THE APPLICATION OF THE FLIPPED LEARNING MODEL IN HIGHER EDUCATION

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Abstract

The present article was developed at the Polytechnics of Chimborazo in the city of Riobamba, Ecuador, with the objective of determining the relationship between the teaching model with the results of the summative and diagnostic evaluations obtained by the students, of the Thesis Design subject, of the Graphic Design Engineering career. For this quantitative study, a quasi-experimental design was used, in which a pre-test and post-test were applied, using the Likert-type data collection instrument previously validated by experts, on the perception of two teaching methods: the traditional one (focused on the teacher) and Flipped Learning, in a sample of thirty (30) students. The results had an important tendency to activities through Flipped Learning, highlighting the criteria that evaluated the link between the academic goals with the teaching model as well as the role of the teacher in promoting it. The conclusion is that it is necessary to constantly research educational innovations worldwide, in this sense, the Flipped Learning model was perceived satisfactorily by the students, due to the effectiveness of modifying the order of teaching processes and materials, which are important for the achievement of academic goals and the consolidation of learning.

Key Words: Pedagogical Model, Flipped Learning, Abstract University.

1. INTRODUCTION

Nowadays, higher education has shown important changes in the pedagogical models adopted, especially in the most modern and constantly evolving educational systems. This has been evidenced in each of the progress that has led to the planning of the teachings, the instructional means, as well as the scenario where they are implemented, and the consideration of the actors involved in it, they are a fundamental part of the progress at the university level (Luna-Encalada et. al., 2021). One of the main elements in this order is precisely the premise of the teacher's model or method of action (Lozada-Yánez et. al.,2022; Santillán-Lima et.al.,2021), that is, the approach taken in a practical and not merely theoretical way for the execution of the classes, within which a support must be conceived theoretical supported by the precepts of the psychological theories of learning, such as that of Vygotsky's Constructivism, which allows to proceed in the construction of improvements to the teaching and learning processes constantly. For Robinson (2015) when referring to the education system currently "it does not encompass the development of the people in all its dimensions and does not take into account the infinity of talents that it possesses. That is why he considers that schools learn without enhancing latent inner creativity and talent (Lozada et. al.,2018). " In this sense, this is a factor that has been specified in today's university, since even many schools apply behavioral-type methodologies (based on the

focus centered on the role of the teacher as a base) and do not specify the other side of the theory "balance" where, at the level of education, attention should really be transferred to it.

In this regard, Reigeluth (2012) affirms that "a model of direct transmission of information to a model that favors interaction and formative evaluation, implies the design of scenarios that allow the passage of specific spaces for the transmission of knowledge, led by the" wise man on the stage (Granda et. al.,2022;Lima et.al.,2021). Due to the "space" of higher education or in university institutions is actually a multiform environment, understood in this way by the plural and heterogeneous characteristics, both of the students and of the teachers themselves and their professional training, it is important to specify the requirements that the actors of the context have in common, in which of course the ultimate goal must be: that learning is consolidated and there is new knowledge in the person, that means, the student. According to Tourón and Santiago, (2015) Columbia University (USA) showed that, of the 200 words per minute that a teacher can speak, the student captures around half; students retain 70% of what is explained in the first ten minutes of class and only 20% of what is explained in the last ten, staying attentive only about 40% of the time the class lasts. This particular aspect refers to the ability to retain vigilance by the teacher around the speech he is giving and the theme of the instructional objective developed. This element allows us to infer that the routine, obsolete, or traditional teaching models as they are also known, are indeed very difficult for the educational purposes in the university to be achieved today. For this reason, we speak in the present of the alternation of teaching, or the method used for it.

In this sense, Martínez and Esquivel (2018) state that "despite the fact that in many classrooms the reality continues to be traditional teaching, innovative experiences of pedagogical intervention have spread that for some years include the use of ICT(Molina-Granja et. al.,2022). Although the introduction of technological tools has accompanied the teaching chair in its different stages of evolution, the pedagogical use of these tools is the key to an adequate teaching-learning process. So, it is not only a matter of adding a new instrument, tool or strategy to the traditional methodology, but of implementing the appropriate didactics. "According to Vallet et al. (2017) one of the elements to consider in many of the instructional schemes, especially in university spaces, is the effects of cooperative learning, most of them have focused on the comparison of results between cooperative learning versus competitive and individual learning. Therefore, the inclusion of technology and more properly information and Communication Technologies with the premise of Cooperative Learning is a current trend for the formulation of teaching plans, in which the interaction needs of students with their students are adapted and the possibility of using electronic media and devices that facilitate global communications, especially when it comes to solving problems proposed in the academic environment (Pauca-León et. al, 2022).

For Guitert and Pérez (2013), collaboration processes in the educational field are not new. It is a fact of constant study for the specialized sciences in teaching, to be able to adequately enable instructional models that allow the consolidation and achievement of learning. Undoubtedly, peer collaboration or cooperation is a trend unequivocally embraced by many innovative teachers who are currently seeking to improve the classroom experience and the students they teach. In this order, the change of the pedagogical model represents the following base to the identification of the main needs of the education system, that is why it is considered one of the most innovative approaches formulated by research teachers, this is the teaching method called Flipped Learning, according to Cantón (2017) it is a learning model designed by a young man from the University of Alcalá named Alfredo Prieto Martín, who for several years has tested the effectiveness of the procedure in classrooms, based on the methodological catharsis of a unidirectional model to a multidirectional model of self-study with important and better consequences with more time in classes, a big improvement of the argumentative and discursive capacity of the students as well as the prior preparation of the students according to the topics developed.

According to the Flipped Learning Network (2014), flipped learning is an approach that allows teachers to implement one or more methodologies in their classroom. To counter some of the misunderstandings about this term, the governing board, and leaders of the Flipped Learning

Network (FLN) - all experienced facilitators in this practice - have created a formal definition of the term. By defining it explicitly, it seeks to weaken some of the myths that teachers, the media, and researchers promote. For Landa and Ramírez (2017), the Inverted Learning Model takes the content that was exposed in class, instruction directed by the teacher, and replaces it with what was traditionally done as homework, activities assigned to be completed by students at home, those that take place inside the classroom. Additionally, it gives the student responsibility for their own learning to a greater degree, since it requires completing the preparatory work prior to the session and being more participatory and interacting with their classmates and the teacher during class time.

Burford and Chan (2016) Little (2015); As a pedagogical model, Flipped Learning integrates a series of didactic methods, methodologies, techniques, strategies, and didactic resources (typical of other pedagogical models such as problem-based learning, challenges and discoveries, project work or blended learning (Hultén and Larsson, 2016; Bergmann and Sams, 2014; Tawfik and Lilly, 2015; Tourón and Santiago, 2015).

On the other hand, the Observatory of Educational Innovation of the Technologic of Monterrey (2014) maintains "this model gives a twist to traditional education by imparting direct instruction outside of class time, generally through videos (Molina-Granja et. al., 2018). This frees up time to carry out more meaningful learning activities such as: discussions, exercises, laboratories, projects, among others, and also to promote collaboration among the students themselves" (p.4).

One of the most relevant aspects of this model is that the student is not seen as a mere listener focused as a passive subject of the teaching and learning process. Rather, in Flipped Learning, the learner is conceived as the protagonist of his own construct, which is why this model is based on the following pillars:

1. The flexible environment: with which the facilitator (role played by the teacher in the Flipped Learning model) must transfer the teaching context many times outside the classroom or create alternative spaces for academic instruction.
2. The learning culture: learning is transferred to the responsibility of the student and not merely of the teacher as a common thread.
3. Targeted content (Intentional Content): it thinks about the contents of direct instruction that are accessible by students and based on this prioritize so that they can address them independently. Formative evaluation techniques are used such as differentiation, support resources of interest and relevance, etc.
4. The professional facilitator (Professional Educator): refers to the fact that the teacher provides continuous and close monitoring of their students, providing relevant and immediately feedback and evaluating their work. The professional facilitator reflects on their practice, connects with other facilitators to improve their instruction.

According to the reviewed aspects, it can be understood that the model called Flipped Learning, innovative in its composition and application in higher education, represents an important variant of traditional instruction methods, which are based on the teacher's knowledge and the transmission of the ideas and content of the same through structured and regulated sessions, often even at the time of its application. Therefore, the models based on technology and cooperation, key elements of this method, come from this approach based on the restructuring of the order of the elements, an especially valuable variable of the higher education system. Because, before, routines that must be fulfilled by students were consistently followed, with the pre-established schedule that homework assignments had to be completed outside the classroom, while the indicated tasks were fulfilled in the classroom according to the lesson plan, in the Flipped Learning method, aspects of communication between the actors in the context are modified, through the interaction of the facilitator, who can also carry out updating and consultation actions with other knowledge mediators, just as students should do, through movement in different scenarios from the limits of the university infrastructure, so the search for solutions to the exercises or the answers to the proposed activities is a way to do it, which they must achieve through inquiry and exploration,

often with the cooperation of other learners and participants in the educational event, to achieve each of the academic goals. So, the main one of all purposes is the motivation in learning of the main actor of the model, which is the student.

In such a way that the present research aims to determine the relationship between the teaching model with the results of the summative evaluations obtained by the students, of the Thesis Design subject, of the Graphic Design career, during the pretest stage and posttest completed in the study that is exposed.

2. MATERIALS AND METHODS

Design

It was a quasi-experimental quantitative study with two moments of data collection and recording, within the positivist research paradigm, the conventional pedagogical teaching method was applied in the classroom (traditional model), it is centered on the teacher, for the evaluation of the initial results of consolidated learning in the group of study participants. For this purpose, a schedule of fifteen (15) days of continuous classes was established under the traditional teaching method, centered on the teacher, in which the teacher gave the academic class and the student complied with all the planned routine as a passive actor, who hears and attends, after this, the summative evaluations were applied with the delivery of the assignments due for that purpose. After this, it was applied in a second phase of the research, the gathering of the complementary information followed by the use of the Flipped Learning pedagogical model for fifteen (15) days more, adapting the teaching planning to the four pillars of the mentioned model "FLIP", in which the education schemes were changed, adjusting to the indicators of the Flipped Learning teaching method, this is how the scope and results obtained could be evaluated, in contrast to the same course of students of the Graphic Design Career from the Higher Polytechnic School of Chimborazo in the City of Riobamba, Ecuador.

Variables studied

Average number of students before and after the application of the Flipped Learning model.
Perception of the instructional model used by students

Data Collection Instrument

An instrument was structured with a total of six (6) proposals on the evaluation criteria of aspects such as acceptance of the teaching model used by the teacher, also, the motivation of the teacher in the classroom through the implementation of an alternative pedagogical model. Therefore, the propositions were developed using a Likert scale with a total of five response options: Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree, the aforementioned questionnaire was applied to a total of thirty (30) students in two moments (pre-test and post-test) however, before applying it, they were subjected to expert judgments, through content validation, by an expert in the pedagogical area and another in the area of methodology research, the result of the evaluation of the questionnaire formulated for this study was that it was pertinent and coherent for the theme and the purpose of the research, which is why it was applied in two moments, in this sense Franklin and Walker (2010) warn that the advantages of reviewing questionnaires by a panel of experts are that it is fast, of moderate cost, it can cover a wide variety of potential problems ranging from spelling errors, grammar or from writing to problems with the concepts that are being operationalized in the questionnaire, additionally it covers cognitive aspects of the respondents, it can reveal potential difficulties for the interviewer (if there is one) and it can reveal possible problems for data analysis.

Process

At the beginning of this research, a previous selection of thirty (30) students was made, who were of both genders (male and female), later a data collection instrument was designed which was subjected to the validity of its content. After this, the Likert questionnaire was applied during

phase one (I), which was executed at the end of the class under the pedagogical model centered on the teacher (traditional), after fifteen (15) continuous days of academic activities in the classroom, with summative evaluations, in which the schedule established in the corresponding hours of the subject "Thesis Design" was achieved, to the aforementioned course of thirty (30) students formally enrolled in it, after applying this questionnaire, the research continued during phase two (II) in which the questionnaire was applied a second time to the students, but this time was after completion of the teaching planning based on the Flipped Learning pedagogical model, which consisted of a change of environment, the consideration of the individual needs of the students around the topics approached, so they were given freedom to investigate freely and propose ideas on the aspects that will be most difficult. The reproduction of audiovisual material on the most representative elements of each instructional objective was also developed during the planned classes. At the end of the fortnight, the same instrument was applied again to evaluate the students' perception of the teaching model used.

Sample
The subjects of the sample are students of the Graphic Design career, of both genders, a total of thirty (30) with a relationship of eighteen (18) women and twelve (12) men. Which were the population and the absolute sample of this study.

Inclusion criteria
Students enrolled in semester II-2020
They are in the ninth semester and the subject of Thesis Design
All those included expressed their voluntary desire to participate as a sample in the research that is presented.

Exclusion criteria
Students who are not taking the course even when they are enrolled.
Students who indicated not wanting to participate in the study data collection.

Table 1.
Semesters and Subjects of the sampled students

Level / semester	Subject	Number of students
Ninth	Thesis Design	30

Source: Santillan 2023

Sampling Strategies
An intentional form of sampling was applied, a total of thirty students from the Higher Polytechnic School of Chimborazo of the Faculty of Informatics and Electronics was selected for the diagnosis of the research, specifically of the Graphic Design Career. Therefore, all the students enrolled in the course or subject were taken as a population and sampled in a census form.

Reference to the type of statistical analysis employed
The statistical analysis was based on the description of the data through the use of count measures such as the average in the pretest and posttest with the testimony of the students who were participants in the aforementioned study. In relation to the factors considered: the average of the students before and after the application of the Flipped Learning model was globally evaluated to know how the application of this teaching scheme had affected the improvement or restriction of some elements relative to the learning of the instructional objectives initially planned, before the fifteen days of classes with each pedagogical method.

Information processing and analysis
- The first aspect was the Design of the data collection instruments considering the main descriptive elements of the students' preferences.
- Second, the content of each of the items was evaluated, presenting the instrument to the experts in the pedagogical and methodological areas respectively.
- Third, the first results of the research (pretest stage) were recorded after the first fifteen days of classes with the teacher-centered teaching method.
- Once the days of phase one (I) of the study were completed, the class was developed with the change of teaching model and the application of the same questionnaire to the sample (post-test) a second time.
- Completed the data collection stage in the two phases. The results were analyzed by items
- Then the information on the data obtained was tabulated.
- Finally, the analysis and interpretation of the information graphically represented was developed.

Data Collection Instrument designed
For the information gathering stage: a structured data collection instrument was formulated as a closed-response questionnaire, with the characteristics of a Likert-type scale, which had five response options: 1: Strongly agree, 2: Agree, 3: Neither agree nor disagree, 4: Disagree, 5: Strongly disagree. With a total number of six proposed criteria which were exposed in the form of items that, according to their preference, the respondents answered in a unique way in two research phases (pretest and posttest).

Possible Limitations
Among the possible limitations, it was specified that the participants who were evaluated in the pretest phase as part of the research, could not be considered for the second stage of the diagnosis. Despite this specific aspect, the students were notified of the need to attend the classes scheduled within the study and that in the end they could comply with the respective summative evaluations for the totalization of the results.

3. ANALYSIS AND RESULTS

After the development of the data collection process, the results obtained within the referred investigation were evaluated, with which outstanding elements such as the Acceptance of Teaching Techniques stood out as one of the aspects most referred by the study participants themselves (See Table 2)

As can be seen in Table 2, the majority of students, 33%, agreed with the application of the Flipped Learning model, during the fifteen days that the research phase lasted in which this pedagogical model was applied. An important contrast with the result obtained in phase I in which the great majority of the participants expressed an indifferent attitude towards the form of teaching adopted for that phase.

Table 2.
Acceptance of Teaching Techniques

Instrument Measurement Scale	Pretest	Postest	Pretest	Postest
	Absolute Fr.	Absolute Fr.	% Absolute Fr.	% Absolute Fr.
Strongly disagree	0	0	0	0
Disagree	6	2	20	6,67

Nither agree nor disagree	14	8	46,67	26,67
Agree	6	10	20	33,33
Strongly agree	4	10	13,33	33,33

Source: Santillan 2023

In relation to the relevance in the classroom of the implementation of individual and collective assessment activities in the classroom, it is worth noting that within the pillars of Flipped Learning one of the essential aspects is the change of environment and physical context in which teaching is carried out, so it is not limited only to a classroom, but open spaces such as the sports field were used at a time of academic activities, then a virtual space was structured online for the interaction of the teacher with the group distributed of students on two occasions, during which special emphasis was placed on formative assessments. Therefore, the results of this perception of the students have been collected in Table 3.

As can be seen in Table 3, the percentage of acceptance and preference for the considered differentiation and adequacy in a different environment of common and individual tasks, as part of the Flipped Learning method, is especially favorable after the measurement made through the designed instrument, obtaining a high value of 67% that explains the tendency of students in this sense.

Table 3.
Relevance of individual and collective assessment activities in all academic objectives

Instrument Measurement Scale	Pretest	Postest	Pretest	Postest
	Absolute Fr.	Absolute Fr.	% Absolute Fr.	% Absolute Fr.
Strongly disagree	0	0	0	0
Disagree	10	0	33,33	0
Nither agree nor disagree	10	6	33,33	20
Agree	2	4	6,67	13,33
Strongly agree	8	20	26,67	66,67

Source: Santillan 2023

An element that results fundamental for this type of studies is the one concerning the level of motivation represented by the pedagogical model adopted in classes by the teacher, with which it is possible to measure the opinion of students about the stimulation represented by the teaching approach, the resources and materials used as well as the role of the teacher. In this regard, important changes are outlined in Table 4.

Table 4.
Motivation for students from the role of the teacher who implements the teaching method

Instrument Measurement Scale	Pretest	Postest	Pretest	Postest
	Absolute Fr.	Absolute Fr.	% Absolute Fr.	% Absolute Fr.
Strongly disagree	2	0	6,67	0
Disagree	1	0	3,33	0
Nither agree nor disagree	5	2	16,67	6,67
Agree	7	8	23,33	26,67
Strongly agree	10	20	33,33	66,67

Source: Santillan 2023

Another of the elements analyzed in this study was precisely how the students perceive the influence of the teaching method and the relationship of collaborative activities with the improvement of academic goals, that is, in what way the tasks together represent a contribution to the achievement of individual learning goals, because with the Flipped Learning method it was possible to concatenate the positive influence of online cooperation and in activities outside the classroom for the resolution of evaluated research proposals. This aspect was better accepted than when individual summative evaluation activities were developed in phase I (See Table 5)

Table 5.
Perception of improvement in academic goals and their relationship with collaborative activities as a result of the teaching method used in the classroom

Instrument Measurement Scale	Pretest	Postest	Pretest	Postest
	Absolute Fr.	Absolute Fr.	% Absolute Fr.	% Absolute Fr.
Strongly disagree	0	0	0	0
Disagree	8	0	26,67	0
Nither agree nor disagree	12	6	40	20
Agree	5	14	16,67	46,67
Strongly agree	5	10	16,67	33,33

Source: Santillan 2023

Next, the preference of cooperative activities of the subject and extra-subject was evaluated for the consolidation of Learning in the classroom. One of the aspects was linked to the previous one because it is related to the cooperation of the students. For this reason, the results of the responses were analyzed, obtaining as result that most of the students prefer team activities, in

which inside or outside the classroom they get involved with their other classmates to solve tasks in order to achieve the consolidation of learning, those aspects are significantly indicated in Table 6.

Table 6.
Preference for the cooperative activities of the Subject and Extra-Subject for the consolidation of learning.

Instrument Measurement Scale	Pretest	Postest	Pretest	Postest
	Absolute Fr.	Absolute Fr.	% Absolute Fr.	% Absolute Fr.
Strongly disagree	8	0	26,67	0
Disagree	0	4	0	13,33
Nither agree nor disagree	2	6	6,67	20
Agree	10	12	33,33	40
Strongly agree	10	8	33,33	26,67

Source: Santillan 2023

The last element considered in relation to the perception of the teaching model adopted by teachers, within the University at present represented an important judgement, within the research that is presented, obtained a valuable number of students who accepting the implementation of the model Flipped Learning in the classes, indicated that they "strongly agree" with it. In this sense, the participants were surveyed on whether in general areas within the Higher School of Chimborazo there really is innovation and the will, according to their perspective, in relation to teachers to improve teaching processes and restructuring of the study plans that are made in university careers, especially in the last semesters of each specialty.

In an incipient way, the students and participants of the study affirmed that in the second moment of data collection, a notable improvement in the teaching processes was evidenced, achieving progress in the instructional objectives. So the inference that is made is: the need to improve teaching processes through the innovation of pedagogical models, the readjustment of learning scenarios, modification of old schemes and updating the communication mechanisms between teacher and student, because by creating forms of interaction, such as those executed with the Flipped Learning model through forum-type spaces and video calls, it was possible to articulate the transmission of messages that perhaps in the teacher-centered model would not have been possible. Therefore, in effect, teaching strategies and the methodology adopted are linked to the objectives of the University, especially if it is intended to measure the quality levels of graduated professionals in terms of the existence of new features in formal academic instruction.

After applying the Flipped Learning model, the result was that 40% of the respondents, students of the Thesis Design course, affirmed that they strongly agreed with the pedagogical model implemented, which different result shown the pretest process, with which was managed to measure through the applied instrument that there was no acceptance by the students regarding the form of teaching adopted by the teacher in class.

Table 7.
Acceptance of the teaching model adopted by teachers within the university in general areas of study

Instrument Measurement Scale	Pretest	Postest	Pretest	Postest
	Absolute Fr.	Absolute Fr.	% Absolute Fr.	% Absolute Fr.
Strongly disagree	0	0	0	0
Disagree	5	6	16,67	20
Nither agree nor disagree	15	4	50	13,33
Agree	10	8	33,33	26,67
Strongly agree	0	12	0	40

Source: Santillan 2023

Table 8.
Evaluation results per semester with teaching methods

Sem.	Pretest (Teacher-Based Pedagogical Model-Traditional)				Postest (Flipped Learning Model)			
	Approved Absolute Fr.	% Approved Absolute Fr.	Failed Absolute Fr.	% Failed Absolute Fr.	Approved Absolute Fr.	% Approved Absolute Fr.	Failed Absolute Fr.	% Failed Absolute Fr.
9°	15	50%	15	50%	25	83%	5	17%
Aver. (mean) of the course	6,24				7,93			
Stand. Deviat. (σ)	2,23				2,38			

Source: Santillan 2023

4. DISCUSSION AND CONCLUSIONS

The research presented in this article gave as a result, after the analysis of the values obtained in the diagnosis that: the surveyed students prefer the activities promoted with the Flipped Learning method, which consists of modifying the fundamental pillars of the pedagogical model, to the consolidation of learning in the people in which it is applied. Pillars such as: the materials used, the review of individualized information, the position of knowledge mediator, in this case, the teacher, as well as the modification of the setting in which the class takes place. According to Hernández (2017) in his doctoral thesis "The Inverted Learning Cycle, assisted by the Production of Learning Videos", "Each person is skilled at certain things, not all are born or develop in the same way because intrinsic and extrinsic factors affect their training: the context in which they develop,

educate, work, as well as their individual differences related to their learning preferences, skills and motivators" (p.2). Therefore, a preponderant element of this teaching scheme is that the learner is seen as an individual person, and thus the protagonist and not just another actor, passive and listener of the teacher's instruction. In the present investigation it was possible to show that students have a tendency to the academic activities promoted within the Flipped Learning model, the individual and collective results demonstrate it, obtaining a notable difference in relation to the average when applying the traditional pedagogical model, where the course obtained in the evaluations a score of 6.24 on the scale of 1-10, which in comparison with Flipped Learning, represents an important difference when seeing that the arithmetic mean of the group's scores totaled 7.93 points on the same scale , which indicates that there is indeed progress in terms of the summative evaluation of the contents taught with the teaching methodology adopted.

On the other hand, the preference of students for learning activities that involve the cooperation of students among themselves was evidenced. In this sense, the value obtained in the answer "Agree" was 40%, indicating that the respondents tend to cooperative-type tasks, in which they even have to teach their colleagues in some areas in which they have strength, as Borja refers (2015) "that you learn more when you teach, reaching an effectiveness of up to 90%." This element considers the student to be individually responsible for their learning, however, collaborative activities are combined for the achievement of common academic goals, especially in practical specialties, which in a habitual way it was believed should follow routine and repetitive methods for the achievement of academic goals and the consolidation of learning in higher education students, but which has now been evidenced that this is not the case, but that the constant updating of the teaching method is warranted.

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