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CLASSROOM FLIPPED: EVIDENCE OF SIGNIFICANT LEARNING IN INDUSTRIAL ECONOMICS UNDERGRADUATE STUDENTS

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ABSTRACT

The objective of this paper is to analyze implementation of the Flipped Classroom model. The analysis included a sample of 30 students, through the application of a questionnaire with individual interviews. We gather information on the student experience using the flipped classroom. Results revealed significant improvements in the learning process of the students who used the Flipped Classroom model in the course Theory of Econometrics.

JEL: A22, I21

KEYWORDS: Flipped Classroom, Significant Learning, Education

INTRODUCTION

T his paper describes the results of an innovative teaching experience that introduces the Flipped Classroom model for students in the course econometrics theory. Data were gathered in 2017-2018, for undergraduate students of Industrial Economy at the National School of National School of Higher Studies Leon Unit of the Universidad Nacional Autónoma de Mexico. The university has head office in the city of Leon, Guanajuato, Mexico. A problem that arises in higher education is the lack of selflessness, low utilization, and students that play a passive role in their own learning. It is the responsibility of the teacher to foster motivation for students to actively participate and produce their own knowledge. Students at the University examined are digital natives. They use different information and communication technologies including smartphones, tablets and computers. They regularly use technology for entertainment or social communication with friends or family. However, technology is used far less for educational purposes to help improve the learning. Professors must adapt technology meet current student needs and become a mediator-facilitator for students in higher education.

The Flipped classroom model inverts the roles of traditional teaching. Unver the Flipped Classroom model, class activities, usually taught by the teacher, are now carried out by the student from his/her home (study of the previous reading of indicated material). This is done through the use of multimedia technologies (smartphone, tablet, laptop, others). Classroom time involves activities that require a greater participation and interaction, where the teacher participates only as a facilitator (Estes, Ingram and Liu, 2014). This study examines use of the Flipped Classroom model to promote a more active role among the students. The goal of the flipped classroom is to motivate students to learn and find new knowledge through the use of digital devices or their applications. This is done in such a way that, from their home or any site, they use the technologies for a didactic purpose. Students, guided by the teacher as facilitator, can carry out work that makes possible a more active, participative role in the construction of their learning. Time in the classroom is used for activities that require greater participation and interaction. The objective of this work is to analyze the Flipped Classroom model as a strategy for education that stimulates significant learning

of students. The research question is: To what extent the Flipped Classroom model favors learning by undergraduate in Industrial Economics students?

Flipped classroom teaching approaches may result in more autonomous, independent, self-constructive and participatory students with a high confidence in themselves. They may develop other competencies that will facilitate the tasks of their profession. This document is organized as follows: The next section presents a review of the flipped classroom literature. The following section presents the methodology. The paper continues with a presentation of results. Finally, the paper closes with some concluding comments.

LITERATURE REVIEW

The origin of the inverted classroom was first reported by Lage, Platt and Treglia (2000) and later as it relates to a specific economics course by Tucker (2012). Bergmann and Sams (2012) sought a solution to prevent students from missing classes. They began recording the content of their classes and distributing the videos to students for review. They referred to this process as the Flipped Classroom model (Bergman and Sams, 2012; Talbert, 2014). The Flipped Classroom model brought a change in the dynamics of the work in the classroom. It reverses the roles of traditional teaching. Activities of class, usually given by professor, are now performed by the student at home (study of the previous reading of indicated material), through the use of information and communication technologies (videos, forums, chat, email, social networking). This approach allows a constant interaction of the student with the teacher and with their classmates. Face-to-face lectures are reserved for activities which require greater participation and interaction. The teacher participates only as a facilitator (Bergman and Sams, 2014; Lage, Platt and Treglia, 2000).

The integration of emerging technologies in learning offers more options for content and redefines class time as an environment focused on students (MacKinnon, 2015). In addition to items of technology, the theoretical framework of learning is related to the model construct (Davies, Dean and Ball, 2013). Specifically, with regard to the process of collaborative construction, questioning and resolution of problems in a joint work program (Vigostky, 2012). Therefore, the classroom becomes a context of collaboration and exchange between students. It stimulates and encourages the teaching and learning of the students, promoting group participation, group discussions and the resolution of problems (Angelini, 2016). Experiential learning is based on a process of "student-centred continuous learning", in which the student experiences, reflects, contemplates and acts on what is learned (Coufal, 2014). In the case of the flipped classroom, experiential learning allows the student to practice in class, experiment, reflect, think and act in the construction of knowledge (Yeganeh and Kolb, 2009).

The flipped classroom model focuses on the identification of competencies to be developed in the student. The teacher must classify course content into direct instruction items (video-conference) and those that are better in experimentation. To reach these goals professors should proceed with a methodology centered on the student (Bishop and Verleger, 2013). This leads to the implementation of active tasks and collaboration, involving the deployment of mental activities within the classroom where the teacher participates as facilitator (Baepler, Walker and Driessen, 2014). The flipped classroom has been transformed in recent years as a didactic resource of great relevance. The approach demonstrates the benefits available from the development of some programming. It inserts in a culture of digital learning (Coufal, 2014).

Flipped Classroom Model and Experiential Learning

Experiential learning is based on a process of "continuous learning student-centered", in which the student experience, reflects, contemplates and acts on what is learned (Coufal, 2014). In the case of the classroom flipped, experiential learning allows the student to do the practice in class, experiment, reflect, think and act in the construction of knowledge (Yeganeh and Kolb, 2009). Emphasizing that they require the help of

the educator to reach its full potential, in addition to highlighting the importance of collaboration and interaction of the active participants between the students and the teacher. Therefore, the implementation of the classroom invested in class, in a context of collaboration and exchange among the students, stimulates and promotes the teaching of students learning, promoting group participation, group discussions and resolution of problems (Findlay-Thompson and Mombourquette, 2014). As a basis for the above, the Flipped Classroom model, considers as an essential element, the identification of target competencies that must be developed in the student. At this point, the teacher must classify the contents that need to be learned by direct instruction (video-conference) and those that are better placed in the experimentation (Davies, Dean and Ball, 2013). To reach the goals we should proceed with a methodology centered on the student (Bishop and Verleger, 2013); which leads to the implementation of active tasks and collaborative involving the deployment of mental activities superiors within the classroom where the teacher participates as facilitator (Kong, 2014). The flipped classroom has been transformed in recent years into a didactic resource of great relevance, whose extension and dissemination demonstrates the advantages it can offer for the development of optimal learning and inserts in a culture of digital learning throughout life (Baepler, Walker and Driessen, 2014; Galway, Corbett, Takaro, Tairyan and Frank, 2014).

Flipped Classroom Model and Active Learning

This section describes theories about how the Flipped Classroom model offers an alternate method of study. The environment, the mediation teacher and multimedia technologies provide an essential element for the improvement of learning. Lage, Platt and Treglia (2000) argue for the need to improve the learning of a group with different types of learning that existed in one area. This was important given the diversity of students gathered in a group and the traditional styles of teaching of professor. The authors developed an environment of media, designed for students with different abilities, so that students could access easily and to integrate into the group (Mason, Shuman and Cook, 2013; Mattis, 2014). The Flipped Classroom model, through the support of multimedia technologies, allows the student to choose the best method, time and space to acquire knowledge at his/her own pace (Cheung, 2014). The material is in the multimedia system at different levels, for which the student can easily access. Knowledge acquisition is the responsibility of both students and professors with the professor having the role of facilitator to guide the practical activity and learning (Angelini, 2016; Enfield, 2013).

To implement the Flipped Classroom model successfully, from the beginning of the academic cycle, the teacher notifies students of the steps to follow on the use of the methodology. These include items such as: outlining the objectives, planning to implement the new model, and training in the use of the Flipped Classroom model. This structure provides the student numerous opportunities to demonstrate, with practice, the apprehension of the content (Blair, Maharaj y Primus, 2015). The central investigation of this work is to analyze whether the Flipped Classroom model and the use of multimedia technologies favors the learning by students. If strategies like the inverted classroom are used more in higher education schools, we may form more autonomous, independent, self-constructive, participatory students with a high confidence in themselves. These students can develop other skills that will facilitate the tasks of their professions.

METHODOLOGY

The methodology used is qualitative descriptive. The method involved the analysis of a sample of 30 students. The purpose of the study is to obtain information about the perception and experience of the students regarding the Flipped Classroom model. The method of observation and semi structured interviews was used with the intention of thinking about how to understand the perspective of the participants. We study experiences, perspectives, opinions and meanings regarding the Flipped Classroom model (Cohen, Manion and Morrison, 2007). Since the method is qualitative, the research is non-probabilistic, and the results cannot be generalized. However, the results obtained are of great importance. The results indicate

student's perception and experiences in the natural classroom (Cohen, Manion and Morrison, 2007). The results allow analysis and evaluation of whether the Flipped Classroom model stimulates and favors learning. in the students participating that course theory econometric in the undergraduate in Industrial Economics program of the National School of Studies Superior unit Leon, in the period 2017-2018.

The sampled students were observed and asked semi-structured interviews questions. The 30 students were divided into 5 teams in groups of 6 students, who voluntarily, attended classes and participated in the implementation of the Flipped Classroom model.

Table 1 presents a summary of the methodology applied a group of 30 students that participated in the observation process and the application of the instrument with semi-structured interviews. The six teams interviewed, participated voluntarily in the process of implementing the flipped classroom Table 1 shows a summary of the methodology applied, described in the five following phases: The first phase is to exchange. Students are now completing activities at home which were previously performed in class. The second phase is completed in class is to perform activities. In this stage, students present work done at home, and get feedback from peers through the guidance and advice of the professor. In the third phase, the students design and develop videos with information about the activity studied. Finally, students by teams present the video in class, thereby creating interest, participation and collaboration among students. This tool is useful because it allows you to reinforce the exercises performed in class. In addition, some students cannot attend class and review of these videos at home helps them obtain the information.

Table 1: Summary of the Methodology to Implement Semi-structured Interviews to Students

| Methodology	Qualitative Analysis
Method	Participant observation Interviews with semi-structured questions
Sample of the participant group	30 students (group-class)
Instrument with semi-structured questions for data collection	Notes for observation in various class sessions Interviews with semi-structured questions to students: Team 1: Interview 1, Team 2: Interview 2, Team 3: Interview 3, Team 4: Interview 4, Team 5: Interview 5.
Analysis type	Analysis of observations Analysis of responses of semi-structured interviews

Table 1 presents a synthesis of the methodology to implement the semi-structured interviews to a sample of 30 student, divided into 5 teams in groups of 6 students who participated in the implementation of the Flipped Classroom model. The experiment was implemented a Theory of Econometrics course in the period 2017-2018.

Once the participant observation process was completed, the semi-structured individual interviews were conducted. From the results obtained, five levels or categories were identified: Organization and development, creativity and effort, skills and competencies, motivation and encouragement, utility and satisfaction.

RESULTS AND DISCUSSION

In the analysis of the data, categories appear that give meaning to the development of the study. Figure 1 shows the categories or levels identified as a result of interviews with students made up of teams of five students.

Figure 1: Categories or Levels for Conducting the Interviews of Students
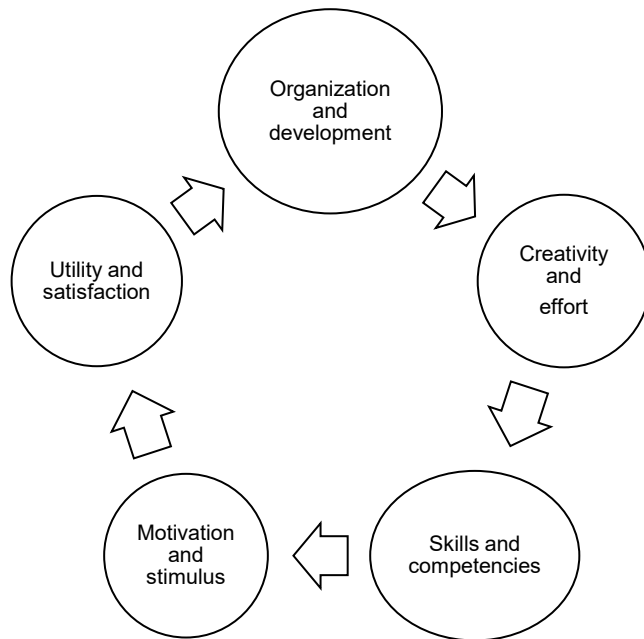
This figure shows the categories identified through interviews with a sample of 30 students, grouped into by 5 teams of six students each, who participated in the implementation of the Flipped Classroom model. The model was implemented in a Theory of Econometrics course in the undergraduate in Industrial Economics program, in 2017-2018. Categories identified are: organization and development, creativity and effort, skills and competencies, motivation and encouragement, usefulness and satisfaction.

In the category organized and development, students were asked how they organized and planned to work from home. We want to know how they study and understand topic assigned for the first activity, before coming to class. The teams interviewed commented that initially they did a reading of the subject in the book, and consulted other documents and videos available on websites. The results were as follows:

"For the first activity, we started the work practically out of nowhere, we had some notion on the subject (...)" "We divided the themes of the first activity, we read the book, such as bibliographies online, we seek explanations in video, we summaries and among ourselves we clarified the doubts that were emerging" (Interview 1).

"For the development of the activity, my partner and I divided the work; we read, analyze and consider carefully the chapter (…) and be able to write a good summary since this information is rise directly to the website (…)" (Interview 2).

"(…) Our team is available to develop a summary where each identified the main ideas and secondary of that topic, to consequently, develop a brainstorming where we all make the ideas more relevant to the text, describing objectively and relevant types of forecasts more used, its purpose and the tools used for this (…)" (Interview 5).

For the second, category creativity and effort, students indicate that developing the video called for greater effort and time. Students had to investigate teaching tools and skills on how to design and create videos on the internet. The results are as follows:

"At first we had a hard time making the first video, clearly it was the hardest part, teach us about the march and even more complicated was to find the perfect didactic tool so that our companions could attend and

understand the topic, in a way fun and interesting, beyond what is commonly done in classes (…)" (Interview 1).

"We decided to carry out a free blog in an internet page, because we believe that anyone can access the website from the comfort of your home, school or work (…)" (Interview 2).

"The development of the video was developed using Apple's IMovie program (...) " "We have a previous meeting (...) Filming small fragments of the video by means of a Smartphone and analyzed possible corrections or improvements to it, consequently the video was edited in the program earlier mentioned" (Interview 3).

"(…) the team decided for realizing an interactive video in the platform Powtoon, where every member, already in its house, was responsible for the synthesis of a specific point of the chapter already knowing the general context (...)" (Interview 4).

In the third category skills and competencies generated, students interviewed noted that once they were able to acquire the skills and tools needed to design and create a video, it was easier for them to elaborate the videos with content on the activity. The results obtained are:

"Finally it was decided by the blog "webnode", here you could use graphics and images to call the attention of the user and with videos of auto-recordings of exercises that explains the activity (…)" (Interview 2).

"The video was presented to our classmates in the class assigned to expose this activity (…)" having good acceptance from our peers, facilitates the learning and create greater interest in the class (...)" (Interview 3).

For the category motivation and stimulation, the process for the elaboration of a video differed by team. However, each wanted to achieve the same goal: to make a video that had a creative activity, that was entertaining and understandable to stimulate and motivate learning of the viewing students.   Once they acquired and developed the skills to make the videos, it was easier for them to use the videos to study and review the topics to be investigated. The results obtained in the teams interviewed are:

"(…) When we exposed the video in class, our classmates were very nervous because it was the first time, but it was very friendly, in the classroom an excellent atmosphere has been perceived, there is a lot of understanding and tolerance, with the time everyone has been able to develop their expression skills (...) " (Interview 1).

 "At the end of the session, a brief feedback was made by our team on the structure to develop the script with the content on the subject of the video, as well as the motivation and initiative for the elaboration of the video delivered "(Interview 3).

"The video caused interest and kept the attention of the companions. During the presentation there were questions on the part of our colleagues and arguably the issue was clear because, was very well synthesized the video and also reason for the roommates to investigate and read the topic (...)" (Interview 4).

Finally, the category utility and satisfaction makes reference to results obtained in developing the videos by teams of students. The interview results show comments on the importance and usefulness of the videos for the understanding and learning of the activity in class. Subsequently, the effort was rewarded when they presented the videos in class.

"We understood the meaning of the inverted classroom, encouraged the interest to learn, use all possible means, generated more empathy for the teaching work of our teacher (...)" "It is good to exchange roles and

feel the responsibility of doing a good job for Our companions learn a theme, it was a very pleasant experience (...)" (Interview 1).

"(…) The implementation of video tutorials on the internet really pleased our classmates; It serves as a tool to reinforce the exercises we do in class, some students for various issues can not attend in class and the review of these videos at home would help them to review the Class View, and thus not be delayed "(interview 2).

"The presentation of the video in the class created major interest, participation and collaboration in the companions, facilitating the creativity and understanding of the topic (...)" " After the class we speak and decide that it was a good form of work and that we would keep on implementing it" (Interview 3).

"At the end of the class, we concluded that the change of roles through the work of the students in team at home, and presenting the video with the work at the end in class, creating enthusiasm and good disposition by the companions, we all participate in the activities achieving a Better understanding of the subject, benefits the creativity and innovation of the activities (...)" (Interview 5).

CONCLUDING COMMENTS

The objective of this work is to study and evaluate the effects of the Flipped Classroom model on students who studying Theory Econometric in the undergraduate in Industrial Economics program, in the period 2017-2018. We explore the extent that the Flipped Classroom model favors learning. We establish categories of consideration. From these categories we infer some patterns and guidelines of action of the students. Categories were selected based on answers given by the teams on the usefulness and implementation of the inverted classroom.

Students were organized and planned to work to create a video which is linked to collaboration and interaction between the teams. All students who participated in the development of the video, were stimulated by the learning results, which in turn is linked to the category of utility and satisfaction. To develop a video according to an assigned activity, meant that the students made an effort through work at the home. Students agree on the positive influence of professor for the development and understanding of the activity assigned in class.

Students found the methodology to be a valuable teaching aid. The approach improved the student's academic performance. It allows reinforcement of exercises and practices carried out in the classroom, without the distractions of the class. Some students cannot attend class. The review of these videos at home helps them understand materials. The inverted classroom has substantial potential in Industrial Economics and in other races of the National School of Higher Studies Unit Leon, as well as in academic institutions of higher education. A limitation of the present study is that many teachers do not use innovative classroom techniques.

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