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Implementation of emerging virtual classrooms: case study, master in innovation and creativity in education

Implementación de aulas virtuales emergentes: caso de estudio maestría en innovación y creatividad en la educación

GALEANA-VICTORIA, Luis Gustavo†*, SANCHEZ-GARCÍA, Judith Ruby and FLORES-AZCANIO, Nancy Patricia

Universidad Politécnica del Valle de México, México.

ID 1st Author: *Luis Gustavo, Galeana-Victoria* / **ORC ID:** 0000-0002-6133-1124, **CVU CONAHCYT ID:** 398137

ID 1st Co-author: *Judith Ruby, Sanchez-García* / **ORC ID:** 0000-0002-5550-5917, **CVU CONAHCYT ID:** 826268

ID 2nd Co-author: *Nancy Patricia, Flores-Azcanio* / **ORC ID:** 0009-0009-3799-1075, **CVU CONAHCYT ID:** 673888

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Abstract

Emergent virtual classrooms served as a rapid solution for millions of students worldwide to continue their professional-level teaching and learning processes during the COVID-19 pandemic. However, despite the significant efforts made by institutions, educators, and services, school dropout rates, socio-economic issues, and health problems had a substantial impact, causing students to abandon their studies. In the quest to provide different alternatives that motivate future professionals to resume their academic lives, it was found that the implementation of emergent virtual classrooms combined with an adaptive learning strategy tailored to the contexts of students and teachers yielded findings that could be considered within the new hybrid learning strategies now being promoted in the post-pandemic era.

E-Learning, LMS, Chamilo, Emerging Virtual Classrooms, adaptive learning

Resumen

Las aulas virtuales emergentes sirvieron como solución rápida para que millones de estudiantes en todo el mundo continuaran con su proceso de enseñanza y aprendizaje en nivel profesional durante la pandemia provocada por el COVID-19. Sin embargo, a pesar de los grandes esfuerzos por parte de instituciones, docentes y servicios la deserción escolar, los problemas socio económicos y de salud permearon de manera considerable para que estudiantes abandonen sus estudios. En la búsqueda de ofrecer alternativas diferentes que motiven a futuros profesionales a retomar su vida académica se encontró que la implementación de aulas virtuales emergentes combinadas a una estrategia de aprendizaje adaptativo y acorde a los contextos de los estudiantes y profesores resultaron hallazgos que podrían ser considerados dentro de las nuevas estrategias de aprendizaje hibridas impulsadas ahora por la era post pandemia.

E-Learning, LMS, Chamilo, Aulas Virtuales Emergentes, aprendizaje adaptativo

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* Author's Correspondence (E-mail: gustavo.galeana@upvm.edu.mx)
† Researcher contributing as first author.

Introduction

The confinement caused by the pandemic in the early 2020s in the field of education generated significant changes in the implementation of virtual classrooms, previously learning management systems (LMS) and virtual classrooms already existed, their adoption and use were limited with face-to-face education being the norm in most educational institutions, it also brought with it the need to maintain social distancing and all schools found the need to move their educational processes to virtual environments leading to an expansion and rapid adoption of online learning platforms (Salazar Padilla et al., 2022) (Posso Pacheco, 2022).

The main objective of this paper is to present the results obtained from a case study of the collaborative project between academics from the Universidad Politécnica del Valle de México and the Universidad Tecnológica Tula-Tepeji to implement emergent virtual classrooms using the LMS Chamilo system at the Instituto de Integración Cultural located in Tultepec, Estado de México, for the master's degree in Innovation and Creativity in Education. The initiative arises as a response to the needs posed by distance classes during the COVID-19 pandemic in the year 2020 and that to date had a series of adjustments and modifications that make it a fundamental tool in post-pandemic times (Mukhammad Nur Chasani & Agung Suci Dian Sari, 2023) (Farokhi & Haryadi, 2021). In previous years the Cuerpo Académico Tecnologías Emergentes had worked on the design of didactic strategies applicable to different learning environments (Flores-Azcanio et al., 2020) (Sanchez-García et al., 2019) in addition to which 2020 served as an impetus for research to analyse learning processes (Galeana-Victoria et al., 2020).

Prior to the implementation of virtual classrooms the institute faced significant challenges in adapting to the distance learning modality during the COVID-19 pandemic, the lack of a robust and specialised platform hindered effective interaction between students and teachers, as well as the management of didactic resources and the evaluation of academic progress.

LMS systems and emerging didactic strategies

Chamilo is an open source learning management system (LMS) that emerged in 2010, developed by an international group of developers driven by the need for a flexible and accessible educational platform. Chamilo has established itself as a popular LMS solution that has been used in a considerable number of institutions around the world.

Some of the main advantages of the platform are:

- Content management. It provides tools for the organisation and delivery of content in a structured way.
- Communication and collaboration: It offers online communication and collaboration functions through tools such as discussion forums, chats, wikis, sending private messages, among others.
- Assessment and progress monitoring: Allows the creation and administration of online assessments, such as quizzes and exams. Teachers have the possibility to track the progress and academic performance of each student, generate reports, provide personalised feedback and create an individual profile.
- Customisation and adaptability: Chamilo provides options to customise the appearance and configuration of the learning environment according to the needs of each educational institution, the scalable modular architecture provides flexibility to adapt to different contexts and emerging needs.

Therefore, Chamilo is a tool that stands out for its intuitive and user-friendly interface, which simplifies its use for both educators and students. Moreover, one of the tools that arouse the interest of educators is the possibility of creating and managing robust online assessments that are integrated with comprehensive monitoring reports that complement the advice and feedback both face-to-face and online.

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It is important to take into consideration that although Chamilo is a solid platform for the implementation of virtual classrooms, it is necessary to have an adequate planning and instructional design methodology to guarantee an effective learning experience, as well as an emerging training plan and a technical support structure to provide the necessary technical support to carry out the activities.

It can be summarised that the central objectives of this article are, firstly, to promote the use of the Chamilo platform for the implementation, configuration and administration of emergent virtual classrooms, and secondly, the didactic strategy that comes from the urgency of changing and adapting contents initially thought of as support material in face-to-face courses to virtual environments based on adaptability according to the technological, academic and reinforcement conditions that each student and academic requires throughout the fulfilment of activities within a teaching period.

Theoretical framework and background

The growth of distance education in the years following COVID-19 significantly accelerated the adoption of online education worldwide, as educational institutions had to adapt quickly to the restrictions imposed by the health crisis (Posso Pacheco, 2022). After the initial impact of the pandemic, online education continued to expand and establish itself as a viable alternative to face-to-face education because it has democratised access to education, with more and more people able to access academic programmes and courses from different parts of the world without having to physically move (Redacción, 2020). It offers greater flexibility for students to organise their study time and fit around work, family or other personal commitments.

Online education has opened up opportunities for a wide range of subjects and disciplines, allowing students to find programmes and courses that suit their interests and needs, educational technology has had a major influence in providing more engaging and effective learning experiences, and as online education becomes more common, it has increased acceptance and recognition by employers and universities, which has strengthened the credibility of online degrees and certificates.(Johnson et al., 2016)(Magdaleno González, 2021).

Learning management systems (LMS) after the events experienced by COVID-19 underwent an evolution and new adaptation in the educational landscape (Cruz Picón & HERNÁNDEZ CORREA, 2022). The pandemic drastically accelerated the adoption of online education, which generated an increased demand and use of LMS platforms worldwide, systems such as Chamilo, became essential tools to facilitate the transition to online education and ensure educational continuity during periods of confinement and social distancing. In addition, LMSs demonstrated their ability to provide flexibility in accessing educational content, facilitate interaction between students and teachers, and offer a variety of enriching digital resources. LMSs were also instrumental in collecting data and tracking student progress, allowing educational institutions to make informed decisions and adjust their pedagogical strategies. Overall, the changes driven by COVID-19 have strengthened the position of LMS systems as key pillars in online education and reinforced their role in creating learning experiences that are more efficient, inclusive and adapted to the changing needs of contemporary education. (Posso Pacheco, 2022).

In academic terms, a virtual classroom is an online educational environment that simulates and replicates the characteristics and dynamics of a traditional classroom, allowing interaction between students and teachers through digital media and communication technologies (Ruipérez & García, 2020). These are virtual spaces in which teaching and learning activities take place, where teachers can teach classes, share educational content, assign tasks and assess students' progress remotely (Santana Oleas et al., 2023).

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Students, in turn, can participate in discussions, engage in collaborative activities, access digital educational resources and receive personalised feedback from academics, tutors or learning managers. Virtual classrooms foster flexibility, accessibility and personalisation of learning, and have gained relevance especially in crisis or emergency situations, such as the COVID-19 pandemic, where they have become an essential tool to ensure educational continuity in remote environments. Emerging virtual classrooms are characterised by their ability to adapt to different pedagogical approaches and teaching styles. This implies the flexibility to implement various learning strategies, such as active learning, project-based learning or collaborative learning in a virtual environment (Cavanaugh, 2005).

Emerging virtual classrooms have a number of attributes that differentiate them from traditional ones, for example, the agility of implementation during a crisis, as educational institutions need to adapt quickly to the online modality to ensure the continuity of education. Another feature is adaptability to different contexts: Emerging virtual classrooms can be adapted to different educational scenarios and teaching levels. They can be implemented in higher education institutions, primary and secondary schools, vocational training programmes and more (Area Moreira et al., 2010). The COVID-19 pandemic has demonstrated the importance of ensuring continuity of education in crisis situations. Emerging virtual classrooms have become an essential tool to maintain the link between students and teachers, ensuring that the teaching and learning process does not stop.

Chamilo is an open source learning management platform (LMS), an open source virtual campus that is distributed under GNU/GPLv3 license, and that any person, institution or company can freely use for the delivery of training actions through the internet. (Bohemia Interactive Australia Pty Ltd, 2015)

Chamilo had gained popularity in the educational community, primary schools, secondary schools, universities and training centres adopted its use due to its flexibility and ability to adapt to different educational contexts, it offers a complete set of features and functionalities to manage online courses and facilitate learning in virtual environments, it drives collaboration through interaction tools such as forums, chats and private messages in addition to offering a community of support and support that for a system administrator is usually attractive.

Methodology

The type of research chosen for the development of this research is the case study, a qualitative methodology used to investigate a complex phenomenon in a specific context. In this approach, an in-depth and detailed analysis of a particular case, which can be an individual, a group, an organisation or a situation, is carried out. The aim of the case study is to understand the case in its context and to obtain a complete picture of the underlying causal relationships and processes (Hernández-Sampieri et al., 1991). For this work, data were collected from various sources such as interviews, observations, documents and records in order to capture multiple perspectives and dimensions of the phenomenon under study, the data were processed qualitatively and at this stage patterns, trends, and relationships between variables were sought in order to gain an in-depth understanding of the case. (Phelan, 2011).

Among the research stages that were carried out were firstly the definition of the context, which consisted of analysing the educational institution, the characteristics of the curriculum and why Chamilo was chosen as the LMS system. The institute of cultural integration was the setting for this case study, it started after a request from the program director, who after the guidelines that the federal government (Sánchez-Talanquer et al., 2021) imposed for face-to-face classes arose the need to establish a virtual environment for students to continue their learning process started since month of November 2019, after some virtual meetings an emerging plan for the implementation of emerging virtual classrooms was developed in which the following activities were included:

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- Search for a hosting platform.
- Domain registration (electronic url).
- LMS installation process.
- Configuration of security parameters, functionality and user management.
- Emergent instructional design strategy for the design of distance learning courses.
- Teacher training.
- Publication of virtual classrooms.
- Implementation of support and helpdesk programme for students and teachers.
- Satisfaction data collection through surveys and interviews.

In the master's degree in Innovation and Creativity in Education at the IIC (Institute for Cultural Integration), the aim is to train future teachers who will influence the learning process of future generations, in addition to providing all the didactic, methodological and research tools to promote training in the country. The case study will also serve as a documentary background for a didactic strategy for subsequent analysis and reflection.

In the second step, a review of the literature available at the time of implementing the solution was carried out, trends and emerging methodologies for course design were analysed and the trends at that time were evaluated as described in section two.

Choice of LMS system for the implementation of emerging virtual classrooms

When an organisation or institution is evaluating the selection of a learning management system (LMS) for its distance education project, it is essential to consider several key aspects. Among the most important considerations are the clear definition of the project objectives, the technical requirements for successful implementation, the usability of the system for teachers and students, the essential functionalities required, the customisability to adapt to the specific needs of the project, and the security of data and privacy of users (Osma et al., 2016).

In addition, attention should be paid to the level of technical support and maintenance provided by the LMS provider, as well as the associated costs, including licensing, custom development, maintenance and training. The ability to integrate with other tools and systems used by the institution is also a crucial factor. User experience and feedback from teachers and students must be taken into account to ensure a satisfactory experience (Parihar et al., 2021) (Osma et al., 2016).

Conducting pilot tests and evaluations before the final implementation allows to verify how the LMS adapts to the specific context of the project. In addition, it is important to consider the scalability of the system to accommodate future growth of the project. The reputation and experience of the LMS provider, as well as compliance with applicable regulatory requirements, are factors that should also be evaluated. Finally, having an active user community and a broad resource base can be beneficial for continuous learning and technical support. (Ruipérez & García, 2020).

LMS Platform	Advantages	Disadvantages	Functionality	Usuarios activos
Moodle	Large community of users and developers	Initial learning curve for administrators	Course and educational content management	Over 250 million (from 2021)
	Customisable and flexible	Requires adequate technical and server resources	Assessments and student progress monitoring	
	Large number of plugins and extensions	User interface can be complex	Online communication and collaboration	
	Support for different types of content	Upgrades may require time and effort	Grading and feedback tools	
Chamilo	Focus on ease of use and user experience	High resource consumption in some cases	Integration with other tools and technologies	More than 1 million (from 2021)
	Active community and continuous support	Less popular compared to Moodle	Easy administration of courses and users	
	Intuitive and user-friendly interface	Fewer plugins and extensions available	Creation of educational content and assessments	
	Integración con herramientas multimedia	Smaller user community	Online communication and collaboration	
	Actualizaciones frecuentes y mejoras	Fewer customisation options	Tracking student progress and performance	
Claroline	Gran cantidad de recursos de capacitación	Less modifiable and customisable	Reporting and data analysis for decision making	Data not available, less than one million users.
	Enfoque en la simplicidad y facilidad de uso	Fewer advanced features compared to others	Course and educational content management	

	Interfaz intuitiva y amigable	Smaller user community	Creation of educational materials and activities	
	Soporte para varios idiomas	Fewer customisation options	Tracking student progress and performance	
	Facilidad para administrar y gestionar cursos	Requires basic technical knowledge	Online communication and collaboration	

Table 1 Comparative table of the main free and open source LMS systems on the market

Implementation of virtual classrooms

The Chamilo installation process consisted of installing the system on a hosting platform that was contracted externally, where it was verified that the characteristics of the server met the minimum requirements such as the PHP version, the database engine (MySQL) and other necessary components. Subsequently, a series of steps was started, whose guide was followed from the official Chamilo manual (Bohemia Interactive Australia Pty Ltd, 2015), basically the procedure was:

- The domain registration process was carried out with all the necessary documentation to be able to use the address https://iictultepec.edu.mx. The process involved presenting a series of documents that accredited the institution and its educational organisation.
- The latest stable version of Chamilo was downloaded from the official website (https://chamilo.org) or from the source code repository. In the case of the contracted hosting, the installation package was unzipped and the installation wizard was executed by means of an internal tool called softaculus.
- The name and location to create the database was determined.
- The installation process began and lasted approximately 7 minutes.
- Accessed the website through the browser and followed the installation instructions that appeared on the screen.
- From the beginning of the installation, the user name and administrator password for the platform were established.
- Once the installation was completed, the Chamilo administration panel was accessed and the general settings, such as language, time zone, site name, among others, were configured.
- The courses and virtual classrooms corresponding to the subjects or programmes that will be offered in your institution or study centre were created.
- The structure of each course was defined, content was added, activities were created and permissions for teachers and students were established.
- Roles and permissions were then defined for the different users, such as administrators, teachers and students, to ensure proper access to the platform's functionalities.
- The appearance and design of the website was customised using the configuration options and templates available in Chamilo, the logo of the institution was established along with some elements of personalisation to boost the identity of the institute.
- Extensive testing of the platform to ensure that everything is working properly and adjustments to any necessary configuration to further optimise its functioning.

Training and adoption programme

Once the virtual classrooms were established and published, they were shown to the authorities and administrators of the programme, user accounts were created so that it is possible to monitor progress, accumulated connection time, manage users and courses, organise categories, competencies and badges that serve to provide a much better user experience. Once it was approved by the administrators it was imminent to move on to the training programme which consisted of two main activities, two 6-hour videoconference sessions and the second was to organise teachers at specific times to review their classroom configurations at a time of their choice, a spreadsheet was shared in which each teacher scheduled an appointment within the timetable established for this purpose.

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The objective of the training was that the teachers could upload complementary didactic material, elaborate tasks, grade them and manage the evaluation, as well as other functionalities such as discussion forums, private messages, chats and elaboration of activities, one of the main goals was that each teacher could personalise their virtual classroom, for the revision of this, personalised consultancies were established where each advisor could solve the doubts that arose during the process.

Through this process, a brief interview was carried out where, at the end, the teachers expressed their comments on the virtual classrooms, the most relevant of which were the following:

- The platform seems to me to be very organised, from the outset, everything seems clear to me".
- The icons are intuitive and easy to identify.
- I have the impression that after some time connected it becomes slow".
- "It does not have the possibility to assign a grade to assignments unless the student has sent it in the corresponding section, it does not allow flexibility in the time of delivery of activities for each case".
- The evaluations section seemed to me to be one of the best things it has".
- "A bit confusing in the discussion forum settings".
- "The tasks do not allow for a freer adaptation and their revision is complicated".

The platform offers tools for monitoring and tracking users, it has a general section where you can see statistics of students, teachers, courses, among others, from a data and database point of view, as well as details of each of the accounts that make up the students, there were several sessions for platform administrators to generate their reports.

Results and evaluation

In general, a very brief Likert-type survey was developed so that each user within each virtual classroom could give an assessment of the user experience when using the platform, the instrument that appears in the surveys of the same options of Chamilo, appeared as follows: Participants could select their level of agreement or disagreement with each statement using a 5-point scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree).

The Chamilo platform is easy to navigate and use.

- Resources and course materials are clearly organised and accessible on the platform.
- Uploading and downloading files to and from the platform is fast and efficient.
- Activities and assignments can be easily created and graded in Chamilo.
- The student progress tracking system is effective and provides useful information.
- The platform allows smooth interaction between teachers and students.
- The online forums and communication tools are useful to foster collaboration and discussion.
- The platform has a variety of assessment tools (quizzes, exams, etc.) that are effective in measuring student learning.
- The technical support provided for the use of the platform is timely and efficient.
- Overall, I am satisfied with the functioning of the Chamilo platform for the development of my academic activities.

The above gave an average as can be seen in figure 2.

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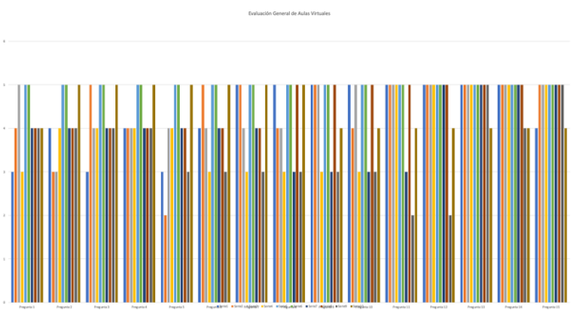

Figure 1 Overall results of the Linkert evaluation survey

Although the implementation was successful, there were some items with the development of activities and tasks that were confusing, the section of evaluations and forums were the best evaluated, while the overall performance of the platform was slow and unresponsive in some parts. The implementation had to be readjusted after the start of the classes when nobody could access the platform, so adjustments had to be made to the sessions and training courses.

In general, it can be determined that the element of time and the emergency for placing the spaces was covered, the students were able to continue their learning process and from this point onwards they would work in a different way for the production of the academic contents of each course.

Figure 2 Example of a pop-up virtual classroom of the subject Didactic use of the Internet accessible from the e-mail address http://iictultepec.edu.mx

Conclusions and future work

By way of conclusion, it is determined that this type of project could be considered as a combination of a process and a method. Although it is based on the implementation of specific software such as the Chamilo tool that uses information technology, the initiative itself involves a series of steps and actions that go beyond the mere acquisition or implementation of a product or software.

The project involves the contracting of hosting services, the installation and configuration of the Chamilo platform, the creation of virtual classrooms, training for administrators and teachers, and the promotion and dissemination among students with the respective technical support. All these components make up an integral process to implement and adapt the platform to the needs and requirements of the Institute for Cultural Integration and the master's degree in Image and Creativity in Education.

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In order to make this project a success, several strategies were involved, emerging instructional design methods as analysed in the following research as specific steps were followed using strategies to guarantee an effective, fast and successful course design of the virtual classrooms. In addition to the above, aspects such as training, creation of individual classrooms, monitoring and evaluation, promotion and facilitation of integration among learners were involved.

Although the project involves the adoption of a specific software, as a research group we conclude that it involves more than merely technical elements that are based on an integrative vision involving innovation, problem-solving capacity and planning oriented towards emerging didactics, which will continue to be explored in future research.

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