Blended learning experience through projects

Una experiencia de aprendizaje combinado a través de proyectos

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Abstract

This research applies the method of blended learning with project-based learning as a teaching strategy. The main objective was to identify the didactic contribution of the blended learning method through the solution of problems in a university context as mechanism to support the development of student competencies. The achievement of these competences was evaluated through face-to-face sessions and online interactions which sought to grant technological solutions to real organizations. Thus, through the Canvas model, the student carried out the creation of a business in a collaborative, distributed and integral manner as part of the educational experience called Technological Solutions applicable to organizations, taught at the Universidad Veracruzana in Mexico. The research question is: What is the didactic contribution of the blended learning method through problem solving in a university context? As a result of this mixed study, the contribution of the teacher is determined by coordinating, organizing, investigating and preparing the appropriate educational materials and technological resources for maximum use in student learning. A primary role of the teacher was to motivate the student to make a final product that can connect their educational activities with real-life situations.

Resumen

Esta investigación aplica el método de aprendizaje combinado junto con el aprendizaje basado en proyectos como estrategia de enseñanza. El objetivo principal fue identificar la contribución didáctica del método de aprendizaje combinado a través de la solución de problemas en el contexto universitario como mecanismo de apoyo al desarrollo de competencias de los estudiantes. El logro de dichas competencias se valoró a través de sesiones presenciales e interacciones en línea que buscaban otorgar soluciones tecnológicas a organizaciones reales. Es así que a través del modelo Canvas el estudiante llevó a cabo la creación de un negocio de una manera colaborativa, distribuida e integral como parte de la experiencia educativa denominada *Soluciones tecnológicas aplicables a las organizaciones*, impartida en la Universidad Veracruzana en México. La pregunta de investigación es: ¿Cuál es la contribución didáctica del método de aprendizaje combinado a través de la solución de problemas en el contexto universitario? Como resultado de este estudio mixto, se determina el aporte significativo del profesor al coordinar, organizar, indagar y preparar los materiales y recursos educativos tecnológicos adecuados para su máximo aprovechamiento en el aprendizaje de los estudiantes. Un rol primordial del profesor fue motivar al estudiante para hacer un producto final que pueda conectar sus actividades educativas con situaciones de la vida real.

Blended learning, Project-based learning, Higher education

Aprendizaje combinado, Aprendizaje basado en proeyctos, Educación Superior

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Introduction

Blended learning is a strategy where teachers plan their classes and integrate activities so that students always interact taking advantage of technological advances, thus facilitating collaborative work and interaction between students and the teacher, who assumes the role of a learning facilitator in the educational process, both face-to-face and virtually. When using technology as a learning support tool, it is essential to incorporate pedagogical aspects through well-planned strategies.

Project-based learning (PBL) is a student-centered teaching methodology, in which students work in groups in a coordinated manner, learning everything by executing realistic and practical projects, developing a broad framework of skills and applying the knowledge acquired in a multidisciplinary way, Agudelo (2015). It is through the PBL strategy that knowledge management, students, tasks and activities are integrated looking for meaningful and pragmatic experiences.

Therefore, it was decided to evaluate blended learning using PBL as a teaching strategy in the educational experience of Technological Solutions Applicable to Organizations of the Accounting major at the Universidad Veracruzana, Xalapa campus, in Mexico. This 40-hour educational experience was taught in a semester as a workshop which included: face-to-face classes; virtual classes (through the eminus institutional platform, the Facebook social network and Whatsapp, in addition to various free tools for website design); search and reading of information; individual and group work done by the students; and the final evaluation that evaluated all the activities carried out in the final product (Andrade, 2012).

The final product was the creation of a technological solution which was published on a website designed by each team.

The final project integrated the elements of the *Canvas* model. The diagram represents a systematic prototype consisting of nine interrelated blocks that allow the understanding of the different activities which guided the creation of a business model in a simple and friendly way.

It was possible to promote the collaborative and distributed work of the students by interacting with the business environment, as well as putting into practice what they learned throughout the educational experience in a real-life case. Therefore, the learning activities included the environments, teaching strategies and learning management in higher education, along with the learning meaning, in accordance with the opinion of the Accounting students, contributing in this way to the integral formation of the students through blended learning strategies.

The research question is: what is the contribution of applying the blended learning strategy through the educational experience of Technological Solutions Applicable to Organizations? The general objective being: to evaluate the learning experience of the students in blended learning using PBL for this purpose. The analysis of the learning activities was carried out while working with the principles of PBL, as well as the analysis of the technological tools used to design business projects as final products of the course, (Cabero, 2004).

The paper presents a review of the literature, the problem statement, the methodology and the presentation and discussion of the results. As it is a mixed approach, the qualitative analysis was prioritized, in which it was determined that the effective contribution to blended learning is granted by the teacher and the way in which they coordinate, organize and plan the learning environment, as well as the teaching strategies and the selection of appropriate technological resources. The support from the teacher throughout the course is of great importance, since they are identified by the students with a main role to encourage them to solve problems of an organizational and technological nature by providing pertinent conclusions in the projects developed, where they also established links with the companies of the State of Veracruz in Mexico.

Theoretical framework

Through blended learning, the integration of technological tools which contribute to the diversification and improvement of the educational process is promoted so that each learning environment is accompanied by training activities for the student.

The use of virtual and face-to-face learning experiences makes it possible to combine the interaction, interrelation and configuration of active participation between teachers-students, students-teachers (Contreras, 2006).

On the other hand, PBL allows the use of technological resources directly involving pedagogical aspects in the learning environment. According to Maldonado (2008), carrying out PBL as part of the curriculum is not a new concept. It is conceived as an integrative strategy rather than a complement, because it is an important component of the teaching-learning process.

According to Huber (2008), the first proposals of PBL date back to 1900-1933. They were the product of an environment for the exchange of ideas, decision-making and action-planning in order to make a specific product at the end of the task.

According to Rodríguez and Cortés, the PBL strategy is a guide to student progress through the diagnosis of problems, feedback and evaluation of the overall results of the learning achieved (Halverson, 2014).

It can be asserted that PBL is an effective strategy that allows the development of students' skills and competencies through the search for problem solutions, as well as contributing to collaborative and distributed work.

The *Canvas* model proves itself pertinent in the design of the business project since it is represented through a diagram of interrelated elements that allows systematically analyzing the way to create a functional company (Osterwalder, 2011).

Through the design of the *Canvas* model, the students created an original technological solution proposal that responds to the needs of Veracruz companies and considers elements such as: the value proposition, the customer relation channels, the relation with resources and activities necessary to maintain the value proposition of the company, and, finally, the income and costs generated when the company is fully working (Feuerstein, 2012).

Figure 1 shows the elements that make up the *Canvas* model, each element has an interaction with the others, which allows the communication of the areas involved:

Figure 1 Diagram of the ontology of business models proposed by Osterwalder
Source: Osterwalder (2008)

This is how the *Canvas* model was used according to Sánchez (2011) to integrate the areas of the technological solution proposed as the final project of the educational experience based on PBL guidelines, in which technology and pedagogy are mixed in a way that both follow a didactic strategy according to the business subject of the selected educational experience (Márquez, 2010).

Methodological design

The methodological design applied to this research according to Hernández, R., Fernández, C. and Baptista, P. (2014) was mixed in nature and applied to all participants of the educational experience. We considered in the quantitative analysis 54 students evaluated through a survey with a structured questionnaire applied online with *Google Forms*.

The survey was divided into three sections (blended learning experience, PBL teaching strategy and opinion on the proposed technological environments). The reliability of the instrument was evaluated using the split halves method and the result was a percentage of 0.92. The content, the construct and the validity of the criteria were validated through expert judgment.

On the other hand, the qualitative approach was carried out to obtain sensitive information which would explain the categories of analysis of the social phenomenon through the use of subcategories.

Five students were selected to participate as key informants, who should meet the following criteria: (1) they have been a student of the educational experience of Technological Solutions Applicable to the Organizations of the Bachelor of Accounting in the Faculty of Accounting and Administration, (2) they have actively worked individually and in teams on said educational experience and (3) they are willing to respond to the full survey. In the case of the quantitative analysis we used the SPSS tool and for the qualitative analysis, the MaxQDA tool.

Development of learning strategies

The educational experience of Technological Solutions Applicable to Organizations belongs to the disciplinary area of the Accounting program at the University of Veracruz. Its competence unit is for the student to apply information and communication technology as a tool to improve the productivity, profitability and competitiveness of an organization.

In this educational experience, the active participation of students was promoted to identify the type of technology suitable for companies and the development of a technological solution of a real organization without considering its size, but with the requirement of being real.

For this reason, it was necessary to ask activation questions to analyze, in a preliminary way, situations to solve complex problems. In this sense, the market, business competitiveness and the different situations that students should consider for a technology-based solution were analyzed.

Therefore, by using technology and having the assistance of the teacher during the learning process, some elements were combined to contribute to the student's own educational process, Osorio (2011).

The learning activities were carried out through face-to-face and virtual sessions via the institutional platform, a closed group on Facebook and Whatsapp for the communication and comments of the students. The final business projects designed by the students were interactive web pages, process automation systems, among others. All projects were based on the *Canvas* model, in support of various companies in the capital of Veracruz.

The development of the blended learning experience therefore fulfilled its objective by integrating face-to-face and virtual sessions through the consolidation of the Eminus institutional platform, the integration of social networks such as Facebook and Whatsapp and the use of various free web design tools. Figure 2 show the mentioned elements.
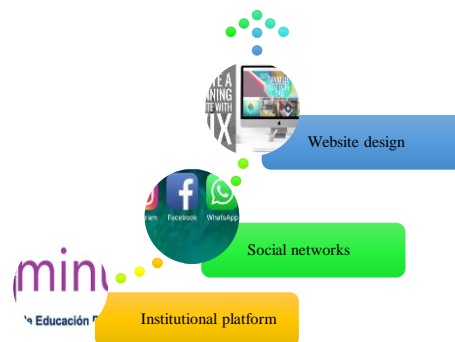

Figure 2 Integration of elements in the development of learning strategies
Source: Prepared by the authors

–   Institutional platform. Used for the integration of various tools, the organization and coordination of the course; likewise, through the platform, the instructional design was implemented, considering elements such as competences by subject, content, activities and evaluations, as well as internal communication mechanisms like an internal chat and permanent forums by topics. Eminus (2019).

–   Closed group and discussion forum through Facebook, where participants had the opportunity to interact in an uncontrolled environment. Otero (2018).

–   Websites: the use of free platforms on the Internet to design and publish business projects. Wix (2018).

In order to prepare the final project, the general indications and guidelines of the *Canvas* business model were implemented (Pizarro, 2011). According to them, a company must be established systematically. These steps were adapted for the educational experience described above, for which work teams of up to 5 students were organized.

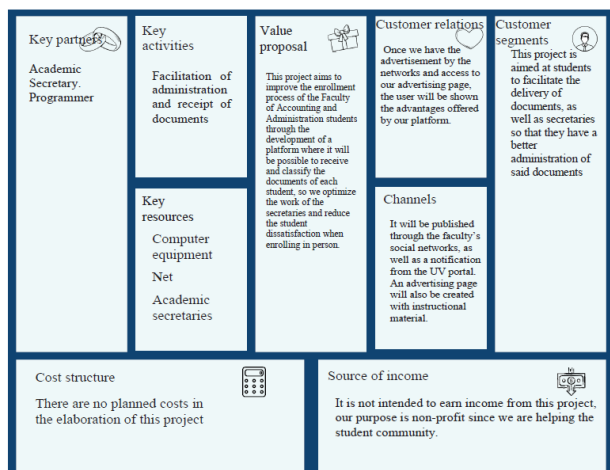Figure 3 presents a schematic result of the application of the CANVAS model to a technological proposal:

Figure 3 Ejemplo de Modelo Canvas aplicado a un proyecto empresarial
Source: Prepared by the authors

Gulsun

Throughout the course, complementary activities were carried out in face-to-face sessions and, later, they were uploaded on the institutional digital platform to be evaluated, Gulsun (2013). There was also a constant feedback and discussion in the forum of social networks (Facebook and Whatsapp). At the end of the course, the students made a presentation of their final projects in a fair of technological solutions in which the representatives of the companies were invited.

As an example of a technological solution, we present a company called "Típico Alto Lucero," created by a young Mexican, Williams Domínguez, who has not exercised his major and presently has an economic deficit. He is from Alto Lucero de Gutiérrez Barrios, a town located 35 kilometers southeast of Xalapa in the state of Veracruz, which is recognized for its rich and varied cuisine. Based on this, his products were marketed with great demand; however, it was considered necessary to promote his products, so the following was proposed:

The implementation of a mass communication mechanism for the promotion of his products through a website, Facebook and Whatsapp, giving solution to the economic and commercial sector of the Típico Alto Lucero microenterprise, all this was to increase the demand for his products and sales. Figure 4 shows the main page of the technological solution:

Figure 4 Technological solution for the Típico Alto Lucero Company
Source: Prepared by the authors

Figure 5 shows the menu of the technological solution where elements of various social networks can be seen as a diffusion mechanism.
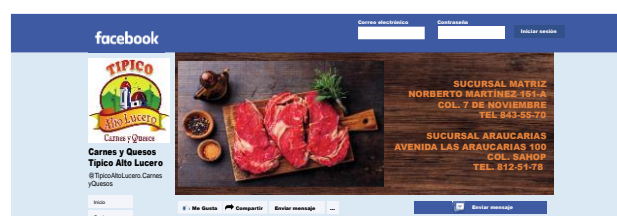

Figure 5 Menú de la página *Web* de la empresa Típico Alto Lucero
Source: Prepared by the authors

Finally, Figure 6 shows the statistical results of the use of the Whatsapp social network, where the interaction with customers is presented.

Figure 6 Statistics of the social network in Whatsapp of the Típico Alto Lucero Company
Source: Prepared by the authors

Results

The dynamics of learning application combined with PBL was carried out successfully in both face-to-face and virtual environments. An active participation of most students during the course must be remarked. Innovative ideas prevailed as evidence through business proposals, considering real needs faced by emerging companies.

The results of the qualitative inquiry reveal some elements of great relevance, for the category of learning environment we considered face-to-face classes, technology implementation and appropriate learning.

In this way, the students evaluated the face-to-face classes and the development of virtual activities. The explanations, the objectives of the teacher and the comments on the activities that the students did among themselves were established.

In the category of technology implementation, students identified it as a work tool which allows the facilitation of the teacher and his review on time, as well as innovation using different virtual configurations to develop the final project. The students showed their approval on the use of websites by advertising their technological solution.

Regarding the category called appropriate learning, the students said that the use of technology was good because it helped them develop their final product; and there was a continuous teacher-student and student-student communication. The students discovered that learning was much more meaningful.

The category called integrative project was comprised of: connection between school and the real world, teamwork and learning experience.

Thus, in this category, the perception of the students related to the final project of the course could be inferred. The connection of educational activities with real life situations generated an experience in which collaborative work was significant.

Here are some opinions from students who support this situation: Student 1: "I think it is a good option to reinforce learning in classes." Student 2: "I liked working with real companies and especially interacting with employees and managers." Student 3: "We were able to integrate ourselves to a working team in a very appropriate way, considering everyone and also involving everyone." Student 4: "I learned that starting a business is not easy, but when you finish, you feel really satisfied." Student 5: "The use of the *Canvas* model facilitated the development of the project."

Among the results, acceptance of students of blended learning is important, since the use of project-based learning allowed them to have an integral vision of organizations to be able to propose technological solutions that would provide them with competitive advantages, for which the *Canvas* model is regarded as an excellent way of representing the business context, where the key elements within organizations were included.

Collaborative and distributed work was strongly motivated, the use of open environments such as social networks led to greater freedom in both individual and team participation, greater and better effective communication was achieved, as well as strengthened relationships of tolerance and respect.

Regarding learning environments: Student 4: "We considered that the Eminus institutional platform is functional as a mechanism for providing various external resources and as a means of control for the delivery of activities and keywords, although we observed that there may be improvement to the elements of internal communication such as forums and chats, as there is great preference for social network environments like Facebook and Whatsapp."

Regarding the use of free environments for the design and development of websites some comments were: Student 2: "The tool is easy to learn and use, but the most important thing is to know how to integrate all the elements obtained from the needs of companies to guarantee its success and improve in the face of competition."

The use of social networks like Facebook and Whatsapp allowed a better interaction between teacher-student, student-teacher in the closed group and discussion forum to interact at any time and place. Regarding the quantitative study, the group of informants consisted of 63% female students and 37% male students, whose ages range between 18 and 22 years.

When asked about their opinion about the learning environment, the combination of face-to-face classes and the use of different technological resources throughout the course, 92% of them provided positive responses. Therefore, when blended learning is used in a teaching process, according to studies, it implies the integration of well-designed spaces where knowledge acquisition and construction can be conceived as part of the planning and organization of learning situations, the time to be invested, the strategies to be used, the instructions of the classes and the selection of educational resources to create effective learning environments.

With respect to the institutional electronic learning platform, an appropriate learning environment was considered in which the students interacted with the teacher. It was a favorable tool for the coordination of the course, according to the opinion of the students.

Although the online environments had a specific objective for each activity, it was important to consider the evaluation of the students to identify in which they liked to work and which one was the most favorable for the activities. Thus, students had diverse opinions about learning environments throughout the course.

Implementing the PBL strategy, according to Rodríguez and Cortés (2010), who recommend the identification of a final product within the area of subject matter research and the development of a management plan for the project, the design and the elaboration of a product according to a specific environment, meant an integral process in which, in an authentic way, the students developed their own ideas to create their technological solutions.

We assert that there is a contribution of blended learning in scenarios where the teacher takes their role as coordinator and facilitator of learning strategies, the use of PBL allows a better identification of the technological solutions that can be proposed to companies and the use of the *Canvas* model homogenizes the tasks and elements that must be considered in a timely manner, contributing to the quality of the proposed solutions.

Finally, the intervention of the teacher in the learning environment is of great in the development of the activities, as well as in the success of the PBL strategy.

Conclusions

The application of innovative learning models such as blended learning and project-based learning contribute substantially to the integral training of students. Through this research, the importance of considering adequate planning and the selection of learning strategies was determined, especially monitoring and feedback from the teacher to achieve learning success. Having learning environments alone do not guarantee success in its implementation, and educational platforms without proper interaction do not result in satisfactory and significant learning. Thus, the Technological Solutions Applicable to Organizations turned out to be accepted, with a final product that generated a positive impact on the companies benefited through the proposals.

The main contribution of this research lies in the design of a mechanism that integrates blended learning and problem-based learning for the achievement of skills, in addition to allowing innovation in the traditional class using learning elements that enrich the students and allow the use of educational resources which are widely accepted by them. Based on this research, we envisage the possibility of having a platform to avoid delays in the advancement of the study plans, since although there could be a suspension of classes, the students still have elements that allow them to work from home.

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