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Experimenting blended learning in a flipped classroom environment

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***Abstract*— The synergy of blended learning and flipped classroom educational models have been in great demand in recent years, especially as a result of the COVID-19 coronavirus pandemic that has forced traditional education to implement alternative models that make use of information technologies to continue the academic training of students worldwide at all educational levels. The objective of this research was to validate the relevance of the implementation of blended learning in a flipped classroom environment in a higher education course. The research methodology was quantitative, using the survey as an instrument. The results obtained are concentrated in a great acceptance of the applied models indicating ease in the learning scheme and the improvement in the autonomy of the students through the virtual platform, the need for adequate planning and design of the course is asserted, in addition The guidance, intervention and feedback of the teacher as facilitator of the course was essential. As a consequence of this, its validation allows endless opportunities for the design of educational experiences under these teaching models, since it can be implemented in other areas of knowledge.**

Keywords—blended learning, flipped classroom, higher education, virtual course

I. Introduction

Today innovation in educational practice has become a necessity to achieve the desired competencies at all educational levels, for which various learning strategies and methods have been proposed, among which virtual learning environments stand out. The Universidad Veracruzana is no stranger to educational innovation practices, which is why since 2004 it developed its own virtual learning platform denominated *Eminus* [1].

Blended learning and flipped classroom are considered two important innovations in the area of technology-mediated education, so it was decided to implement both models in a higher education course, exchanging face-to-face sessions for virtual synchronous sessions taking advantage of various platforms such as zoom, teams, meet and designing the course on the Eminus virtual learning platform to later validate its effectiveness. It is based on the hypothesis that the pedagogical models of flipped classroom and blended learning are favorably accepted as a learning strategy in Higher Education.

Therefore, the objective was to validate the blended learning teaching models in a flipped classroom environment in a Higher Education course.

The article is organized as follows: section two presents the theoretical framework with the foundation of blended learning and the flipped classroom; later in section three the contextual framework of project development is presented to distinguish the application of the model and the environment; section four identifies the model adopted for the case study; section five presents the results obtained and finally section six presents the conclusions reached.

II. Theoretical Framework

Blended learning proposes alternating face-to-face classes with virtual sessions, promoting flexibility and autonomy as well as being attractive to be implemented in a class, a complete course or even an educational program.

[2] Say the term mixed learning allows the extension of the face-to-face class (or virtual synchronous session) through digital platforms, providing flexibility in times and spaces, increasing the autonomy and responsibility of the student [3].

The blended learning modality requires greater interaction between teachers and students, especially through various virtual learning environments and various technological tools to meet the learning objective; At the time of the face-to-face or synchronous meeting, students have the opportunity to discuss specific topics covered on the platform [4].

The inverted classroom, on the other hand, allows to have the time in class, so that the students apply the knowledge previously acquired from home, through various educational resources, arranged in a platform or virtual classroom, thus allowing them to take advantage of the time of the face-to-face class (or synchronous sessions) to express doubts, make inquiries and interact with the teacher and other students.

In his prologue, Prieto described the various strategies of the flipped classroom, in which they allow students to transmit to students by digital means (documents, videos, images) the information that must be studied before class, without consuming face-to-face time and checking the results of their

study through online questionnaires or formative evaluation activities and class discussion [5].

The inverted classroom technique is understood as turning the class or a class upside down. This term serves to define a new teaching method whose basis lies in the methodology of inverting the classroom, where tasks that were previously done at home are now done in class and vice versa [6].

III. CONTEXTUAL FRAMEWORK

The Universidad Veracruzana has a Comprehensive and Flexible Educational Model (MEIF) based on competencies with three main axes: the theoretical, the heuristic and the axiological. Therefore, the student must know things, do things and want to do things [7].

[7] indicates that one of the basic guidelines for the MEIF establishes the learning of communication and self-learning skills as mandatory, allowing the acquisition of digital skills.

In the Bachelor's Degree in Administrative Computer Systems, the educational experience of Multimedia Applications is taught in the Organizations of the optional terminal area, whose unit of competence is that the student designed and integrated multimedia elements in a project based on their knowledge of their uses and advantages, as well as criteria for the design and management of specific applications, which allow the achievement of organizational objectives, in an area of respect with creativity, commitment and responsibility.

Therefore, this educational experience is considered as a viable alternative to evaluate and validate the level of acceptance of blended learning in a flipped classroom environment.

A. Research objective

Validate the blended learning teaching model in a flipped classroom environment in higher education.

B. Method

The research was quantitative, with a descriptive approach, part of the research hypothesis: the pedagogical models of flipped classroom and mixed learning, are favorably accepted as a learning strategy in Higher Education.

C. Population and sample

The study sample is made up of 23 students from the eighth semester of the Administrative Computing Systems degree at the Universidad Veracruzana who completed the educational experience of Multimedia Applications in Organizations whose ages range from 21-22 years of age.

D. Research validity and reliability

To collect the information, a university student satisfaction questionnaire prepared by [8] was used, towards online training (CUSAUF), which presents a Likert-type response scale, from 1 to 4. Said The questionnaire presents 28 items, which evaluate the following dimensions: General aspects of the subject; related to the teacher-tutor; related to the contents; related to communication and finally, to the learning environment.

The reliability and validity of the instrument was analyzed and validated by Cronbach's Alpha coefficient [9]. Of the 29 items, 23 were considered valid and 6 were excluded. When the test was carried out, the alpha value obtained was .95 according to the Murphy and Davishofer scale, this represents a high level of reliability.

On the other hand, [10] comments that one way of evaluating the internal consistency of an instrument is through the two-halves procedure, obtaining as a result, Cronbach's alpha where part 1 obtains a value of .873 and the part 2 of .954, the correlation between the forms is .848, with the Spearman-Brown method, in equal length it was obtained as a result .918, and in unequal length .918. Using the Guttman coefficient of two halves, a result of .916 was obtained. According to Vellis on the rating scale, it is very good, and has a reliable influence for research purposes.

IV. BLENDED LEARNING IN A FLIPPED CLASSROOM ENVIRONMENT

The instructional design is the planned, organized and systematized process that starts from the learning objectives, detailing each of the contents, with the purpose of meeting the student's training needs; at the same time, it determines the teaching methodology and techniques that contribute to the achievement of said objectives, it also provides for the evaluation of the teaching and learning process with the intention of strengthening and consolidating it.

The ADDIE model, acronym for Analysis, Design, Development, Implementation, Evaluation, according to [11] is an interactive process instructional design model, where the results of the formative evaluation of each phase can lead the designer instructional back to any of the previous phases if necessary. The end product of one is the beginning of the next. It is considered a basic model because it contains the essential phases of it.

In this sense, the course was designed under the ADDIE instructional design using Eminus as a virtual platform, to be taught in the mixed learning modality in a flipped classroom environment.

Techno-pedagogical development

Eminus is the Distributed Education System of the Universidad Veracruzana that allows synchronous and asynchronous communication, allowing to present online courses, carrying out, the design of classes, the programming of activities, communication tools such as forums, messaging, as well as the application of exams and the evaluation section.

The activities carried out in the flipped classroom model are identified in three moments: before, during and after the synchronous classes, in Figure 1 you can see:

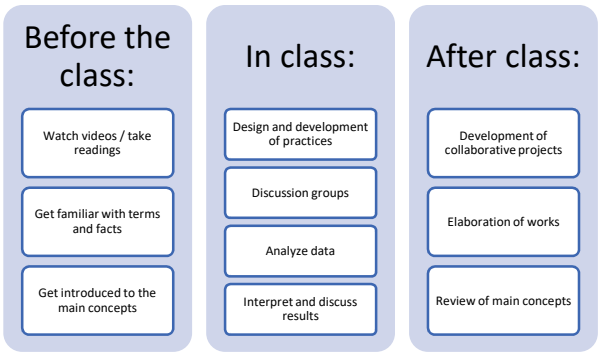

Fig. 1. Activities in the flipped classroom

In Figure 2 some examples of the activities carried out through.

V. Results

In the dimension of aspects related to the teacher-tutor, in Figure 3 a favorable acceptance by the students can be observed. Evaluating positively, they highlight the work of the teacher, the activities carried out being adequate, as well as the ideal animation and stimulated participation. The aspect that obtained a lower evaluation was related to the facilitation of the understanding of the technical issues of the platform at some point during the course, with a percentage of 26%.

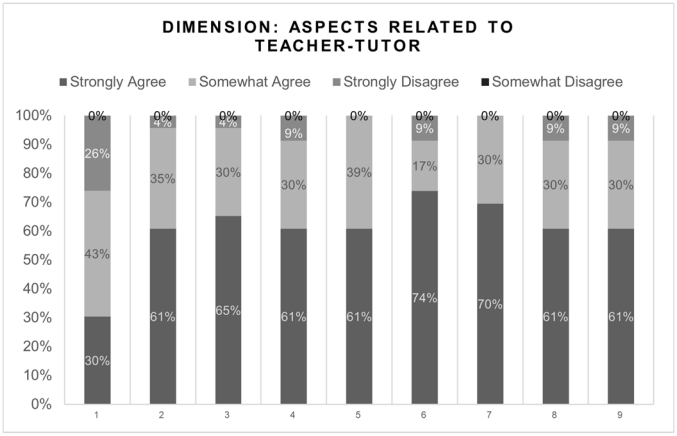

Fig. 3. Dimension: Aspects related to the teacher-tutor

In the dimension of aspects related to the contents, Figure 4 shows a favorable acceptance by the students, obtaining 100% acceptance of the items referring to the fact that the amount of information presented in the course was sufficient and adequate, the The contents were easy to understand, appropriately generated the interest of the contents from a theoretical point of view, in the same way they were considered pleasant, as well as the relationship between the timing and the contents offered were appropriate. On the other hand, the lowest valuation with 4% refers to the interest of the contents from a practical point of view.

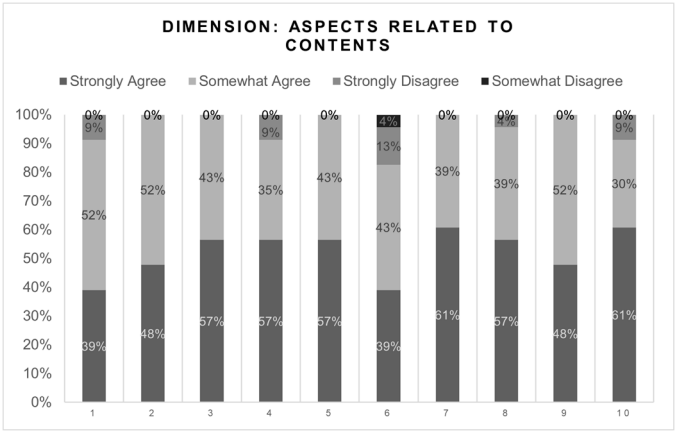

Fig. 4. Dimension: Aspects related to the contents

In Figure 5 the dimension of aspects related to the virtual environment is identified, where a positive assessment is generally appreciated, highlighting the approval in the technical operation of the platform being an environment easy to understand, the aesthetic quality of the environment making reference the size, type of letters and colors, as well as the response times to access links, tools, etc.

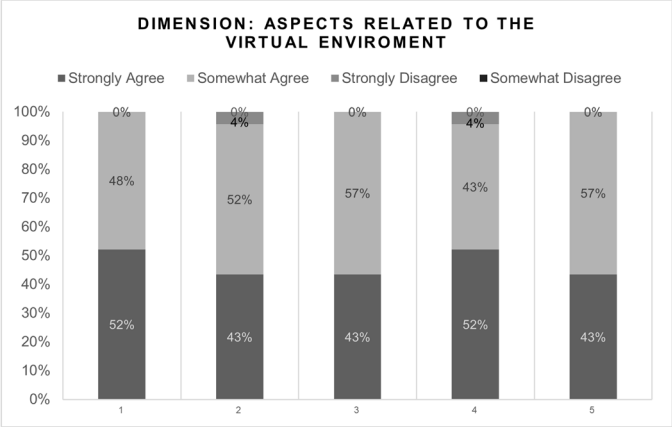

Fig. 5. Dimension: Aspects related to the virtual environment

In general, in Figure 6, the positive assessment regarding the satisfaction of an online training is appreciated, both in the dimensions of teacher-tutor, content, communication and virtual environment, they are adequately valued by the students.

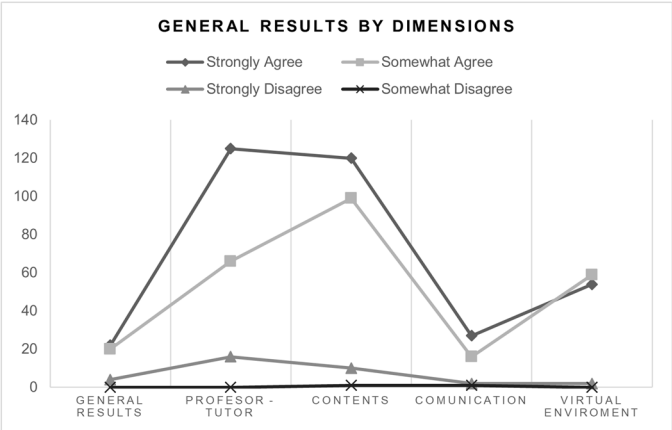

Fig. 6. General results by dimension

A. Analysis and discussion of results

The general research hypothesis is favorably accepted as a learning strategy in Higher Education, the results obtained indicate that the application of blended learning in a flipped classroom environment has a positive influence, facilitates individual learning, the acquisition of new skills, the restructuring of the cognitive structure is generated, as well as encourages creativity to achieve the objectives proposed in the educational experience.

In addition to the above, a hypothesis proportions test was carried out where the Hypothesis (Ho): The flipped classroom model is accepted by 7 out of 10 students as a learning strategy.

The statistical test for proportions indicates that the Ho must be accepted, this is evident since at least 70% of the students accept it as a learning strategy, with a significance level of 5%.

These results confirm that the blended learning model in a flipped classroom environment, in addition to being an option to innovate the traditional learning method, also results in an important positive change by promoting individual learning, the acquisition of new skills, learning autonomy and fostering creativity.

VI. Conclusions and Future Work

It was found that the implementation of blended learning in a flipped classroom environment is accepted by students and promotes their autonomous learning, emphasizing the need for proper planning and design of the course, in addition to the supervision of the facilitator.

In turn, it opens a gap for the generation of knowledge in various investigations, where it can be implemented in various educational experiences, as well as in other areas of knowledge, and in turn investigate the acceptance and degree of digital skills by teachers, since, to be implemented, its vision, design and reliability of the model are necessary.

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