A step towards innovation at Central University of Ecuador: Implementation of the virtual educational platform

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ABSTRACT

The Ecuadorian university has trained professionals, most courses and programs are carried out with habitual practices and there is a little innovation in the use of new tools that favor learning. At Universidad Central del Ecuador (UCE) there were about eighty programs and each one of them had an average of sixty subjects. The common aspect is focused on the transfer of knowledge, remaining pending in getting learnings based on more active and participatory didactics. In the search for innovating teaching to improve learning, the insertion of new information and communication technologies in the university student´s life has been proposed, considering the implementation of a Virtual Platform, whose main purpose is to support the teaching-learning process. The proposed implementation of the Platform is carried out with a permeable effect according to the levels of interest of teaching, which is considered as a complementary task to the teaching activities and it certainly does not replace the presence of the teacher. It is established that the teaching process management lies down on the faculty´s exclusiveness. The first step was the implementation with an Open Source platform type, where elements such as usability, popularity, support, programming code, adaptability and capitalization were considered. The e-portfolio, including all available activities and resources, which favor innovation in the teaching task was taken into account. The structure of the paper is organized as follows: Introduction where the theoretical foundations are described. Methodology based on the action research through which the application of this process is described. And the results of both the piloting and the final implementation phases where faculty and students, as part of the sample and the implemented classes with the resources and activities used were cuantified.

CCS CONCEPTS

• Applied computing→Education → Applied computing~Learning management systems

KEYWORDS

Virtual educational platform, teaching-learning process, educational innovation

1 INTRODUCTION

The Universidad Central del Ecuador is an institution that is part of the higher education system and it is empowered to award degrees for both Undergraduate and Graduate levels [16]. The targeted population is around 40,000 students in 71 undergraduated and 121 graduate programs. It has 2300 faculty and 1600 administrative and service employees.

The UCE is facing up a general problem in its community. The lack of information about educational innovations and autocracy in the use of educative platforms does not benefit the development of innovation teachers 'processes, which favors the improvement of the educational quality.

It is significant to state that after the report presented by CEAACES, in the 2012 institutional evaluation, the obligation to construct and implement a "Strategic Plan" is established that allows to carry out all requirements established for the accreditation of the Institution, among which the University is observed for not having an Educative Virtual Platform at the University level. [16]

In 2015 the UCE starts the implementation of the "Virtual Educational Platform", based on Moodle, which is a free distribution software and one of the most used worldwide. It is oriented as an element of support to the teaching-learning methods, it is proposed as an optional element which favors the innovation processes in the teaching task and it is

recorded the usage of the academic portfolio for the teacher and student, establishing the following premises:

Teaching in the On-campus modality to support the activities that take place in the classroom, fostering the collaborative learning, managing the academic portfolio for the teacher and student.

Teaching in the Off-campus, in the blended or convergence means and in the virtual system as a fundamental tool for the development of the teaching - learning process, management of academic portfolio for the teacher and student.

The teacher training under the responsibility of the University Institute of Pedagogic Training (IUCP), in which a teacher will be able to take part in courses to improve his/her professional and teaching competencies.

The objective of this work is to describe the activity of "Implementing a virtual educational platform as an innovation tool", by describing the phases that were developed: 1) Implementation of the virtual educational platform for the university community, 2) Development of the teacher training process, 3) Analysis of the activities and resources used by members of the university community who use the educational platform, and 4) Integration of new tools and activities in the learning process and the teaching task that produce educational innovations.

2 STATE OF ART

The changes that have occurred in the last hundred years have been vertiginous in relation to previous centuries giving way to the creation of new scenarios in which the human being has a digital impact. Technology is presented in all human and social activity, conceptions such as the digital citizen pose new scenarios of interaction including dependence on information and communication technologies [1].

"All of this requires that higher education institutions make their procedures and administrative structure more flexible, to adapt to the needs that this new society presents" [2]. This is then where the use of them will be provoked [3]. There are three key aspects which define theses current times, and of course, the world of education: learning, digital, and open [4].

"Education stands up as the means, the civilizing human resource per excellence that is fundamental to our well-being, if it is not reinvented in the terms that the logic of digitality forces, it will suffer, as it suffers now, the deep limitations of a world which elapsed and transpires at different beats and paces"[5], considering these concepts, the university should look for some niches to coexist with technology, fulfilling the role of an agent of change considering that the "new professionals must have a greater cultural and technological background; besides they should be more versatile and multipurpose" [6].

In this context, "Making changes in the learning / training that lead to improvements in the learning outcomes" [7], is a requirement of the university work where this so-called innovation process must respond to some needs, also it must be effective and efficient as well as sustainable over time and with transferable outcomes beyond the particular context in which they emerged [8].

Educational innovation is a process that involves the selection, organization, and creative usage of elements linked to the institutional management, to the curriculum and / or to the teaching, since it usually responds to a need or problem that regularly requires a comprehensive response [9].

The Argentinean researcher, Marta Libedinsky from her vision analyzes innovation from different interpretations. She explains the relationship between innovation and educational technology and stresses the importance of the implementation of these kinds of resources for educational innovation; in this particular aspect, she focuses the strength in the breaking of rigid schemes that continue being handled in the curricular educational projects and the opening to the innovative educational experiences [10].

An innovation process through the implementation of an educational platform begins in the context of the Universidad Central del Ecuador, where "innovation and educational technology are oriented into the multiple, possible, and creative forms that allow the generation and knowledge evolution fostering creativity, innovation, and sharing. In this world, the challenge for universities is both the integration of all these platforms and tools in our systems, for example the use of licenses that protect teachers as authors of the educational materials". [1]

For this, it is important to identify the leading teachers who are those who stimulate, provoke, accompany, and promote the different interconnection environments. Instructors develop the basic skills among students emphasizing the human dimension such as the development of the research capacity, ethics, artistic, social, and self-cognition.

This implies a change of culture in the academic - research task – relationship with the society of teachers, which has been driven in response to the demands of the digital era. The way of learning and teaching has as a horizon the preparation of non-desktop citizens (reading and writing on multimedia platforms), but that they get involved in the world [10].

The significant and relevant intellectual tasks planned by the tutor-teacher with the support of technologies in different environments are oriented to the development of capacities at the higher level [11]. They should foster innovation that imply the impulse to the search of different sources. The selection of codified knowledge, its contextual processing and dissemination in situations, problems, and alternative solutions with the integration of methods that encourage inquiry, must include the learning by discovering in non-fragmented and increasingly complex contexts [12].

The tutor-professor should promote the intellectual tasks in the student, develop the propositive critical and creative thinking in harmony with reflection and action in conditions of equality, and respect to diversity and equity in balance with the heart, mind, and hands [10]. This involves personalized

strategies aimed at learning and teaching from the scientific research field, but which connect a student with his/her praxis in diverse collaborative, experiential, relevant, and community learning environments with their peers who foster innovation [13].

The main objective of Open Education is autonomous learning and, for achieving it, it is crucial to provide the learners with contents and tools that allow them to carry out their studies [4].

The teaching-learning process in the programs were developed with the replication of practiced models used during several generations since the teaching style reproduced what they experienced before in their learning style. Therefore, the innovation of teaching used as a marginally form another type of tools, for instance, technology. In a particular way, the virtual platforms were used in an isolated form depending on the teachers´ individual initiative.

In such circumstances, the impetus of technological platforms finds out a field to be discovered within the higher educational niche. This entails to establish and design strategies for implementing an educational platform that responds to these new scenarios of the society, where the university could not remain isolated [9].

It is important to consider the need for Higher Education institutions to move towards globalization and internationalization of knowledge [14]. Therefore, having a digital interaction niche, it is an inescapable requirement in the vocational training processes.

The virtual environments in the context of education are places for interaction among teachers and students. They facilitate communication, didactics, and pedagogy to exchange textual, multimedia and interactive didactic resources. This place is available at all times for students and teachers creating a space for information exchange and learning activities [17]. These environments are called virtual because they are based on technology and they are a support for three systems: On-campus, Off-Campus, and blended education [15].

3   RESEARCH METHODOLOGY

The action research is a methodology that aims at producing a propositive and transformative knowledge, through a process of debate, reflection, and collective construction of knowledge among the different actors of a territory in order to achieve social transformation. [7] [8]. This methodology proposes the following steps: Plan of Action, Execute the Action, Observe the Action, Perform the Reflections [9], and start all over with a new plan of action; therefore, this research is in accordance with this methodology [7].

3.1 Plan of Action

The plan of action was carried out in three phases in order to comply with the proposed methodology:

1. Implementation of the platform. It describes how this process was performed.
2. Piloting training processes for teachers and administrators of the Faculties. A training course, which allowed the integration of not only several technological resources in the platform, but also the staff in charge of the accompaniment to the teacher and student was designed.
3. Analysis of the activities and resources used by members of the university community who used the educational platform. A study of the results obtained in the platform to design new processes of accompaniment was done.
4. To incorporate tools and activities in the learning process and teaching work that produce educational innovations. According to the results, new tools at the request of teachers as a result of the innovation process are included.

3.2 Execution

3.2.1 Implementation of the Platform. For the selection of the Learning Management System (LMS), a project is carried out with PYXERA GLOBAL and IBM Corporate Service Corps, which includes a Feasibility Study of a Virtual Educational Platform for the Institution. As a first phase, an analysis of three platforms is made, it points out their strengths and weaknesses.

Among the technical aspects to consider are the type of software, usability, popularity, support, programming code, flexibility, and capitalization.

On the other hand, within the analysis, the dimensions of the demand and something, which is quantified such as the number of programs, students, teachers should be included. Because the higher range is limited to all subjects or modules, it is necessary that all of them have their own support in the Platform.

Due to the number of users, the integral methodological strategy that facilitates the diffusion and use of ICT in the teaching - learning process is applied as follows:

1. Implementation of the product in the piloting mode. The implementation per phases, also called piloting of the Virtual Educational Platform. This is necessary to test the hardware and software, in a small and controlled scale, for a period of time that demonstrates the strengths and weaknesses of the system. The results of the piloting are used as improving elements to be implemented in all the University.

2. Implementation per phases. After the piloting, the human and technological resources for the total deployment in the institution are identified.

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3.2.2 Piloting Training. It was performed by all Faculties and Faculty administrators in order to create a supporting group for the teaching work; besides, the following courses were included:

1. MOOC courses for using the virtual platform available to teachers and students.
2. A "Technological Resources for Teaching Innovation" Course, having an introductory module, a module that describes the technological resources of the institution and a module for using the virtual educational platform, was implemented.
3. A "Technological tools for academic development" Course aimed at those responsible for the technical support in the faculties was designed. It has these elements: customer service, E-mail as validation mechanisms, tools available in the electronic mail for the teaching, the virtual educational platform, and its integration with E-mail was carried out.

In addition to these courses, some other aspects that facilitate the integration of the members of the university community to the platform are created:

1. A module for requesting the creation of a course.This is verified in the University Academic System to create correctly the name, assignment of students, and teachers.
2. Creations of structures by domains of work; in other words, undergraduate, graduate, and teacher training.
3. Policies for the use of the virtual educational platform.

3.2.3 Analysis of the activities and resources used by members of the university community who use the educational platform. The processing of about 200,000 records, generated from April 1st, 2016 to April 30th, 2017 was developed under the following premises:

1. Quantifying the resources and activities used by teachers and students.
2. Analyzing the results by Faculties.

3.2.4 Incorporating tools and activities in the learning process and teaching work, which produce educational innovations. A quantification of requests for additional software to be installed in the platform, and its usage by teachers and students was done. For this purpose, a help desk to receive these requests was set up.

4 RESULTS AND DISCUSSION

4.1 Analysis and selection of the Platform:

In the analysis of the platforms and elements that allow us to determine which of them should be chosen demanded an analysis of the attributes that permits the user to have a friendlier and more flexible environment was done. Such analysis is shown in the following table:
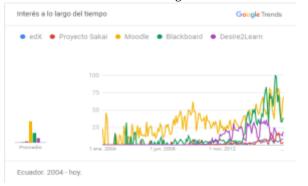
Table 1:**General attributes of the plataforms**

Description	Moodle	Sakai	OpenSWAD
Open Source	Yes	Yes	Yes
Usability	High	High	High
Popularity	High *	Medium	Medium
Extensive support for Spanish	Yes	Yes	Yes
Programming code	PHP, MySQL and Apache	Java	C
Adaptability	High **	Low	Low
Capitalization	High ***	Medium	Low

*   Surveys and articles mention the ease of use of Moodle; it is confirmed by interviews applied to teachers of the UCE.

**   The installed version gets used to the needs of the Institution.

***   The opportunity of the UCE to be a technical center to give support to the installed version.

It generates students´ skills to: learn, program, and manage the various components; favoring innovation.

Google Trends in its analysis of popularity and trend of different platforms carries out a study of interest starting in the year 2004 up to the present. It is significant the presence of Moodle as a platform, its interest is sustained over the time and it exceeds others in the average of use.

Ecuador 2004- present time

Figura 1: **Statistics of use of Platforms Google Trends**

Based on the analysis and previous results, the decision is made to implement the Virtual Educational Platform, the LMS Moodle

In order for the implementation of the platform to be sustainable and permeable with the educational performers, it is proposed that prior to its use, some technical support should be provided. It must have the involvement of the Information and Communication Technologies (DTIC) Office management and the IUCP.

4.2. Results of the piloting phase

Focal groups were encouraged by Faculties to implement the platform; such groups should show interest in receiving the necessary technical support.

Access roles are established and it is defined the following: Teachers will have access to edit the course. Students will be able to log in into the courses. The General Manager of the platform who is in the DTIC and the Administrators per each academic unit: it must be understood that an academic unit, a Faculty, a direction office, or a leveling is an internal unit organization.

For the piloting process, the following activities were carried out:

1. Sensitizing the performers so that they are committed to the use of the Virtual Educational Platform.
2. Socializing with teachers the different policies for the use of the Virtual Educational Platform.
3. Informing about the available tools to support the teaching-learning process. They allow the exchange of information, and generate synchronic and asynchronous activities.
4. Orienting teaching towards the configuration of the virtual classroom, which includes an informative section, an academic place, and a closing element. There should be a survey of satisfaction of the virtual classroom, which allows participants to give some feedback about the system.
5. The technical team of the technology Unit is prepared with the purpose of becoming allies for the users´support, especially for teachers.
6. A university policy supported by the teaching staff [2] (Academic and Research Vice-President and General Academic Board) is established.

During the piloting phase, people worked with the platform as they wished. The users 'results who logged in into the platform in this stage were:

Table 2: **Results of the piloting phase**

	2016-2017		
Areas of knowledge	AU	DC	ES
Life Sciences	255	255	1363
Exact Sciences	308	287	4132
Social Sciences	255	255	2000
Total	818	797	7495

AU: Number of virtual classrooms

DC: Number of teachers

ES: Number of students

The participation in the piloting phase reflects a beginning with different actors belonging to different areas of knowledge and with a representative scope in relation to the universe. About 20% of students are part of this stage and one third of teachers has already implemented a virtual classroom.

4.3 Result of the total implementation

The potential university community to be served at this phase is 4,400 students of the leveling course, 37,000 undergraduate students, 2,500 graduate students, and 2,300 teachers.

With the defined roles, a technical adjustment was made. Socializations to all the academic community members were carried out. The following resources were enabled: 1) A massive and open online course (MOOC) for use of the virtual platform, available to teachers and students; 2) A module to request the creation of a course was implemented. Such resources are verified by the University Academic System to validate the courses information.

Table 3: **Results of the Total implementation phase and its increase regarding the piloting stage**

Areas of knowledge	Implementation 2017-2017			Porcentage of increasing		
	AU	DC	ES	AU	DC	ES
Life Sciences	804	247	1664	315 %	145 %	122 %
Exact Sciences	590	300	8742	192 %	105 %	212 %
Social Sciences	1695	465	7408	665 %	274 %	370 %
Total	3089	1012	17814	378 %	127 %	238 %

AU: Number of virtual classrooms
DC: Number of teachers
ES: Number of students

It is remarkable the growth from the piloting stage to the total implementation. At the classroom level, its increase is almost four times bigger. At the students´ level, it doubles the initial stage. At the tearchers´ level there was a small increment. Therefore, it is observed that among teachers who use the platform is consolidated as a complement to their work. And referring to the students´ side, the impact is important since it approaches to the half of them.

An analysis concerning to gender about students´ participation, shows harmony with gender distribution in the enrollment process. In the area of life sciences, the number of male is 766 and female 898 (46.03% and 53.97 % respectively). In the area of exact sciences, 4,634 male and 4,108 female (53% and 47%) participated. And in the area of socials sciences 3,160 male and 4,248 female (42.65% and 57.35%) took part.

In the field of life sciences, the participation is small in comparison with the total number of enrollments, so the task is to motivate the teachers of this area.

In this piloting phase, the technological resources needed to support the entire university community were identified. Besides, it was possible to identify the innovative teaching communities that will facilitate the implementation

in several Faculties and at the same time to provide evidence about the specific Faculties, where an extra work must be done.

4 Results by created resources

The usage that was given to the virtual classrooms is diverse. Different fulfilled activities and used resources were obtained; in fact, it is known what elements are taking relevance in the support to the teaching aspect and the student´s learning [3].
The users, teachers, and student's results are based on both the undergraduate level and a general leveling course (Ethics and University Thought).

In the future, the use of the virtual classrooms should be generalized for the undergraduate level and it should be used in graduate programs, where this platform is practically unknown.

The data related to the teachers' work are obtained from the *uvirtual* application. In the case of the period 2016-2017, it includes six months of activities. In the period 2017-2017, it includes three months. They show the following results based on the activities developed on the preparation of resources, Table 4:

Table 4: Developed activities in the Virtual Classroom

Resource	2016-2017	2017-2017	Percentage of use
File	3714	3815	16,343
Attendance	1300	2206	7,610
DataBase	18	5	0,050
Folder	352	383	1,595
Questionnaire	1664	2239	8,472
Classroom	1721	4053	12,534
Tag	2471	2130	9,987
Forum	1016	991	4,357
Glossary	27	184	0,458
Lesson	60	66	0,274
Book	165	75	0,521
Workshop	256	227	1,048
Task	2585	2853	11,804
URL	824	1327	4,669
Wiki	39	34	0,158
Create module /classroom	3526	2945	14,047
Page	200	917	2,425
Chat	88	85	0,376
Query	95	61	0,339
Category	394	853	2,707
Skype	6	1	0,015
Buttons	33	17	0,109
Poll	12	11	0,050
External tool	0	1	0,002
Off-line Quiz	0	1	0,002

Resource	2016-2017	2017-2017	Percentage of use
Insignia	12	10	0,048
Total	**20578**	**25490**	**100**

The main developed activities are associated with the design of the course, prevailing the following ones: uploading of files, creating classrooms or modules, organizing classrooms, creating tags, registering attendance, and URL records. A 65.19 percent of activities are included in the previous ones. The activities that lead to a greater student´s activity such as: tasks, questionnaires, forums (represent the fourth, the sixth, or the ninth position) with a 24.63 percent. Other activities are of lower rank.

For the analysis of the work done by students, the information of two months (October and November 2016) was obtained. The results are summarized in table 5.

Table 5: Resources used by students

Used resource	Overall total	Percentage
File	21,074	9,341
Attendance	327	0,145
Database	9	0,004
Folder	1413	0,626
Chat	1113	0,493
Questionnaire	22,796	10,104
Forum	158,989	70,469
Glossary	6637	2,942
Lesson	22	0,010
Book	1592	0,706
Page	790	0,350
Workshop	163	0,072
Task	4015	1,780
On-line text	956	0,424
Url	4016	1,780
Video conference	126	0,056
Wiki	1576	0,699
Total	225,614	100

It is noticeable that the most used resource is the forum (70.47%), followed by the questionnaire (10.10%), and file management (9.34%); the other 12 resources represent only the remaining 10%.

The continuous technically and administratively support is provided for students and teachers. For this activitity, the DTIC has the technical staff trained in this area.

5 CONCLUSIONS

In order to promote the use of a virtual platform at Universidad Central del Ecuador some actions have been taken and some significant learnings have been achieved; such actions include:

1. The implementation of the platform did not have any technical problem because it had a solid technological infrastructure. The reliance on its use by the university community has allowed the growth

of users. The users' access is 24/7, which allows students and teachers to log on into their classrooms according to their needs, requirements, and pace.

2. It was determined that the Moodle platform is the one which provides the best service. The decision to count on with an open code that has a very good usability, popularity, support, adaptability, and capitalization is upheld.

3. The students' most used tools are: the forum, the questionnaire, and the file. On the contrary, by the teachers' side the most used tools are the file, the creation of classrooms, the organization of courses and the tasks. In the study of the usage of the platform, it should be investigated how the tools are used in order to propose improvement procedures.

4. It is necessary to conduct studies about the way "of how" the resources are used to have better results in the platform.

5. It is necessary to design a Continuous Training Plan for the teacher with the purpose of establishing permanent improvement actions. The teacher of the UCE should become an actor in the usage of the platform.

6 FURTHER RESEARCH

For this application to be implemented there are several recommendations for the upcoming, some of them have been pointed out in the conclusions. There is an extra one which is added and it is concealed, and it deals with the study of the impact on both teachers and students; in both cases it should be accompanied by the problems they faced when using the platform and the facilities they found. The impact on the academic achievement in learning will also have to be studied.

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