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Characterization Of Flipped Classroom Model in Higher Education: A Perception from Educational Resilience During Covid-19 Pandemic

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Abstract

This article presents a study about some perceptions of university students’ perceptions in Barranquilla, Colombia about flipped classrooms during Covid-19 pandemic. The group of participants were 302 students who are studying in different universities of the city and took their virtual or remote classes with a flipped classroom strategy. Students identified their learning styles, experiences and characteristics of the virtual or remote classes and their class preferences. In addition, they mentioned resources and learning spaces used by the teachers that promote collaboration and knowledge development and technology used by the university to develop classes. Given the results of the survey, it was determined that flipped classroom strategy is a useful method for the students because it allowed them to be more self-taught (independent learning) during pandemic. It was possible to identify their learning styles and to create spaces of greater participation with the teachers as guides. Flipped classrooms allow learning by doing, developing and participating and no memorizing (traditional method) supported by emerging technologies applied in university teaching. These technologies must be combined with different strategies that allow the development of skills, teamwork and comprehension of the topics

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1. Introduction

In Covid-19 time, each scenarios involving companies, the state and academia faced the pandemic with the tools available and accessible to the contingency presented when declaring an epidemic to a pandemic, in the educational sector the teaching processes went from face-to-face to virtuality without having a prior action plan that was based on strategies that included virtual scenarios and student autonomy, the United Nations (UN), through its agency for Education, Science and Culture (UNESCO), has generated the World Education Agenda, which seeks to implement until the year 2030 and where issues such as access to education, coverage, tools and its quality in the world are addressed. One of the models that were already applied with excellent results is the flipped classroom model as an innovative methodological proposal in educational classrooms where its main characteristics is to develop the learning process outside the classroom. According to the Inverted Learning Network (Flipped Learning Network, FLN) defines this model as a pedagogical approach in which direct instruction moves from the dimension of group learning to the dimension of individual learning, transforming the remaining group space into a dynamic and interactive learning environment where the facilitator guides the students in the application of the concepts and in their creative involvement with the content of the course.

The proposed difference in the flipped classroom is the use of multimedia technology (video conferences, presentations) to access the support material outside the classroom, which classifies it within the technology-mediated models. In 2012, the model was popularized by Bergmann and Sams, calling it the flipped classroom model (FCM) or flipped classroom, the most recognized term at the basic educational level in the United States [1] [2]. [3] Lagel et al based their studies on the need to match the different types of learning of the multiple students congregated in a group and the teaching style of the teacher. With this premise, the use of multimedia is considered an instrument that allows the student to choose the best method and space to acquire declarative knowledge at their own pace [2] [3] [4], especially whether the material is on the web or is easily accessible; transferring responsibility for content apprehension to the learner; and the teacher, the organization of their practice in order to guide the activities towards the goal set [3] [6].

This research aims to analyze the perception of some students at different universities about flipped classroom, levels of motivation, learning progress and process during Covid-19 pandemic. On the other hand, this paper analyzes the student’s perception through a survey which shows the the impact of flipped classroom and strategies used by teachers on their level of motivation, as well as their impressions about the strategies used by universities on their level of motivation and digital competence according to their experiences.

2. Literature Review

According to Quiroga [8] which defines flipped classroom as a pedagogical approach in which direct instruction moves the student from a collective learning space to an individual learning space, and the resulting collective learning space, is transformed into a dynamic and interactive learning environment, where the teacher guides the students as he applies the concepts and participates creatively in the subject. The author focuses on the role of the teacher as the guide or companion who generates the learning environment and fostering the learning culture with each other, being the one who proposes the strategies that invite the autonomy and commitment of the student.

[7] Lopez defines the flipped classroom as a pedagogical model creates the opportunity for the teacher to give a more individualized treatment and, when carried out successfully, covers all phases of the learning cycle. (Cognitive dimension of Bloom's taxonomy), allowing the student to take charge of their own learning development at their own pace and raising the sense of responsibility from the individual to the group.

The flipped classroom method is a pedagogical model with which it has been put into practice since 2000 [3]; however, it has been Bergmann and Sams in 2012 whom have popularized it by adding significant components. This method consists of transferring the work of certain learning processes outside the classroom and it will be the student who, at home or in another extra-class space, independently will carry out their academic activities; the student will use the real time of the class to facilitate and develop other processes aimed at acquiring knowledge and sharing and putting into practice what has been learned. The basic components of the flipped classroom are the skills proposed on
the subject to be developed by the student and student-based learning; the teacher is a guide or tutor; and higher analysis, synthesis and evaluation thinking skills. [6]

Learning is the process which abilities, skills, knowledge, behaviors and values are modified and acquired [11], according to the definition; With practice and the necessary tools, new knowledge is acquired not only technically but also as active actors, interpretive beings within the process that can modify ways of acting and reacting to proposed situations and environments.

Human learning is related to education and personal development, which directly involves the forms of teaching and techniques used by the facilitators. It must be properly oriented and is optimal when the individual is motivated and feels interested in continuing in the process from an active and committed perspective. The study of how to learn is a topic to Educational Sciences, pedagogy, neuropsychology, educational psychology and anthropology, which includes the peculiarities of each stage of human development. It conceives its theoretical, methodological and didactic approaches for each of them for example pedagogy and andragogy, the education of children and adults respectively.

3. Methodology

For this study, a hypothesis to be analyzed was established which consists of determining whether in different institutions of higher education the flipped classroom model was present in the strategies used by teachers in the development of their classes in the time of the pandemic and if this model manages to be significant in the learning process of university students.

A survey [14] was applied to undergraduate students from different universities of Barranquilla through social media groups to determine the presence of the flipped classroom model in the teaching and learning process.

| Participating university          | No. of students | %    |
|----------------------------------|-----------------|------|
| American University              | 103             | 34.12% |
| University of the Coast           | 98              | 32.45% |
| Atlantic University              | 45              | 14.90% |
| Northern University               | 17              | 5.62%  |
| Metropolitan University           | 12              | 3.97%  |
| Simon Bolivar University          | 8               | 2.64%  |
| Other universities                | 19              | 6.29%  |
| **Total**                        | **302**         | 99.99% |

| Semester in course | No. | %    |
|--------------------|-----|------|
| 1-3                | 144 | 47.68% |
| 4-6                | 102 | 33.77% |
| 7-10               | 56  | 18.54% |

There were 32.45% Universidad de la Costa’s students, 2.64% Universidad Simón Bolívar’s students, 14.90% Universidad del Atlántico, 34.12% Universidad Americana, 5.62% Universidad del Norte, 3.97% Universidad Metropolitana and 6.29% of the students were from other universities.

Among them, 47.68 were students from 1st to 3rd semester, 33.77% from 4th to 6th semester and 18.54% from 7th to 10th semester. Students from 1st to 3rd semester represented the biggest proportion.

Within educational research, there is a special consideration for taking samples in a pilot study where it is recommended to include between 30 and 50 participants, who must have the attributes that are going to be measured in the target population [13]. In this study, a sample of 302 students was taken.
In order to answer the hypothesis, the data analysis was carried out by using SPSS software. Firstly, Cronbach’s alpha was used to check internal consistency. It shows the correlation between each of the questions. In this case, a value greater than 0.7 reveals a strong relationship among the questions, a lower value reveals a weak relationship between them. Secondly, Kolmogorov-Smirnov (K-S) test was used to check the normality of the gathered data. Thirdly, to examine the impact of the model, independent samples t-tests was run.

4. Results

4.1. According to the survey.

Table 2. Survey Results. Source: Authors

| Survey Structure                                      | Results                                                                                                                                                                                                 |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Learning styles                                       | Based on the survey results of the learning styles about 56% of the students learn when they write and work with their own notes, 27% of them concentrate when they listen attentively, and the proportion of students who remember through colorful presentations and videos is about 17% which is the lowest. |
| Logic and reasoning, the only ways for learning       | 50% of students agree that to learn they should only take into account logic and reasoning. The other 50% of the students disagree.                                                                          |
| Comfort in classes                                    | 33% of the students consider they feel comfortable in spaces where they generate new knowledge. The proportion of students who prefer structural and established activities is 19% and the proportion of students who prefer to talk and debate the topics to be developed is 48%. |
| Experience with subjects in virtual and synchronous mode | The student’s proportion who had a dynamic experience with subjects in virtual and synchronous is 73% and 23% of the students considered little activity during virtual and synchronous classes. |
| Order of activities in classes by teachers            | Teachers sent material, practical exercises, to count the experience and shared in the virtual meeting was the order with the highest proportion of 58%. The proportion of the order: virtual meeting, speech of the teacher, tasks to perform at home is about 30%. Tasks, virtual meetings, delivery of new material was the order with the lowest proportion of 12%. |
| Common characteristics of classes                    | According to the survey, 63% of the students learn in practice by applying the topic to be developed. 7% of the students memorize the topic to be developed, without practicing and 30% of students prepare topics out of classes and discuss them in the academic space. |
| Teacher position                                      | 82% of the students consider their teachers as a guide. About 15% of the students consider their teachers as dictators and 3% of them consider their teachers as an absent person. |
| Technological resources used by teachers              | The student’s proportion who said teachers used technological resources different from virtual meetings is 82%. 18% was the proportion of students who confirm teachers used only the virtual meetings. |
| Access to technological platforms at the university   | 6% was the proportion of students who claim they don’t have platforms that facilitate the learning. 94% of the students have platforms to study and review all the material. |
| Learning environment based on peer collaboration and knowledge development | The student’s proportion who said teachers didn’t generate a learning environment based on peer collaboration and knowledge development is 16%. 84% of the students agree that it generates that space of collaboration and knowledge development. |
| Strategies and learning spaces based on independent work by students | 92% was the proportion of students who said there were tasks and strategies based on independent work by students. 8% of the students commented that they didn’t have that space. |

Table 3 shows attributes and applied instruments.
Table 3. Table of attributes and applied instruments. Source: Authors

| Attributes                                                                 | Applied instrument                                                                 | Outcome | Attribute percentage |
|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------|----------------------|
| Deep, progressive and much more meaningful learning. Autonomous            | We talk and debate generating new experiences from decision making.                | 81%     | 72.5%                |
|                                                                           | We learned in practice by applying the corresponding theme                        | 64%     |                      |
|                                                                           | the teacher was a guide who accompanied me in practice                             |         |                      |
| The student is the center of learning, and the teacher is his coach in this process | Generated collaboration spaces to share experiences and learn from each other      | 82%     | 83.5%                |
|                                                                           | Structure 1 was applied, sent material-2. practical exercises-3. we shared the experience and shared in the virtual meeting | 59%     |                      |
| Neat and structured interactive content.                                  | The teacher applied tools and learning spaces based on autonomy (could make decisions and develop greater commitment) by the students based on content with clear guidelines and instructions. | 93%     |                      |
|                                                                           | We use unknown interactive platforms that were not used in class before.           | 74%     |                      |
| All technology at the service of learning.                               | My teacher used innovative technological resources                                 | 83%     | 80.6%                |
|                                                                           | The university has technological platforms for continuous learning                 | 85%     |                      |

The table shows the validation by the students of the attribute or component of the inverted classroom model in the development of classes in higher education. Four basic attributes were taken to validate whether the model was present in the strategies used by teachers in the development of their classes in times of pandemic. Attributes are initially chosen: Deep, progressive and meaningful learning (autonomous). The applied instrument shows that the students generated new experiences from the practice of autonomy in 72.5%, which is the average of attribute 1, evidencing development of the topics and constructive debates from the making of their own decisions. Attribute 2, the student is the center of learning, and the teacher is their coach in this process, the students are who recognize the teacher as a facilitator who accompanied them in the learning process and not a controller of them, being the attribute stronger in research resulting in an average of 83.5%; recognizing the collaborative spaces fostered and generated from the teacher's practice. Attribute 3, orderly and structured interactive content, the instrument validated the structure and interactivity of the content provided and guided by the teacher, resulting in a 76% presence in this component. Attribute 4, all technology at the service of learning, was one of the most significant components in teaching practices, the instrument included the use of interactive platforms with 74%, resources by the teacher in 83% and availability by of universities on platforms that support the development of classes with 85%, giving an average presence of the attribute in 80.6%.

According to the statistical study of the data and to improve our model, a previous analysis was made where the variables and the sample were categorized according to their attributes without losing the sense of the characteristics of the investigation. We searched through SPSS Software for the indicated subgroups to do the test (pretest to make leveling of the model assignment). We are left with the post-test that shows the significance of the hypothesis and the flipped classroom model applied to university students.
At first, in order to find internal consistency among the questions, Cronbach’s alpha was used. The instrument's total Cronbach's alpha coefficient was 0.766, slightly higher than the acceptable minimum of 0.7 considered in this article. This value reveals a strong relationship among the questions.

Secondly, to find out whether the gathered data were normally distributed, One-Sample Kolmogorov-Smirnov test was run on all scores of post-tests with 2 subgroups categorized in sample of 30 to reduce dimensions without losing the attributes and characteristics of the investigation. According to table 6, this analysis shows that the scores of the two subgroups were normally distributed, that is the Asymp. significance level was less than the observed value (0.585, 0.205 > 0.05).

Thirdly, Descriptive statistics of the post-test of both groups is shown in Table 7.
Table 7 shows the performance of both subgroups group in the post-test. The mean score of the first group (\(M = 79.03\)) was greater than the mean score of the second group (\(M = 50.93\)). This difference does not seem to be a significant one, but to ascertain whether it is or not, Independent Samples t-test is shown in Table 8.

### Table 8. Independent samples test. Source: Authors

| Variances                  | t-test for Equality of Means | 95% Confidence Interval of the Difference |
|----------------------------|------------------------------|------------------------------------------|
|                            | F                            | Sig | t   | df  | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| post1 Equal variances      | 7,879                        | .007| .370| 58  | .713            | 1,367           | 3,698               | -6,035| 8,769 |
| equal variances not assumed| .370                         | 51.987| .713| 1,367| 3,698            | -6,054           | 8,787 |

Table 8 shows that since the Sig. (2-tailed) value is greater than the alpha level (0.713 > 0.05), it could be argued that there was not a statistically significant difference between the post-test scores students in the first subgroup (\(M = 79.03, SD = 13.058\)) and the students in the second group (\(M = 50.93, SD = 16.970\)). Therefore, it was concluded that the difference between the two subgroups was insignificant after the treatment was done. The participants in both groups allowed to conclude that the model was efficient and significant in times of pandemic and that it is an efficient strategy for university students.

### 5. Discussion

This article examines student’s self-perception motivation and learning under flipped classroom model in the times of Covid-19 in their virtual meetings (remote mode).

The information showed a relation between students and flipped classroom model regarding the components that were evidenced by the responses given by the students related with reported motivation and perception of learning. According to the results, it was possible to identify the basic components that build the flipped classroom model: the proposed competencies on the subject to be developed by the student; student-based learning; the student demonstrates knowledge, and the teacher is a guide; and superior analysis, synthesis, and evaluation thinking skills.

The perception from participants allowed us to determine that the flipped classroom model provided a beneficial learning experience. A high level of satisfaction was reported according to knowledge construction by students, feedback and help by teachers, access to information and technology, collaboration and participation, support and motivation.

Most of the students expressed that they were provided with access to the necessary resources and information to finish their courses with great motivation. In addition, as other studies show, respondents agreed that the assessments contributed to their understanding of course concepts and the online assessments enabled them to demonstrate their learning. Most students also expressed satisfaction with the responsiveness of teaching staff to their learning needs.

Regarding our hypothesis of the investigation that is to test whether the flipped classroom model is a significant strategy in the educational learning process of university students. After collecting the data, we used independent samples t-test to analyze them in order to find out the effectiveness of the flipped classroom in the students' learning process. The findings showed that topic interest has a significant positive effect on students. The results statistically revealed that both subgroups were significantly statistical. Therefore, the null hypothesis of the study "flipped classroom meaningful strategy in the learning process of university students" was accepted.
6. Conclusion

The integration of technology in learning has always created a lot of excitement and expectations due to the changes that innovation can bring. According to the literature consulted, this instructional model does not consist of a technological change, it only takes advantage of new technologies to offer more content options to students and, most importantly, it redefines class time as a student-centered environment [10]. In times of the Pandemic caused by Covid 19, the teaching processes in higher education were reevaluated and adapted to new proposals from teaching. In the traditional method, educational content is presented in the classroom and practice activities are assigned to be done at home. Flipped Learning gives a twist to this method, improving the classroom experience by imparting Direct Instruction outside of class time - generally through videos. 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.

With the results obtained, it can be concluded that the components that characterize the flipped classroom model have been present in the pedagogical proposals made by teachers in higher education in times of pandemic, applying strategies considered innovative for students because they are accompanied by tools and collaborative spaces where autonomy was allowed to students to make decisions with greater commitment, creating a supportive environment and building learning by accompanying each other. They recognize and validate that learning is significant when they discuss and debate the topics developed, generating new experiences whether they are complemented with interactive virtual tools that target all the dominant learning styles in the classroom, considering that they learn when they write and build knowledge with their own annotations and remembering the topics developed when they have had contact audiovisual means that allow their concentration, considering them dynamic and contributing to knowledge.

The attributes of the flipped classroom model were characterized in the research and satisfactorily showing that teachers have practiced their pedagogical strategies to face the challenge in times of pandemic, being recognized and highly accepted by students in higher education, adapting to the dynamics of receiving instructions, developing autonomously and discussing in collaborative spaces putting into practice what has been learned with technological tools that allow interactivity.

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