
Assessment of Student Learning (2)
Education, Research and Globalization (1)
In-service Training and Professional Development of Teachers (2)
Experiences in Primary and Secondary Education (2)
New Trends in Business Adm.& Mgmt. Education (1)

ICT Skills in Education
Student Support in Education
New Trends and Experiences in Research
Education, Research and Globalization (2)
Pre-service Teacher Experiences (2)
Education in Psychology and Psycho-pedagogy
New Trends in Business Adm.& Mgmt. Education (2)

POSTER SESSIONS, 20th November 2012.

Poster Session 1. New challenges in Higher Education and Research, Accreditation and Quality, Curriculum design and University-Industry Cooperation

Poster Session 2. Teacher Training Experiences and Global Issues in Education and Research

VIRTUAL SESSIONS

Academic Advising and Tutoring
Academic Research Projects
Accreditation and Quality Assurance
Adult education
Advanced classroom applications and technologies
Assessment of student learning
Barriers to Learning
Blended and Mobile Learning
Curriculum Design
E-content Management and Development
e-learning experiences
Education practice trends and issues
Education, Research and Globalization
Educational/Serious Games and Software
Ethical issues in Education
Experiences in Post-graduate education
Experiences in Primary and Secondary education
Experiences in Undergraduate education
Government Policy issues
International Projects
Language Learning Innovations
Learning and Teaching Innovations
Learning Management Systems (LMS)
Life-long learning education
New Challenges in the Higher Education Area
Research Methodologies
Research on Technology in Education
Student Support in Education
Teacher Training
Technology in Teaching and Learning
University-Industry Cooperation
Virtual Learning Environments (VLE)
Vocational training
Web 2.0 and Social Networking

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An Author Index, a Session Index, and the Technical Program are included in HTML format on this disk to aid you in finding conference papers. Using these HTML files as a starting point, you can access other useful information related to the conference.

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3. Type the search text, click Search button, and then proceed with your query.

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2. A new window will appear with search options. Enter your search terms and proceed with your search as usual.

For Acrobat 8:

1. Open the Search window, type the words you want to find, and then click Use Advanced Search Options (near the bottom of the window).
2. For Look In, choose Select Index.
3. In the Index Selection dialog box, select an index, if the one you want to search is available, or click Add and then locate and select the index to be searched, and click Open. Repeat as needed until all the indexes you want to search are selected.
4. Click OK to close the Index Selection dialog box, and then choose Currently Selected Indexes on the Look In pop-up menu.
5. Proceed with your search as usual, selecting other options you want to apply, and click Search.

For Acrobat 7 and earlier:

1. In the “Edit” menu, choose “Full Text Search”.
2. A new window will appear with search options. Enter your search terms and proceed with your search as usual.

USE OF THE ICTS AS A TEACHING TOOL FOR THE STUDENTS´ SELF-LEARNING: FORUM OF DISCUSSION

Mendiguchía, C.[1], Espada, E.[2], López-López, J.A.[1], Pinto, J.J.[1]

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Abstract

The European Higher Education Area has promoted depth changes in the Spanish Educational System mainly based on the students' learning and assessment methodologies. In this regard, continuous assessing and self-learning are presented as a key factor for a quality teaching-learning process. Nevertheless, the lack of resources to conduct this task and the high number of students in the lecture room can be presented as drawbacks to get this objective. Moreover, carrying out continuous assessment of students´ learning supposes a big challenge for professors, who must create new activities to follow students' progress during the course. These activities must promote students participation and simultaneously facilitate continuous assessments by professors.

In the last years, ICTs have been presented as a very useful tool to conduct and assess these learning activities mainly based on the use of on-line platforms such as the Virtual Campus. These platforms are usually employed by professors to upload materials and documents which are considered of interest for students. However, among the most powerful tools that can be found in these platforms, the use of discussion forums could be highlighted.

In this work, the use of on-line discussion forum in the subject "Instrumental Techniques for Environmental Analysis", which is taught in the Degree of Environmental Sciences of the University of Cadiz, is presented.

In particular, students were asked through the Virtual Campus for participating in a debate about a topic related to the subject that was selected by professors. The activity was performed twice in the semester with different topics. In all cases, students' participation in forums was required and the frequency and quality of their contributions was evaluated. As a consequence, students needed to continuously study the contents of the subject for participating in the forums as it was observed. Additionally, this activity was useful to make students writing in a scientific style, giving reasons for their arguments and opinions, and using specific vocabulary. It is worth mentioning the improvement in the students´ marks in the second forum for discussion showing the progress in their self-learning.

In conclusion, the application of forums has been a successful alternative for self-learning of students that had to express their opinion about different aspects of instrumental analysis in a scientific context. Moreover, it was a useful tool for continuous assessment to professors, who could follow the students' progress during the whole semester in a way that could not be afforded using classical methodologies, with all students, in the lecture room.

Keywords: Discussion forum, technology, innovation.

1 INTRODUCTION

In the last years Higher Education in Spain has been involved in deep changes as a consequence of the Bologna process and its participation in the European Higher Education Area (EHEA). In this context, traditional teaching methodologies have to be changed by those based on continuous assessing and self-learning. In this sense, professors must replace the traditional lectures by new activities during the lessons in the classroom, which must be accompanied by self-learning activities out of the room making students the main actors of their learning process [1]. However, there are some drawbacks to get these objectives mainly related with the lack of resources and the high number of students in the classroom. Taking this into account, assessing students' knowledge and participation at the same time is a big challenge that can be difficulty afforded by professors. Therefore, new activities have to be designed in order to follow student's progress during the course

to identify those aspects of the learning process that should be reinforced. As a consequence, these activities must promote students participation and simultaneously, facilitate continuous assessment by professors [2].

In the last years, ICTs have been presented as useful tools to conduct and assess self-learning activities out of the room that are mainly based on the use of on-line platforms such as the Virtual Campus. In spite of the possibilities offered by these platforms, they are often used only for uploading documents which are considered of interest for students. However, among the most interesting tools for interacting with students using these platforms, forums for discussion can be highlighted.

An online discussion forum is a text-based web application designed to promote constructive discussion between professors and students as well as among students [3] avoiding temporal or geographical limitations [4]. Therefore, drawbacks usually found when a debate is carried out with a large number of students during the lecture in the classroom (i.e. managing the group and the order that opinions are given, limited participation of students to the lecture time, or students frighten to answer in the presence of their partners) could be easily overcome. This is because of the order of students' opinions in forums and its contributions are displayed as 'threads' organized according to the subject, making it a valuable tool for continuous assessment of students learning.

This activity was presented to the students enrolled in the subject Instrumental Techniques for Environmental Analysis, which is taught in the fourth semester of the degree in Environmental Sciences at the University of Cadiz. During this subject students must get the capability to understand and apply the main instrumental analytical techniques for environmental analysis, and manage to select the proper technique to solve a particular environmental determination of pollutants. The forums for discussion have been selected in order to match these two objectives.

Thus, students where asked in the forum for solving a problem about environmental analysis. The role of students was searching information about the proposed problem and giving their opinion about the best way to solve it. Using this methodology, students start studying the subject from the first moment and they also can identify their difficulties to learn the contents alongside the semester [5, 6]. Furthermore, the main objective of the forum was establishing discussions between students and also with professors, giving arguments, writing in a scientific style, and using specific vocabulary. Finally, professors can summarize the main conclusions of the forum and recommendations in a document, in order to let students know what is expected from them [7].

2 METHODOLOGY

As it has been mentioned above, the subject selected to carry out the discussion forum was Instrumental Techniques for Environmental Analysis, which is taught in the fourth semester of the Degree in Environmental Sciences at the University of Cadiz. This subject consists of 6 ECTS (European Credit Transfer System), of which thirty two hours are employed for lectures and twenty hours for laboratory sessions. The theoretical contents of the subject are divided into three blocks corresponding with the main environmental compartments: water, soil and atmosphere. Along these blocks, the main analytical techniques to evaluate and determine pollutants in each environment are presented, taking into account the different parameters and characteristics of the samples. Regarding the laboratory sessions, they have been designed to instruct the students in the use of the different instrumental analytical techniques currently available in our facilities to solve a particular environmental determination of pollutants. A total of eight laboratory sessions were developed starting from simple equipments such as a pH-meter or a conductimeter and finishing with more sophisticated techniques for environmental analysis such as stripping voltammetry.

The evaluation of the subject is divided into a terminal exam (70%) and the results of activities of continuous assessment (30%). The latter corresponds to the evaluation of the laboratory sessions (20%) and the assessment of the discussion forum (10%). It is noteworthy to mention that to pass the subject, the student must achieve a mark of five out ten as the sum of all the activities assessed but with at least 40% of the maximum mark in every single part evaluated. This means that all the mentioned parts of the assessment process are compulsory for the student who must participate in all the activities.

2.1 Discussion forum proposed

To carry out this activity, the team of professors involved in the project began by the selection and elaboration of the environmental situations or topics which were going to be proposed to the students.

In table 1 the topics selected are shown. Then, it was decided the period along the semester when they were going to be developed. In this sense, the first discussion forum was developed at the end of the first block of the theoretical contents of the subject, water analysis. As far as the second discussion forum is concerned, it was offered to the students at the end of the third block, when all the theoretical contents were taught. For this second forum, three different environmental problems related to the three blocks of the subject were presented. This gave students more freedom, allowing them to participate where they considered more interesting from their own point of view or even they could participate in more than one forum, which was positively evaluated.

Thus, professors could have additional information about the most interesting contents of the subject for students. Professors could also think about the aspects to take into account to improve the teaching techniques for forthcoming academic courses. The different topics and questions considered in each forum should maintain student motivation and interest, employing problems of relevance that facilitate critical thinking and help them to use the contents learned during the lessons. Students must use not only the concepts taught in the theory but also the skills gained during the lab sessions.

Table 1. Topics selected for the forum activities.

Forum	Question
1. Water	Viola river crosses along its course a town of 20,000 citizens, poorly industrialized with a wastewater purification system. Moreover, in the lower course of the river crosses an extent agricultural area. A big problem of eutrophication was detected. What chemical parameters would you analyze to know the repercussion and impact of the problem? Which could be the origin? Which analytical technique would you use for the determination of the pollutants? Explain your answers.
2. Water	It is well known that in Algeciras´s Bay there are many types of industries. Furthermore, in Algeciras is located one of the largest containers dock in Europe. A study of the water quality of Algeciras is required to evaluate the effect of such activities in the aquatic medium. What parameters should you analyze? Which technique would be the most adequate to determine the different pollutants? Explain your answers.
2. Soil	A farmer needs to know the fertility of a soil to decide what type of cultivation can be done on it. What parameters should be analyzed? What technique would be the most adequate to measure the pollutants? Explain your answers.
2. Atmosphere	In the city of Huelva there is one of the biggest chemical hubs in Andalusia generating such a great quantity of polluting gases emitted into the atmosphere. What parameters should be measured to know the quality of the air of the city? Which technique would you employ to determine each one of the pollutants? How would you evaluate the contamination from each of the emission source? Explain your answers.

2.2 The evaluation criteria

Every single student must contribute to the topic or environmental problem proposed in the discussion. This required all posts to be read and evaluated by professors. To evaluate the participation of the students in the forum, the number of postings, length, frequency and quality of contribution were considered. It was also taken into account the level of critical thinking and depth of analysis of the topics.

Depending upon the post was completely original or a follow-up to an existing one, the mark was different. The posts that reflect deep learning and critical thinking were positively assessed.

It must be highlighted that not only the content was evaluated but also the scientific writing style, relevance and originality of the participation. Although the professor acting as the instructor (or forum master) of the forum has to be an expert in the field, his/her role was only to facilitate and moderate the debate, encouraging critical reflection and offering support and guidance if required.

3 RESULTS AND DISCUSSION

As this was the first time a tool based in online discussion forums was used to evaluate students in the subject Instrumental Techniques for Environmental Analysis, evaluating student's participation was an important parameter to be controlled in the evaluation of student's acceptance. In this sense, 87% of the students enrolled in the subject took part of the activity. However, a more interesting data is the number of students who contributed to one of the forums with more than one opinion or participated in the solution of more than one of the problems arisen in the second forum, because it was established as a criterion for improving their assessment. This aspect had an important weight because one of the main objectives of the forums was making students argument why they agreed or not the opinion of their partners, defending their contributions to facilitate the learning process. In the first forum, 100 contributions were registered, this means that an important number of students participated with more than one contribution. Moreover, in the second forum a similar participation was obtained, with students contributions divided as shown in Figure 1.

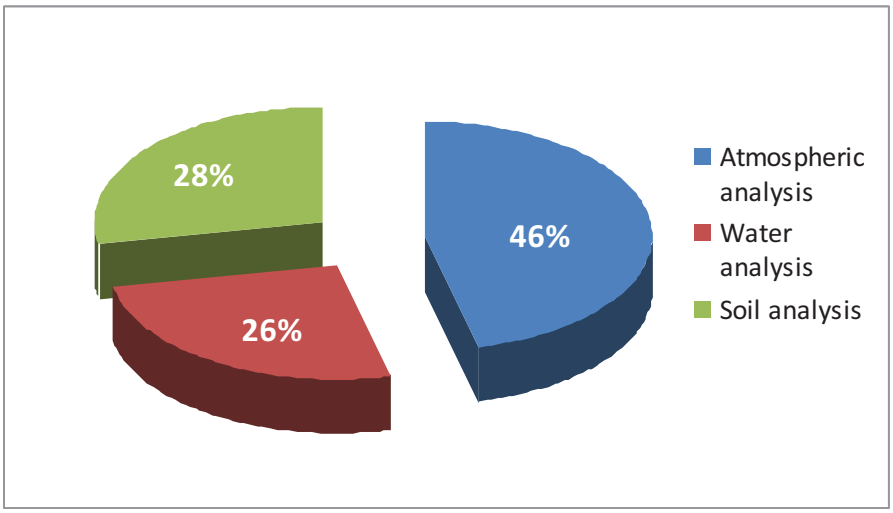

Figure 1. Distribution of participants in forum 2.

As it has been previously explained, the structure of the two forums was different. In the first one, only a question was arisen to students, and as a consequence, only one professor acted as forum master, to direct the discussions. However, in the second forum three different questions were asked, thus, a different professor was designated as a master of each forum, optimizing the effort of professors in the direction of the discussions.

In the case of the first forum: Pollution in the Viola River, students had to select what pollutants they considered as representatives of urban activity and agriculture and decide which was the more appropriate analytical technique to measure the concentration of those pollutants. Student's contributions were structured as follows:

- First entries described the importance of urban pollution and agriculture on river waters and their implications in water quality.
- Second, several opinions were given by listing the chemical variables that should be measured and discussing general aspects of the adequate techniques that could be used for analyze them. In this point, due to the number of pollutants to be analyzed were limited and a big number of contributions were registered offering the same information, the professor responsible of the forum redirected the discussion to focus it on why a technique was valid or not to analyze a pollutant.
- Following the recommendations given by the professor, students established a debate about why they thought that a technique could be used or not to analyze pollutants in the Viola River. This was the most interesting part of the forum, because they had to use a scientific style to defend their opinion giving arguments supported on the material they obtained from professors and they had to search for additional information, using other bibliographic resources.

After proofreading all the contributions, the professor summarized the conclusions of the forum giving the most convenient solution for the arisen problem. However, this does not mean that the solutions offered by students were wrong. In this respect, the professor elaborated a series of recommendations

with comments highlighting some aspects of the forum that should help the students to face a scientific discussion:

- Most of the contributions offered a solution that could be accepted. However, only the most convenient one appears in the summary of the conclusions.
- The objective of the forum was not discussing about an environmental problem. Students should focus on how to measure pollutants, not on how to remediate pollution.
- Technical vocabulary should be improved, because a wrong use of it leads to misunderstanding.
- The main objective of the forum is to debate about why a technique is appropriate for measuring a pollutant. Arguments must be given to support why students accept or reject a partner's contribution.
- Professor congratulate students on their participation and the general quality of the contributions. Students are encouraged to keep working hard to improve their assessment in the next forum.

Finally assessment of students' contributions was conducted according to the criteria previously described in the methodology section. Thus, only 6 students who did not participate in the forum had a mark equal to 0. The rest of the student's assessment was based on the number of times they participated in the forum and the quality of their opinions. As it can be seen in figure 2, the results obtained displayed a Gaussian tendency with most of the students having marks in the range 5-7 points. As expected, only seven students contributed to the discussion with several and well supported opinions having the highest marks.

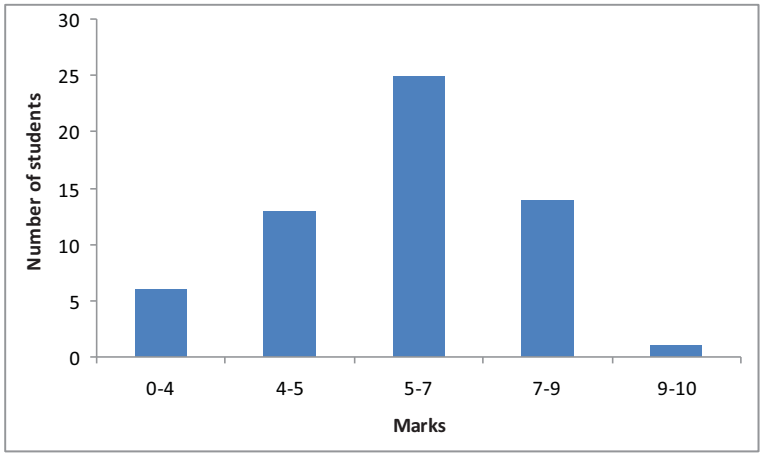

Figure 2. Histogram for the assessment of the first forum.

Once the first forum was closed and corrected, a new forum was opened during the two last weeks of lectures. At this time of the semester, students had received all the materials they needed to pass the subject and they should have a more critical view of the instrumental analysis. Then, professors expected better results for the second forum than those obtained for the first one. Since the second forum was divided into three parts: water, soil and atmospheric pollution analysis, an overview of the results will be discussed, and the most interesting aspects of each one will be highlighted. Finally the results of the two forums will be compared to evaluate the evolution of students learning alongside the whole course.

In the second forum, student's contributions followed the same structure observed in the first forum: description of why analyzing pollutants is important, list of chemicals to be analyzed and the proper technique for their determination, and establishment of a debate with arguments supporting or rejecting the opinion of a partner. In general, this last type of contribution was in higher proportion than in the previous forum. Therefore, the objective of making students improve their communication in a scientific style offering reasons about why a technique is more appropriate due to its characteristics was matched. A very important aspect that must be considered is that in spite of a smaller number of contributions in this forum (95 inputs) if compared with the previous one (100 contributions), students obtained in general a better mark. This was as a consequence of the experience they gained in the first forum and the result of following the recommendations given by

professors at the end of it. The results obtained in the assessment of the second forum are shown in figure 3. As it can be seen, 8 students did not participate in the second forum and only 2 of the students that participated offered a wrong answer. On the other hand, the biggest proportion of them (29 students) got marks higher than 7 points. The main reason was related to their active participation and the development of debates of high scientific quality.

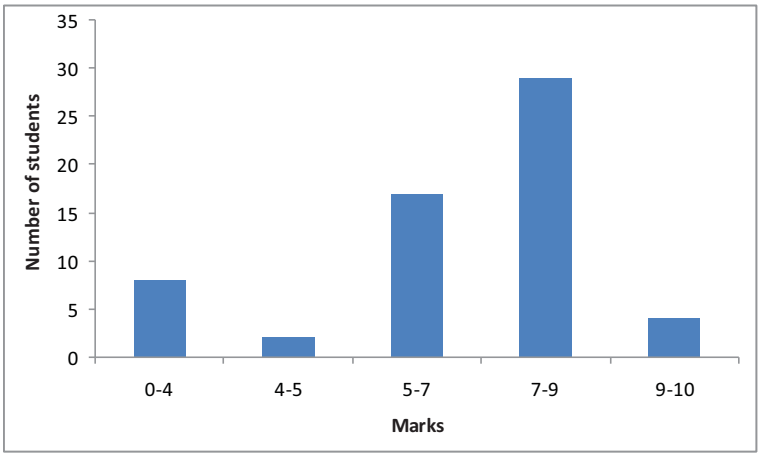

Figure 3. Results of the assessment in the second forum.

Finally, assessments for the three questions arisen in the second forum have been analyzed separately, as shown in figure 4. The best average mark was obtained by students participating in the atmospheric analysis forum, followed by water analysis and finally by soil analysis. This can be explained because during the time the forum was opened for participation, lectures about atmospheric analysis were taking place in the classroom and students could use the concepts and documents recently given by professors. The difference between assessments in the water analysis forum and the soils analysis forum can be explained by the experience that students got during the progress of the first forum, which also was about water analysis. However, the most important information that can be extracted from the second forum is that students considerably improved, in general, their communication skills in the field of instrumental analysis at the same time they studied the contents of the subject.

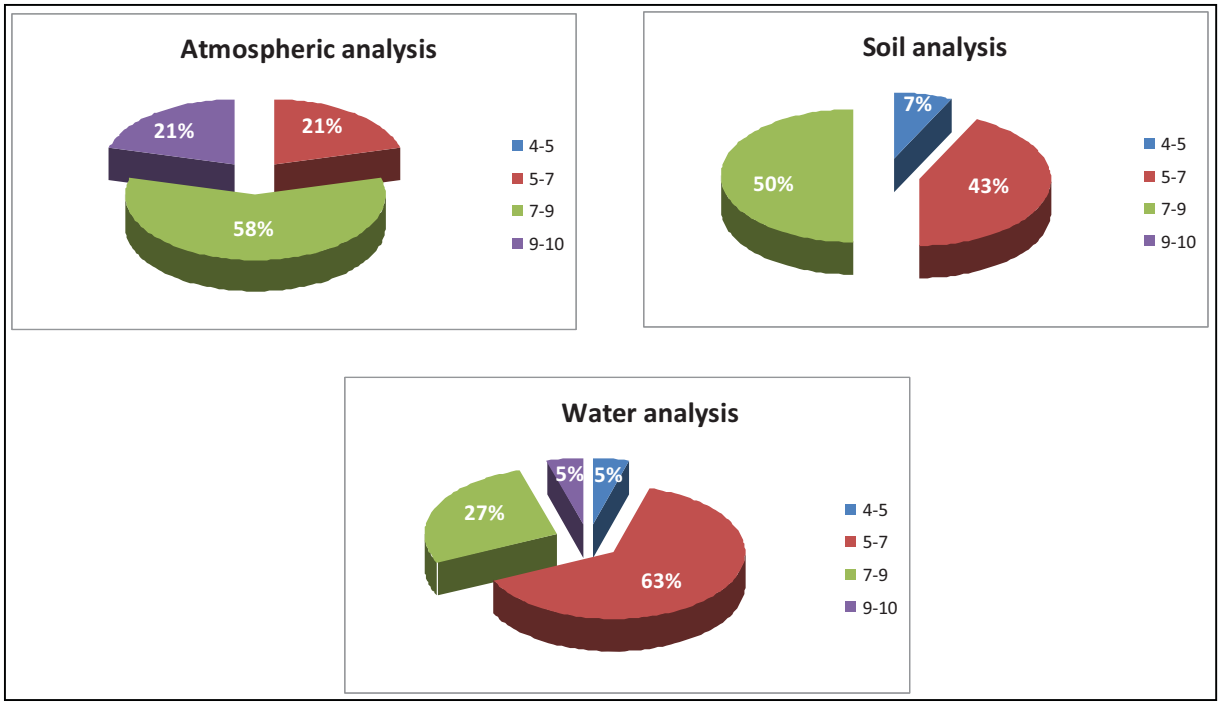

Figure 4. Results of the assessment of forum 2 by topics.

Regarding professors opinion, forum has several advantages. This type of debate can be conducted without spending lectures time, and the program has not to be shortened. Directing the discussion is easier than if it is done in the classroom, and managing turns is not required. The forum makes possible the evaluation of the learning progress during the whole semester. All the opinions can be corrected having time to read and understand them. Last, all contributions remain recorded in the Virtual Campus, constituting a material that can be used for study and allows the professor using it in case of students do not agree with their assessment.

4 CONCLUSIONS

The new teaching methodologies promoted by the EHEA ask for professors to search different assessment strategies than that of the terminal exam. In this context, new alternatives have to be explored and assayed with students as the main agents of their own learning. Nowadays, the use of information and communication technologies (ICTs) is extensively included in our daily life (PCs, tablet PC, mobile phones, etc.). In this sense, online platforms such as the Virtual Campus in the University of Cadiz appear as a valuable tool to develop and assess self-learning activities. The online discussion forum has been selected in the present work to assess students self-learning in the subject Instrumental Techniques of Environmental Analysis. The results obtained from this experience have shown that students have improved their communication skills in a scientific style and have maintained up-to-date in the topics related with the subject. On the other hand, the assessment of such activity was promising by professors because they got information about the contents of the subject in which students were more interested and also which aspects they would take into account to improve their teaching techniques. Finally, the online discussion forum has shown as a valuable tool to carry out self-learning activities enabling the assessment of students´ progress in the subject.

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CONFERENCE ABSTRACTS

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Dear ICERI2012 participants,

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We also wish to take this opportunity to welcome the participants. It is gratifying to have delegates from more than 70 countries with a common interest on education. Thank you for coming to ICERI2012 and for having travelled from far to join us.

This should also be a good occasion for you to explore Madrid. Do not lose the opportunity to enjoy and live this unique city and its surroundings. It has an enormous cultural and historical offer that will make your stay unforgettable.

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Experiences in Undergraduate Education (2)
University-Industry Cooperation (2)
Workplace Learning and Collaborative Learning. WBLQUAL Project
New Challenges in the Higher Education Area (2)
Experiences in Engineering Education
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Technology Innovations in Teaching and Learning (2)
New Trends and Experiences in Education
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Technology Innovations in Teaching and Learning (3)
Education practice trends and issues (1)
Generic Skills in Curriculum Design
Global Issues in Education and Research
Pre-service Teacher Experiences (1)
New Trends and Experiences in Health & Life Sciences
Technology in Foreign Languages Teaching and Learning

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Poster Session 1. Technology in Teaching and Learning and Experiences in Undergraduate education

Poster Session 2. Assessment of Student Learning and Experiences in Primary, Secondary and Post-graduate education

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Research on Technology in Education
Experiences in Undergraduate Education (3)
New Experiences in Curriculum Design
Diversity Issues in Education and Research
Special Education (1)
Links between Education and Research
New Experiences in Maths & Statistics Education

Web 2.0 and Social Networking
Education practice trends and issues (2)
Accreditation and Quality Assurance: Evaluation and Assessment
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Experiences in Communications & Media Studies

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Assessment of Student Learning (1)
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USE OF THE ICTS AS A TEACHING TOOL FOR THE STUDENTS´ SELF-LEARNING: FORUM OF DISCUSSION

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Abstract

The European Higher Education Area has promoted depth changes in the Spanish Educational System mainly based on the students' learning and assesment methodologies. In this regard, continuous assesing and self-learning are presented as a key factor for a quality teaching-learning process. Nevertheless, the lack of resources to conduct this task and the high number of students in the lecture room can be presented as drawbacks to get this objective. Moreover, carrying out continuous assesment of students´ learning supposes a big challenge for professors, who must create new activities to follow students' progress during the course. These activities must promote students participation and simultaneously facilitate continuous assesments by professors.

In the last years, the Information and Communication Technologies (ICTs) have been presented as a very useful tool to conduct and assess these learning activities mainly based on the use of on-line platforms such as the Virtual Campus. These platforms are usually employed by professors to upload materials and documents which are considered of interest for students. However, among the most powerful tools that can be found in these platforms, the use of forums for discussion could be highlighted.

In this work, the use of forum for discussion in the subject "Instrumental Techniques for Environmental Analysis", which is taught in the Degree of Environmental Sciences of the University of Cádiz, is presented.

In particular, students were asked through the Virtual Campus for participating in a debate about a topic related to the subject that was selected by professors. The activity was performed twice in the semester with different topics. In all cases, students' participation in forums was obligated and the frequency and quality of entries was evaluated. As a consequence, students needed to continuously study the contents of the subject for participating in the forums as it was observed. Additionally, this activity was useful to make students writing in a scientific style, giving reasons for their arguments and opinions, and using specific vocabulary. It is worth mentioning the improvement in the students´ marks in the second forum for discussion showing the improvement in their self-learning.

In conclusion, the application of forums has been a successful alternative for self-learning of students that had to express their opinion about different aspects of instrumental analysis in a scientific context. Moreover, it was a useful tool for continuous assessment by professors, who could follow the students' progress during the whole semester in a way that could not be afforded using classical methodologies, with all students, in the lecture room.

Keywords: Forum, self-learning, continuous assesment, ITCs.

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360