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The Flip Teaching as Tool to Improving Students' Sustainable Learning Performance in a Financial Course

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Abstract: Flip teaching (FT) is a methodology with a significant impact on the educational innovation trend that encourages active learning and facilitates the learning of students. The main objective of this study is to measure the impact of flip teaching on the learning of a course at a higher education institution. To analyze the differences in the exam marks between students that follow FT and other methodologies, the t-statistic and Mann–Whitney U test have been used. Results indicate that FT allows improving the performance of students and achieving collateral capacities, such as responsibility and awareness, making learning more sustainable. This study makes an interesting contribution to existing research in education and demonstrates that it is possible to introduce FT in a block of the course and can be transferable to other courses.

Keywords: flip teaching; active learning; improving classroom teaching; university

1. Introduction

Educational systems have evolved in line with the development of societies and their needs. Different transformations have been made in order to adapt the educational systems to the peculiarities of every moment. Nowadays, the irruption and acceptance of ICTs in the daily life of populations involve the alignment of educational systems and practices implemented in educational centers to this new scenario. Such is the understanding of the United Nations, which considers ICTs and education as core aspects to achieve the Sustainable Development Goals (SDG). In this context, academics have begun to explore the potential benefit of using ICTs in the learning process. ICTs include different teaching strategies, such as e-learning, mobile learning, and blended-learning [1]. Flip teaching (FT) is also an ICT, which is attracting great interest from academics. This teaching practice reserves the traditional teaching model so that students learn content out of the classroom, whereas the homework is made in the classroom [2]. Before implementing the idea in universities, schools around the world promoted this methodology. This approach was labeled under different names, such as inverted classroom [3], classroom flip [4], flipped classroom, flipped learning, and flip teaching [2]. The terms used to define this methodology are based on the structure adopted by the course 'flipped' in relation to traditional methodologies. An inverted or 'flipped' class is characterized by the design of courses in which the instructional contents are taught in the form of, for instance, video lessons—which must be reviewed by the student at home prior to the class [4]. Accordingly, the time the student stays in the classroom is used to carry out discussions, solve problems, conduct hands-on activities, and provide guidance to them [5]. Teaching implies taking advantage from the presence of teachers and students in

a common location (e.g., the classroom) to reach active participation, as an authentic teacher–student interaction is the main element for active learning [6]. An optimum environment for active learning can motivate students to interact with teachers, perform activities, and encourage their learning. Therefore, [7] consider FT as an opportunity to engage students through active learning strategies.

From the FT framework, master classes are replaced by materials, such as videos, readings, and others, which are made available to the students—not only prior to the on-site class and during class, but also afterwards. This methodology includes problem-based activities and discussion with an appropriate backchannel [8], for instance, an e-learning platform. Students' interest in technologies is increasing at the same time that the acceptance for lecture-style presentations decreases. As students have new needs and expectations of educational systems, a paradigm shift from traditional teaching to active learning strategies is necessary [9]. FT introduces this complete change of perspective by seeking the student's active involvement in the learning process [10]. As [11] suggest, the FT may be seen as a model of student-centered learning in which they are responsible for working autonomously through flipped material facilitated by professors and promoting greater participation in discussion and research activities in the classroom. This approach aims at the active participation of students in the learning process [10,12] and makes the teaching more sustainable.

Some previous studies have argued that the FT approach has positive effects on the learning process of students [13–18]. For instance, FT can engage more students due to the availability of the teacher as reverse teaching and students may be more satisfied with the flipped method. However, the method also suffers from some limitations. For example, [19] note that some students may not fully comprehend the content of the materials, partly because of their lack of self-regulation and failure to properly schedule their time. [20] claim that FT may lead to superficial learning in student performance, while [21] note that the essence of the flipped classroom emphasizes the learning process rather than the outcome.

Our main objective in this paper is to evaluate the extent to which the performance of students could be affected by receiving lessons through the FT methodology. We used the FT method to teach a specific part, the most difficult for students, of the subject to a group of students, while another group received the same lessons through the traditional methodology. By doing so, we are able to assess whether FT methodology can be used as a tool to capture the students' attention on a specific part of the program, and thus, improve their performance.

The paper is organized as follows. The next section contains a review of the literature. Section 3 explains the materials and methods used in the study. Section 4 presents our empirical results, Section 5 includes the discussion, and the last section contains the conclusions.

2. Review of the Literature

The FT is a teaching practice that reserves the traditional teaching model so that students learn content out of the classroom and they do the homework in the classroom in the presence of the professors. [2] proposed the model of FT to provide a learning opportunity for students who could not attend lessons. The lack of attendance in their lessons led to low academic performance and impossibility to adapt to the pace of the subjects. To facilitate learning by these absent students, these professors decided to record their lessons, which also were displayed by the students who could attend lessons. This new design of teaching initially had a local scope, but little by little, it extended and gained importance until it created what today is known as the Flipped Teaching methodology. This pedagogical model is based on constructivism and the social theory of learning [22], where students have a great responsibility in the learning process [23]. The name used to define this methodology is based on the structure adopted by the course 'flipped' in relation to traditional methodologies. An inverted or 'flipped' class is characterized by the structure adopted by the course in which the instructional contents are taught in the form of video lessons, which must be reviewed by the students at home prior to the classroom [5]. In this way, the time the student stays in the classroom

is used to carry out discussions, solve problems, hands-on activities, and guidance [24] to encourage collaborative learning [25].

FT considers that learning through lecturers is not appropriate for large groups of students, but for small groups [2]. FT can be considered a model of student-centered learning [11], as they are responsible for working autonomously through flipped material facilitated by professors and promoting greater participation in discussion and research activities in the classroom. In this way, the student acquires a greater role and responsibility in his own learning process [23]. This structure allows spending time in the classroom to clarify content through small explanations [26]. The activities that encourage more active participation of the student, such as the resolution of problems or cases, and that allow the student to become more involved in the learning process have a positive impact on the process of learning [15–17] because students reach a higher degree of understanding than in more passive methodologies [14]. Moreover, they can display the flipped material continuously, which reinforces the learning, especially those aspects with a greater complexity [27].

Despite these coincident guidelines, there is no shared model for FT [28]. Most authors have used videos to replace master classes, but the duration and the way in which the interaction happens in the classroom or the complementary materials vary according to the subjects and objectives sought by the professor.

Before implementing the idea in universities, schools around the world promoted this methodology. Teaching implies taking advantage of the presence of teachers and students in a common location (e.g., the classroom) to reach active participation [29]. A proper environment can motivate students to interact with teachers and perform activities, thereby encouraging their learning [30]. García-Peñalvo et al. [6] note that a real teacher–student interaction is the main element for active learning. Roehl et al. [7] consider the FT an opportunity to engage students through active learning strategies. FT involves a change of perspective by seeking the student's active involvement in the learning process [10,12] through the exchange of the two main activities of the traditional model: Lectures and tasks. The key alteration is that lessons are conducted at home and tasks are done in class. FT incorporates collaborative learning, and students are responsible for their own learning while teachers maintain a facilitator role [24]. Students participate in small-group activities and learn in an active mode [31]. The FT structure allows spending time in the classroom to clarify content through small explanations [26]. Some previous studies (e.g., [15–17]) state that activities encouraging more active participation of the student, such as the resolution of problems or cases, have a positive impact on the learning process. Accordingly, Handelsman et al. [14] note that students reach a higher degree of understanding than in more passive methodologies. Additionally, doing homework in class provides a good opportunity for teachers to recognize students' difficulties and their different learning styles. This allows teachers to easily modify lessons according to students' needs within this model [32].

Table 1 summarizes studies on the effect of FT on higher education finance economics subjects. This table shows that previous studies suffer from some limitations.

Table 1. Studies that analyze the impact of the FT on higher education.

Authors	Analysis of Performance or Perception	Country	Field	Comparison to Traditional Teaching?	Result
[33]	Both	USA	Finance and psychology	Yes	Positive effect
[34]	Performance	Colombia	Finance	Yes	Positive effect
[35]	Perception	USA	Accounting	No	Positive effect
[36]	Perception	USA	Accounting and Finance	No	Positive effect
[37]	Both	India	Finance MBA	Yes	Positive effect
[38]	Perception	Malaysia	Accounting	No	Positive effect
[32]	Both	Portugal	Financial Mathematics	Yes	Positive effect
[39]	Perception	USA	Sport finance and economics	No	Positive effect
[40]	Perception	UK	Economics	No	Positive effect
[41]	Performance	USA	Finance MBA	Yes	Negative effect
[42]	Both	South Africa	Economics education	No	Positive effect
[12]	Perception	Australia	Accounting	Yes	Positive effect

First, the majority of prior evidence is restricted to the US. This could be justified by the fact that the FT methodology was initially implemented in this region [2]. However, considering social and cultural differences among countries, it seems relevant to further investigate the extension to which the FT could affect the performance of students in other countries. Second, some studies assess the perception of students of the FT, while others investigate the effect of FT on the performance of students. The evaluation of students' perception on the FT is important because the FT involves active learning. In the case of students' perception being no good, the success of the methodology would be expected to be poor as well. Hence, the interest of students in the research methodology seems important for its effective implementation. Nevertheless, through the performance evaluation, if students taught by means of the FT method perform better than those taught using the traditional methodology, one could directly interpret that students have perceived that methodology as useful. Therefore, in this paper, we focus on the performance of students. Table 1 shows that previous studies assessing performance differences among students through the comparison between students taught using the FT vs. traditional methodology. As we can see, in general, these studies find a positive effect of the FT on performance. Third, Table 1 shows that using the FT to teach one part of the subject, the most difficult for students, and the traditional method for teaching the rest, has not been done by any previous research. We consider that, by doing so, it is possible to attract the attention of students on the difficult section, thus improving their interest and, in the end, their performance. These arguments lead to our hypotheses:

Hypothesis 1 (H1). *The performance of students varies according to the teaching methodology.*

Hypothesis 2 (H2). *The FP methodology can be used as a tool to capture the students' attention on a specific part of the program, and thus improve their performance.*

3. Materials and Methods

The experiment was carried out in a Financial Markets course at a higher education, included within the Economic disciplines, during November and December of 2018. The course is taught in the first semester of the fourth year of the Business Administration and Management degree. It had 56 students organized into two groups: 25 students take the course in the morning and 31 in the afternoon. The secretary of the faculty organizes the students by using alphabetical criteria, thereby warranting the homogeneity between the experimental and control groups. The marks of previous years indicate that there are no differences between both groups. The flip teaching method was implemented in the morning group. The afternoon group was used to contrast as a control group—the teaching methodology, in this case, was the traditional one. In both groups, the median of the age of students was 22 and 70% of students were women in the experimental group and 30% in the control group. The majority of students aimed to finish their degree in 2019 and all of them were Spanish students, as Erasmus students are enrolled in another group with English teaching. Ethical clearance was granted and adheres to the policy on research ethics of the university. Students were informed by professors about the experiment and informed consent was obtained from all participants.

The financial course is structured in three sections according to the objectives of each. The students are introduced to stock and derivative markets. Section 1 includes lessons one and two and deals with fundamental concepts related to the financial framework and stock markets. The aim of this segment is to provide students with an overview of the role of financial markets and participant agents. Section 2 includes three lessons—from three to five—in which the operative characteristics of the stock markets are analyzed. Differences among investing, speculating, and arbitraging are explained as well as operations, such as takeovers and capital increases. Moreover, the main methods of stock valuation, as well as fundamental and technical analysis, are taught. Finally, Section 3 includes lessons six and seven in which derivative financial products (futures and options) are explained. Lesson 6 covers how to use financial futures for speculation, hedging of financial risks and arbitrage transactions.

In lesson 7, call and put options are defined and classified (i.e., in the money, at the money, and out the money). This lesson also includes the factors affecting the price of an option and combined strategies using options.

These two lessons, 6 and 7, involved a special difficulty to be understood by students. Derivate financial instruments are widely classified as complex financial products (see [43,44]). For example, computing the financial outcome of a strategy using options, developing financial strategies by combining options or applying the Black and Scholes procedure for pricing require great efforts from the students. The usefulness of the flip teaching method has previously been evaluated in many studies. In this paper, we test the validity of the flip teaching methodology in lessons that entail a greater challenge for students.

Accordingly, in the experimental group, lessons 1 to 5 were conducted using the traditional method (master lectures), whereas lessons 6 and 7 were taught using the FT method. Furthermore, in the control group, all lessons were taught by the traditional method (Figure 1).

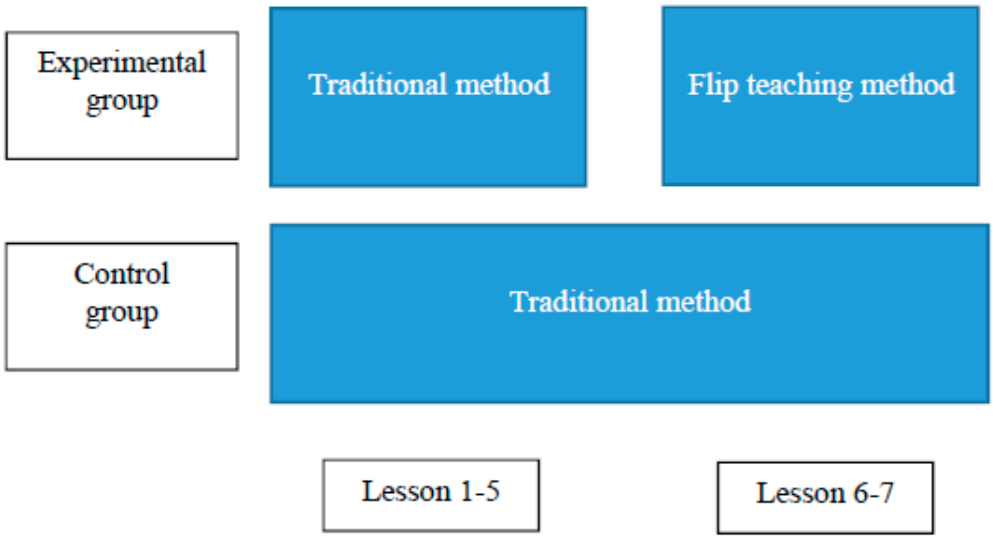

Figure 1. Methodology used in each lesson.

Lessons 1 to 5 were conducted in seven sessions lasting 2 h per session. These sessions were taught to the two groups in a traditional way (by lecture class). The traditional method consists of explaining the concepts of lessons during sessions lasting approximately 30 min and doing exercises during the rest of the class. Here, students did not visualize multimedia material before attending the class and all explanations were new for them. After this block of sessions, an exam was administered to evaluate students and establish the equivalence of the two groups.

Lessons 6 and 7 were conducted in four sessions of 2 h per session. These sessions were differently taught to the two groups. Whereas the control group continued with the traditional method, the experimental group received lessons by the FT approach. After finishing these lessons, an exam was administered to assess whether there were significant differences in marks between the two groups. The duration of the lessons was identical for both groups.

The FT model used in the experiment consisted of activities outside and within the classroom (Figure 2). The first activity involved displaying self-generated videos of 3–4 min out of the classroom. The duration of the videos was short in order to catch the attention of students. The videos did not include the entire lecture, rather, they only covered the starting applied concepts and broad-based ideas. The videos also covered theoretical explanations and exercises together with their solutions so that students could solve them. In the classroom time, students had to complete a questionnaire per session on the Moodle e-learning platform to verify that they had seen and understood the video (5 min in length). The objective of these questionnaires was that students could check their level of

knowledge about issues explained in the videos. After completing the questionnaire, students had time to ask for clarification regarding the concepts outlined in the video (10 min), then, a short lesson was taught by teachers (15 min). Finally, cooperative work was carried out (50 min). Here, students worked in groups to solve practical exercises and discuss the topics covered in the video.

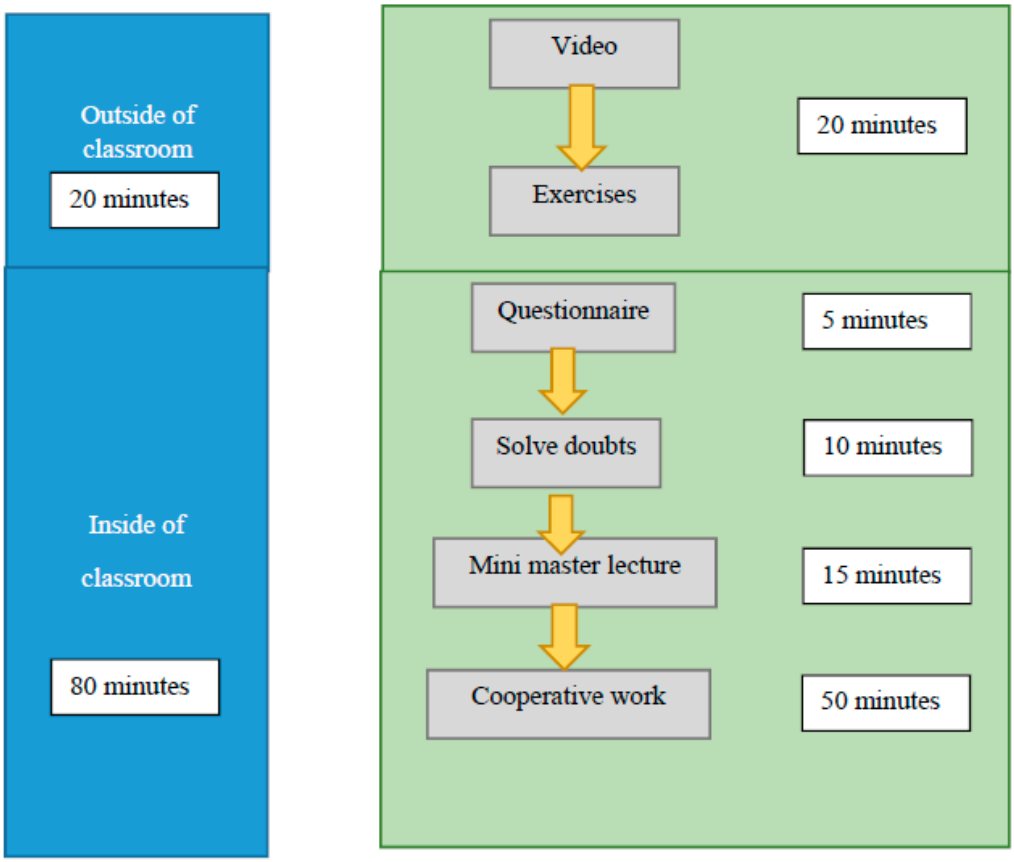

Figure 2. Flip teaching methodology used in the experiment.

4. Results

To check if students displayed the videos out of the classroom, we analyzed their marks on the four questionnaires (Table 2). The first questionnaire corresponded to the concept of financial future. The average mark was 7.25. In the second questionnaire, students had to answer questions about financial options (the definition of calls and puts), the average mark was 9.20. The third questionnaire was about hedging strategies, while the fourth was about factors affecting the price of options. The average marks were 8.33 and 8.26, respectively. The average marks of the questionnaire of the 25 students from the experimental group, which was completed at the beginning of the lesson inside the classroom, show that students displayed and understood the main ideas explained in them. The average marks for each questionnaire was higher than 7 points out of 10 points for all cases. These marks indicate the interest of students in this methodology and that the videos elaborated for the FT model were appropriate for teaching purposes.

Table 2. Average mark of questionnaire in Moodle.

	Questionnaire 1	Questionnaire 2	Questionnaire 3	Questionnaire 4
Average mark $N = 25$	7.25/10	9.20/10	8.33/10	8.26/10

To assess the impact and effectiveness of the FT methodology, student performance was studied by comparing the marks of the first, second, and final exams. In the first exam, the teaching methodology was master lectures, the second exam included lessons carried out with FT. The final mark was a compound of 55% of the first exam, 30% of the second exam, and 15% of practical exercises. The average mark in the experimental group was higher than in the control group for all exams (Table 3). We applied the Kolmogorov–Smirnov test to determine if the data met the normality assumption. Results showed that the marks of the first and second exams met normality, this was not the case for the final mark. Therefore, we used the t-statistic to analyze the differences in the mean of the first and second exam marks while the Mann–Whitney U test was used for the final exam.

Table 3. Average and standard deviation of comparison of exam questions grouped by session.

Marks	Experimental Group Mean (SD)	Control Group Mean (SD)	Z Kolmogorov-Smirnov Test (*p*-Value)	F (*p*-Value)	t (*p*-Value)	Cohen's d
Mark 1st exam	6.586 (0.9957)	6.289 (1.6685)	1.056 (0.215)	7.847 (0.007)	0.784 (0.437)	0.2199
Mark 2nd exam	6.644 (1.5460)	5.554 (2.1876)	0.902 (0.389)	3.806 (0.056)	2.100 (0.040) *	0.5852
				U Mann-Whitney test		
Final mark	7.168 (0.8024)	6.0838 (1.4373)	1.531 * (0.018)	216.000 ** (0.005)		0.9476

* Statistically significant results, $p < 0.05$; ** U Mann–Whitney results, Statistically significant results, $p < 0.05$.

Results indicated that there were no significant differences in the marks of the first exam between the experimental and the control group. This result revealed that both groups could be considered homogenous, as marks did not differ when traditional teaching was practiced. The pattern of means suggests that the marks in the second exam remained stable in the experimental group, whereas, in the control group, they decreased. Results of the control group were consistent with the marks of students from previous academic years. A downturn in the marks in the second exam may have been related to the fact that the study of financial derivatives (lessons 6 and 7) was more difficult for students than other subject matter. Nonetheless, the introduction of FT allowed students in the experimental group not to decrease their level of marks in lesson 6 and 7. This finding suggests that the FT is a useful methodology to improve the learning process. The average mark was significantly higher for the experimental group than for the control group, which strongly suggests the performance of students varied according to the teaching methodology (Hypothesis 1) and that the FP methodology can be used as a tool to capture the students' attention on a specific part of the program—thus improving their performance (Hypothesis 2). The Mann–Whitney U test indicated that the average mark of the final exam was significantly different between the two groups, with the experimental participants obtaining a higher mark than the control group. Finally, Cohen's d shows the size of the effect for the first exam is small, medium for the second exam, and large for the final exam. This means that the differences between the marks for the second and final exam in both groups are relevant and support the previous commented results.

The populations in this study are small and, although non-parametric measures and tests are appropriately used, this limitation requires that the results be interpreted with caution.

5. Discussion

FT methodology is perceived as a requirement for improving future education models [45]. As we showed in the literature review section, some previous studies have implemented this approach in various contexts. However, we noted that previous research still presents some limitations (e.g., it is restricted to the US). The results of this study make several contributions to the existing literature. We use the FT to teach only the most difficult part of the course. Since our results indicate that the

students who were taught through the FT obtained higher grades, the FT methodology can be used as a tool to capture the students' attention on a specific part of the program—and thus improve their performance. This finding suggests that both methodologies, traditional and FT, can be used in a complementary manner. Furthermore, we used the FT in the last year—fourth academic course—of university studies. As far as we know, this is the first study that applies the FT at this educational stage to a finance subject, so that FT could be used successfully at higher assumed levels of student maturity. Our findings suggest that students did not perceive the change in teaching methodology as a hindrance but rather as a benefit. FT promotes more active and conscious learning [12], which allows students to develop critical thinking and create a permanent self-learning [24]. Encouraging the development of critical thinking in students is a fundamental element of their learning as it allows them to solve problems reasonably, question pre-established opinions, identify and evaluate arguments, judge sources of information, and investigate topics of interest. Critical thinking also stimulates a greater perception of their own decisions and responsibility for their actions. In this sense, the student's own conscience and his degree of responsibility for his environment, from a social and environmental point of view, is of particular interest today. In this way, it is interpreted by the United Nations, which has defined the Sustainable Development Goals (SDG), as part of its 2030 Sustainable Development Program, establishing a total of 17 goals in which education and ICT are fundamental to their achievement. Among the objectives, the one most directly related to education is SDG #4: Quality Education. In this context, responsibility is a fundamental aspect that should be included as an indicator of good teaching practices by using ICT. ICT that allows developing this aspect will obtain a higher degree of acceptance in the educational system. Therefore, the use of ICT to achieve SDG #4 is a relevant research field. In this study, we show that the FT methodology allows improving the performance of students and achieving collateral capacities, such as responsibility and awareness, making learning more sustainable. This result can encourage other teachers to use ICT and move toward the achievement of the SDGs.

6. Conclusions

New technologies boost learning in the classroom because teachers, instead of carrying out a lecture class, can spend more time interacting with students. The main objective of this research was to measure the impact of FT on the performance of students in the fourth year of the Business Administration and Management degree. For this purpose, an innovative teaching model was implemented in a syllabus of finance studies. This model included FT in two lessons of the subject and involved the creation of learning resources by students within the learning process. To measure the impact of the FT methodology, an experiment was carried out with two homogenous groups of students. At the university level, we found that those students taught using the FT methodology obtained higher marks than students taught using the traditional methodology. The analysis shows that there were no significant differences in the marks of the experimental and control groups when traditional methodology was applied. However, when FT was utilized, those students taught by this method performed better than those taught using the traditional approach—which confirms our hypotheses. These results indicate that it is possible to introduce FT in a section of the subject and, thereby getting over the demanding higher cost and time when all lessons are designed with FT methodology. The introduction of FT in only one part of the subject can be useful—a finding that facilitates the task of implementing the methodology. This model reduces the effort of professors and allows blending, in complementary twitter fashion, traditional and FT methods.

Although our results are not generalizable to any discipline, they have some implications. The positive effect of the FT approach on the performance of students implies that students may become more satisfied and involved with the inverted method. This methodology includes problem-based activities and discussion by a proper channel [8,46], for instance, an e-learning platform. Students' needs and expectations of the education system are neither static over time nor independent from the pedagogic context. Therefore, making the learning system more dynamic may be beneficial to academic performance. However, the FT methodology should be implemented in appropriate

subjects and contexts. We consider that the traditional approach also has positive features, therefore, both systems can be perfectly implemented as required, without being discriminatory or exclusive. In fact, as detailed, it can involve the students the most. Our findings suggest that FT may increase their performance. However, [24,47] assert that successful FT is desirable when students are prepared and motivated to attend classes. Otherwise, students could perceive this methodology as ineffective. Although the students' limited preparation before class sessions may be an inconvenience, professors should be able to engage students to obtain effective flipped learning [35].

FT is a teaching methodology that is receiving greater attention due to the increased technological availability; however, we consider that further investigation is needed about students' academic performance. Some limitations should be acknowledged. First, we included FT in a portion of the subject. Further research about the use of FT in all of the lessons, not just some, should provide new insights into the effects of this methodology. Second, this study was carried out in an elective course in the last year of the degree. It would be interesting to replicate the analysis in other contexts and types of students. Third, a small sample was used. Further investigation is needed regarding comparing other similar modules of the PGCE/BEd (senior and FET phase) programs over a longer investigative period in the college. Further research should also be conducted, employing a mixed-methods approach, on how students and teachers perceived academic support in the FCP strategy involving self-directed learning.

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