TRAINING OF THE FUTURE TEACHER IN THE FLIPPED LEARNING MODEL IN AN ONLINE ENVIRONMENT

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ABSTRACT

The objective of this paper is to evaluate the effectiveness of a training program, based on the flipped learning model, for future teachers of Secondary Education and Vocational Training. For this study, a pre-experimental research design was used, and an instrument was applied to determine the level of training acquired in active methodologies, design of activities, technological tools, evaluation strategies, and student satisfaction with the training program. The results show the effectiveness of the program for training students in the active methodologies and technological tools most appropriate to implement the flipped model in the classroom.

Keyword: *flipped learning, online teacher training, higher education, technology, active methodologies*

INTRODUCTION

At present, the traditional models of teaching and learning do not respond to the training needs of students, who must acquire a series of complex skills essential for the twenty-first century, such as communication, collaboration, critical thinking, creativity, decision making, complex problem solving, and digital literacy (Fullan & Langworthy, 2013). Training students in these skills requires a more experiential and active teaching model, oriented to learning through discovery, which contrasts with the traditional exhibition model that continues to predominate in current university curricula, despite pedagogical and technological advances (Lai et al., 2018; Mohr & Mohr, 2017). This means that university students graduate without putting into practice, throughout their training, the skills demanded by employers (Murillo-Zamorano et al., 2019).

Teacher training based on theoretical, practical, and pedagogical contents is one of the pillars of a quality educational system in a country (Tourón & Santiago, 2015), another being the premise of learning as an effective integration of pedagogy and technology. In this regard, there are different studies that show that the training of future teachers in information and communication technologies (ICT) is quite poor, which results in teachers not being able to integrate into the educational system (Reinoso-Quezada, 2020; Romero-Martín et al., 2017).

The future teachers of Secondary Education and Vocational Training have to complete a master's degree (60 ECTS credits) in one year after their bachelor's studies. According to the TALIS 2018 report (Teachers and School Leaders as Lifelong Learners), the students do not always acquire sufficient pedagogical preparation for the teaching profession (OECD, 2019). The type of teaching and learning model that the future teacher experiences during their training will determine which option they will choose during their professional practice. Therefore, it is important to use constructivist models based on ICT in which everyone from candidate applicants to teachers are actively involved in their learning process, to achieve adequate pedagogical and technological training that ensures quality teaching (Sacristán et al., 2017). In this sense, the flipped learning model can be the best way to achieve this, since it combines the main educational trends of the 21st century, active learning, and the use of technology.

Previous studies have been carried out in which the flipped learning model has been implemented for teacher training that analyze its effectiveness in terms of motivation, attitude, and improvement of student performance (Martín Rodríguez & Santiago, 2016; Prieto et al., 2021). However, there is not much research on the effectiveness of the model in completely online learning environments (Martín R. et al., 2021; Romero-García et al., 2018). On the other hand, from the study carried out by López Belmonte et al. (2019a) on the implementation of this model in different educational centers, they deduced that teachers, even knowing the model, have certain deficiencies related to digital training when implementing it in the classroom, , and some apprehension about the innovative practices. Therefore, it is necessary that master's students acquire training in the model itself to learn the didactic methods, technological tools, and evaluation strategies necessary to implement the model in the classroom (Prieto et al., 2020).

Based on the above arguments, we implemented a program for training in the flipped learning model for future teachers who study the Master of Secondary Education, Baccalaureate and Vocational Training. This paper presents our evaluation of this program and analyzes the level of knowledge and use of different methodologies, activities, digital tools, and evaluation strategies after implementing the program in a completely online environment.

LITERATURE REVIEW

Description of the Flipped Learning Model

In 2014 the Association of Flipped Learning Network (FLN, 2014) defined the characteristics of the model and coined the term *flipped learning* to refer to the evolution of the model towards meaningful and deep learning. In the last decade many teachers have adapted to the flipped classroom in different disciplines of university studies, such as health sciences, computer science, engineering, social and experimental sciences, and mathematics. This is mainly in the United States, Europe, Australia, and New Zealand (Mintzes & Walter, 2020), though given the rapid extension of the model, there are works published worldwide (Zheng et al., 2020), as seen in the increase in the number of citations on the flipped classroom in Google scholar from 2009, with 157, to 2019, with 11,000 (Prieto et al.,2021).

Technology and pedagogy merge to make possible a personalized learning model for students (Sánchez-Cruzado et al., 2019), in the flipped learning model, which takes advantage of the possibilities of ICT and active methodologies to create a new educational paradigm (Young & Jeong, 2020). It is a pedagogical model in which the teacher ceases to be a mere transmitter of knowledge, but instead reverses the phases of the learning process and focuses their efforts on the application of concepts. Direct instruction is moved from the classroom space, leaving students to work individually on the theoretical contents through videos enriched with questions or accompanied by questionnaires, audio, and other online resources to acquire a basis of information. In this way, the students continuously interact with the materials prepared by the teaching staff for them to study before class is achieved, prepares them to apply the concepts they acquired in the classroom (López Belmonte et al., 2019b; Prieto et al., 2020). The teacher provides questionnaires to check the preparatory study carried out by the students and to address their doubts and difficulties prior to the session (Hew & Lo, 2018; Van Alten et al., 2019). This feedback is used by the teacher to select the most appropriate activities for the classroom to put into practice the contents the students previously worked on and to deepen their understanding and acquire needed skills and abilities (Martín Rodríguez & Santiago, 2016; Tourón & Santiago, 2015) and training competencies. In addition, the teacher has more availability in the classroom to resolve questions during the application of concepts and guide each student through individualized feedback (Hinojo et al., 2019). This generates a classroom climate conducive to learning that gives prominence to the student, while the teacher accompanies and guides the students in their personal learning process (Rivas Natareno, 2020; Wang, 2019).

The Flipped Model for Teacher Training

In a technological society in constant evolution, active methodologies have a relevant role in education due to their special contribution to the teaching and learning process. The combination of technology and pedagogical strategies facilitate the development of certain skills currently considered necessary, such as digital competence (Sosa Díaz & Palau Martín, 2018), teamwork (Estriegana et al., 2019), communication (Cuevas-Monzonís et al., 2021), critical thinking, creativity, and social skills (Martín R. & Tourón, 2017) as well as autonomy in learning (Ventosilla Sosa et al., 2021; Zainuddin & Perera, 2017).

Although there is a wide variety of strategies, pedagogical models, and active methodologies applicable in secondary and higher education, in this study we selected the flipped learning model to train the future teachers of Secondary Education and Vocational Training, because of its widely developed use at this educational level and the good results obtained. Numerous studies show the effectiveness of the model on the teaching and learning process in secondary school students (López Belmonte et al., 2019a; Muir, 2021; Wei et al., 2020) and in Higher Education (Pozo-Sánchez et al., 2021a; Weinhandl et al., 2020), with results that demonstrate an increase in motivation and involvement of students in activities inside and outside the classroom (Santiago & Bergmann, 2018). In addition, positive results are observed in the teaching of Science, Technology, Engineering, and Mathematics (STEM), which involve students in experimental environments that encourage learning (Jeong et al., 2020). Implementing the model increases the overall satisfaction of students with the teaching and learning process (Awidi & Paynter, 2019; del Arco et al., 2019; Hinojo Lucena et al., 2019; Martín R. &Tourón, 2017; Murillo-Zamorano et al., 2019; Sousa Santos et al., 2021; Van Alten et al., 2019), and increases interactions between them and their teacher through teacher feedback during the learning process (Báez & Clunie, 2019; Martín et al., 2021). The effects of the model on students' motivation to learn and their involvement with the work before and during class are directly related to their improved in-depth understanding of the subjects. This translates into an increase in academic performance at all educational levels and in all areas of knowledge, and a reduction in the failure rate (Cheng et al., 2019; Maya Diaz et al., 2021; Prieto et al., 2021).

The flipped model is more demanding than the traditional model in terms of teacher knowledge. The implementation of the model requires greater commitment, dedication, and effort as well as specific teacher training (Kwan & Foon, 2017). The studies of Pozo et al. (2021b) determined that teacher training in the flipped learning model is decisive when applying it in the classroom. In fact, in the study of Moreno-Guerrero et al., (2021), carried out with a sample of 1743 secondary education teachers, they determined that only 43% of teachers were prepared to successfully undertake the flipped learning model. Its application requires teachers to acquire a series of skills in relation to didactic methodologies and digital tools. Although a teacher can be trained at any time in these skills, it seems important that this training is acquired during the completion of the Master's Degree in Teacher Training, since there are studies showing that the teaching experience is negatively correlated with active methodological approaches such as the one achieved with the flipped model (Andreu-Andrés & Labrador-Piquer, 2011). That is why, in the training programs of future teachers, it is necessary to design learning situations in which the knowledge and skills of the subject are simultaneously applied with the flipped model as teachers learn to implement it in the classroom (Souto- Seijo et al.,2020).

The literature review shows few studies referring to teacher training in the flipped learning model during the completion of the master's degree. In the study carried out by Cid et al. (2018), the model is implemented in the Master's Degree in Teacher Training in which students design a lesson using the model and implement it in the classroom. However, the results highlight learning focused primarily on the recording and editing of educational videos. On the other hand, in a study carried out by Ojando Pons et al. (2019) a workshop was designed for the university professor to be trained in the tools and resources necessary to design a proposal based on the model and prepare to implement it in the classroom. Again, the results showed that the learning focused on the use of digital tools, although they did show that most of the teachers who carried out the workshop applied the flipped model in their classrooms.

However, the implementation of the model requires teacher training in the two basic pillars of the model, the innovative use of technology and the teaching strategies used by teachers in their classes (Chou et al., 2020; Ordónez et al., 2021). The mastery of digital tools is necessary to prepare the interactive materials used in the tasks developed prior to the class and to collaborate, communicate, and carry out an evaluation adapted to the pedagogical model (He, 2020; López Belmonte et al., 2019b). In addition, the teacher must be trained to select a teaching method and design activities that allow the active participation of students, through collaboration, to apply the knowledge of the discipline through problem solving and practical cases (Prieto & Giménez, 2020; Thai et al., 2017). Previous studies highlighted how the most used active learning methodologies when applying the flipped model are project-based learning, problem-based learning, case studies, cooperative learning or gamification (Hu et al., 2019; de Alba & Porlán, 2020; Parra-González et al., 2020). In line with the active methodologies used to implement the model, a comprehensive and formative evaluation must be designed (Fernández-Ferrer & Cano, 2019), for both the preclass tasks and the activities carried out in the classroom (Tourón & Santiago, 2015). In this regard, an online learning environment favors the learning of these methodologies as mediated by different digital tools.

Finally, and as one more advantage of the flipped model, it connects the cognitive with the emotional dimension, an important aspect since learning depends largely on the emotions students experience. In this sense, the study carried out by Cañada et al. (2018) showed that in the group in which the flipped model was implemented, the level of positive emotions experienced by the students (fun, confidence, enthusiasm, and tranquility) was higher than the negative ones (fear, worry, nervousness, and boredom) vis a vis a control group in which a traditional model of reception transmission was implemented. This is important because positive emotional states favor active learning in the classroom, while negative ones limit it.

Flipped learning is increasingly frequent in learning and teaching processes and is used for different subjects and educational levels (Mengual-Andrés et al., 2020). Consequently, the scientific literature includes exploratory studies on the effectiveness of this methodology in various contexts (Lin et al., 2019). However, little research has been done that addresses flipped learning from an evaluative perspective of the knowledge and skills needed so that good teaching practices are implemented. Consequently, the main objective of this study is to evaluate whether a training program based on the flipped learning model and developed online has an impact on the training of future teachers of Secondary Education and Vocational Training.

The specific objectives for this study are as follows:

- Analyze the change perceived by students after experiencing the flipped model, at the level of knowledge and use of different methodologies, activities, digital tools and evaluation strategies necessary to implement the flipped model in the classroom.
- Determine the satisfaction of the students who have participated with different aspects of the training program.
- Analyze the emotions experienced at the end of the training program.

METHODOLOGY

To evaluate the results of the implemented educational intervention program, we applied a quantitative methodology with a pre-experimental design to pretest and posttest groups.

Participants

We used a nonprobabilistic sampling for convenience, due to the formative experience that was implemented in the groups in which we taught. A total of 125 students who were studying Curricular Design in the specialty of Mathematics and Background and Disciplinary Orientation to Vocational Training of the Master's Degree in Teacher Training of Secondary Education and Baccalaureate, Vocational Training and Language Teaching, of the Faculty of Education, the International University of La Rioja (UNIR) and the Polytechnic University of Catalonia (UPC) participated in the research during the academic year 2020/21. The participants were 47.2% women and 52.8% men, whose age ranged from 25 to 45 years. In addition, 6.8% were under 25 years old, 43.2% between 25 and 34 years old, 35.2% between 35 and 45 years old, and 15.2% over 45 years old. As for the level of studies, 4.8% were in Doctorate studies, 38.4%, were in a master's degree, 55.2%, had a Bachelor´s degree and 1.6% had a Diploma. Regarding their previous teaching experience, 50.4% did not have any and the average number of years of teaching experience was 1.34 years.

Research Design

The program was based on the flipped learning model and the use of different active methodologies supported by digital tools. We designed 15 synchronous virtual sessions using Adobe Connect and/or Meet (Google Suit) software. These platforms allow students to be organized into groups of 4 to 6 in which they work collaboratively and autonomously.

To make the presentation of contents and analyze the previous ideas of the students, we recorded videos that were enriched with questions through the Edpuzzle platform (https://edpuzzle.com/). In addition, we shared with students in some sessions documents hosted in the Perusall App (https://perusall.com/). Prior to the session, the teacher reviewed the answers to the questions in the videos and the comments made by the students in the shared document. The teacher then determined before the synchronous session if the students had acquired the theoretical concepts that will be used in the classroom activities and reinforced those concepts that presented greater difficulty to the students. In this way, most of the session were dedicated to students putting into practice the contents worked out through activities in which different active methodologies are used. These activities were based on the digital tools of content creation, collaboration, and evaluation, which are necessary to implement the flipped model (Table 1). During the activity, the teacher offered feedback to all the groups of the work they carried out. This feedback was based on the learning objectives established for the activity, including an evaluation instrument, often a rubric, that was shared with the students at the beginning of the activity. After the session, the teacher reviewed the work done and sent through the forum the corrections of and/or comments on the activity carried out.

Table 1. Methodologies, Activities, and Digital Tools

Active methodology	Activity Example	Tool
Problem-based learning	Design of a Treasure Hunt Performing Webquest	Google sites
Project-based learning	Project of Designing a Formative Unit: curricular elements, planning the activities, and strategies and instruments of evaluation and feedback	Google doc
Gamification	Design of an escape room Design of evaluation tests	Google sites Kahoot Socrative
Case Method	Diagnosis of a classroom situation or problem	Google docs
Role-playing game	Simulated department meeting to establish common measures on methodology and evaluation (Collaborative wall)	Linoit
Collaborative learning	Design of a rubric	Rubistar Corubric
	Realization of a motivating video of a didactic unit	Screencast-O-Matic
	Realization of a symbol to collect the tools used in the activities	Symbaloo
Cooperative learning	Activity on methodologies (Puzzle Aronson)	Google docs
	Synthesis activity (mind map)	Mindmeister Goconqr

Instrument

To collect information on the effectiveness of the training program we implemented, we designed and applied a questionnaire that consisted of three sections of numbered items. The questionnaire opened with a series of questions referring to the sociodemographic characteristics of the sample under study. The first section, Methodological Strategies, included two subsections, one referring to the different active methodologies used to implement the flipped model (7 items) and the other to the types of activities implemented in the classroom (8 items). The next section was the Technological Self-efficacy, with 15 items on a series of digital tools used for content creation, collaboration, and evaluation. The last section, Evaluation Techniques and Instruments, consisted of 10 items.

In all the sections we used a Likert scale (1 = *Nothing*, 2 = *Little*, 3 = *Quite*, and 4 = *Much*) and applied it to the knowledge of the students and to the use made by the students. The reliability of the instrument was determined by Cronbach's Alpha, obtaining a value of 0.982, so the instrument had adequate reliability.

We analyzed the satisfaction of the students with the formative experience through a questionnaire ad hoc. This questionnaire consisted of five sections: (a) the activities carried out, (b) teaching performance, (c) interaction with the group, (d) methodology, and (e) emotions experienced. Each section was evaluated with a Likert scale (1 = *Nothing*, 2 = *Little*, 3 = *Quite*, and 4 = *Much*). Overall, the reliability of the instrument yielded a Cronbach's Alpha of 0.910 and was considered adequate.

The instruments were developed in Google Forms and shared with the students through the institutional learning platform at the beginning of the courses and after the completion of them.

Data Analysis

First, we calculated descriptive statistics to know the general characteristics of the sample and the scores of the dimensions established to evaluate the knowledge and use of active methodologies, activities, digital tools, and evaluation strategies necessary to implement the flipped learning model.

Second, we applied the Kolmogorov-Smirnov test with the Shapiro-Wilk correction to determine if the data obtained followed a normal distribution. The data show values of $p < 0.05$ in all the variables of all the scales, therefore the analyzed variables do not have a normal distribution and were analyzed using nonparametric statistics. Specifically, we tested the ranges with Wilcoxon signed-rank test to analyze before and after the intervention the levels of knowledge and use of methodological strategies, technological self-efficacy, and evaluation strategies, to check if there had been any changes. Finally, for all group comparisons we calculated the effect sizes (Cohen's r), where values of $r = 0.10$ were considered low, $r = 0.3$ mean, $r = 0.5$ large, and $r = 0.7$ very large (Cohen, 1988). The data were processed using the SPSS 26.0 statistical package

Table 2. Wilcoxon W-test Results for the Scale Degree of Knowledge and Use of Methodologie

	Knowledge			Use		
	Z	Sig. Asymptotic (bilateral)	r	Z	Sig. Asymptotic (bilateral)	r
Collaborative learning	−8.884	.000	0.794	−6.958	.000	0.622
Cooperative learning	−8.741	.000	0.781	−6.888	.000	0.616
Project-based learning	−7.914	.000	0.708	−6.605	.000	0.591
Problem-based learning	−7.800	.000	0.698	−5.977	.000	0.535
Gamification	−8.532	.000	0.763	−5.172	.000	0.463
Case Method	−6.118	.000	0.547	−2.431	.015	0.217
Role-playing games	−4.435	.000	0.397	−3.184	.001	0.285

Table 3. Wilcoxon W-test Results for the Activity Knowledge and Use Grade Scale

	Knowledge			Use		
	Z	Sig. Asymptotic (bilateral)	r	Z	Sig. Asymptotic (bilateral)	r
Treasure hunt	−8.900	.000	0.796	−5.338	.000	0.477
Scape room	−7.512	.000	0.672	−3.490	.000	0.312
Webquest	−8.349	.000	0.747	−5.088	.000	0.455
Motivating video	−8.600	.000	0.769	−7.006	.000	0.627
Cooperative activities	−9.091	.000	0.813	−7.461	.000	0.667
Kahoot	−9.101	.000	0.814	−7.791	.000	0.697
Evaluation tools	−9.046	.000	0.809	−7.601	.000	0.680
Simulations (role-playing games)	−5.925	.000	0.530	−5.053	.000	0.452

RESULTS

In relation to the first section, Methodological Strategies, the results of the Wilcoxon W test indicated statistically significant values ($p < 0.05$) in all variables for both the scale of degree of knowledge and the use of active methodologies (Table 2). The effect size was large and very large in all items on the knowledge scale, except in role-playing games ($r = 0.397$), where the effect was medium. Regarding the scale of use, there were also large effects in all items except case method ($r = 0.217$) and role-playing games (0.285), where the effect was low.

The same happened with the scale of knowledge and use of activities implemented in the classroom (Table 3), where the results of the Wilcoxon W test indicated statistically significant values in all variables, with a large and very large effect size in all items of both scales.

Regarding the second section referring to digital tools, Technological Self-efficacy, the results of the Wilcoxon W test indicated statistically significant values on both scales (knowledge and use)

Table 4. Wilcoxon W-test results for the Degree Scale Knowledge and Use of Digital Tools Used for Content Creation, Collaboration, and Evaluation

	Knowledge			Use		
	Z	Sig. Asymptotic (bilateral)	r	Z	Sig. Asymptotic (bilateral)	r
Linoit	−4.586	.000	0.410	−3.951	.000	0.353
Google Docs	−8.229	.000	0.736	−7.114	.000	0.636
Google Sites	−8.752	.000	0.783	−7.861	.000	0.703
Cmaps	−7.757	.000	0.694	−6.665	.000	0.596
Mindomo	−6.845	.000	0.612	−6.126	.000	0.548
Mindmeister	−1.869	.062	-	−.824	.410	0.074
Goconqr	−2.857	.004	0.256	−2.363	.018	0.211
Socrative	−7.609	.000	0.681	−6.861	.000	0.614
Kahoot	−9.526	.000	0.852	−8.380	.000	0.750
Symbaloo	−6.945	.000	0.621	−6.051	.000	0.541
Edpuzzle	−9.205	.000	0.823	−9.286	.000	0.831
Corubrics	−6.860	.000	0.614	−6.644	.000	0.594
Rubistar	−4.102	.000	0.367	−4.607	.000	0.412
Screencast-O-Matic	−6.378	.000	0.570	−6.051	.000	0.541
Perusall	−7.562	.000	0.676	−6.456	.000	0.577

Table 5. Results of the Wilcoxon W-test for the Scale Degree Knowledge and Use of Evaluation Techniques and Instruments

	Knowledge			Use		
	Z	Sig. Asymptotic (bilateral))	r	Z	Sig. Asymptotic (bilateral)	r
Test type exam	-6.278	.000	0.562	-2.033	.042	0.182
Short answer exam	-6.974	.000	0.624	-4.744	.000	0.424
Development exam	-6.129	.000	0.548	-5.090	.000	0.455
Virtual Forums	-8.261	.000	0.739	-2.594	.009	0.232
Portfolio	-5.937	.000	0.531	-2.554	.011	0.228
Oral presentations	-5.013	.000	0.448	-4.970	.000	0.445
Work/Projects Report	-4.992	.000	0.447	-5.454	.000	0.488
Self-assessment systems	-5.362	.000	0.480	-5.509	.000	0.493
Observation scales	-8.029	.000	0.718	-6.469	.000	0.579
Rubric	-8.986	.000	0.804	-6.626	.000	0.593

in all variables except the Mindmeister tool (p = 0.062) on the knowledge scale and (p = 0.410) on the use scale (Table 4). In addition, the effect sizes were large or very large in all the items of both scales, except in Linoit and Rubistar where the effect size was medium in both knowledge (r = 0.410 and r = 0.367) and use (r = 0.353 and r = 0.412). On the other side, there was only a low effect in Goconqr on both scales (r = 0.256 in knowledge and r = 0.211 in use).

Finally, in the section Evaluation Techniques and Instruments, we observed statistically significant results in all the variables of the two scales analyzed (Table 5). Regarding the size of the effect, we found greater differences than in the previous dimensions. In the knowledge scale all items reached large or very large effect sizes, except for oral presentations (r = 0.448) and reports of works/projects (r = 0.447), where the effect was medium. Regarding the scale of use, the effect sizes were large or medium in all items, except in test-type examination (r = 0.182), virtual forums (r = 0.232), and portfolio (r = 0.228), where the effects were low.

Regarding the degree of satisfaction with the learning experience carried out, the students valued the experience in a global way with an 8.50 (on a scale of 1 to 10), which indicates a great satisfaction.

Performing a detailed analysis of each of the dimensions studied, we found that in the dimension activities carried out in class all the items reach values higher than 3 (Figure 1), meaning the students were quite satisfied with them, mainly because they had improved their understanding of the subject (3.67) and were allowed to see the application of the concepts to real situations (3.63).

Figure 1. Average of the Items in Activities Carried Out in Class

The assessment of the teaching performance also obtained scores above 3 in all the items of the dimension (Figure 2), so the students were also quite satisfied. This is mainly because the teaching staff designed activities to put theoretical knowledge into practice (3.84), reported on the objectives (3.79), and provided feedback during the realization of the activities (3.77).

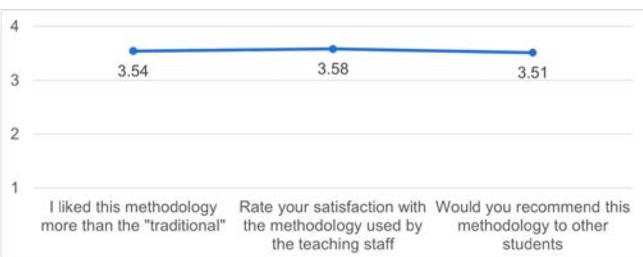
Figure 2. Average of the Items of Teaching Performance

Regarding the interaction dimension with the group (Figure 3), the students were quite satisfied because these interactions favored them to carry out activities (3.52) and all the members of the group participated in the arguments and explanations (3.28).

Figure 3. Average of the Items in Interaction with the Group

With respect to the methodology dimension (Figure 4), again we obtained scores higher than 3.5 in all the items of the dimension, which affirmed that the students were quite satisfied with it.

Figure 4. Average of the Items in Methodology



Finally, we asked the students about the emotions they experienced when working with active methodologies. As shown in Figure 5, the students had greater positive than negative experiences; felt mainly stimulated (3.36), satisfied (3.34), and enthusiastic (3.21) with their participation in the innovation developed; and presented low levels of tedium (1.31), solitude (1.35), irritation, (1.35) and impotence (1.41).

These results indicated that the emotional balance perceived by the students after the realization of the experience was inclined in favor of well-being in a very evident way. The mean emotional comfort felt by students (3.08) doubled discomfort (1.47) on a scale of 1 to 4 points, and discomfort can be classified as almost nonexistent or very low and comfort as medium-high value (Figure 6).

Figure 5. Average of the Items of the Emotions Dimension Experienced

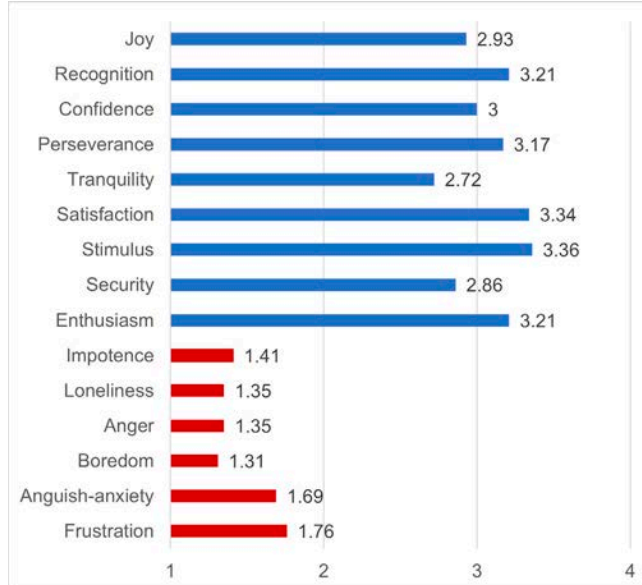
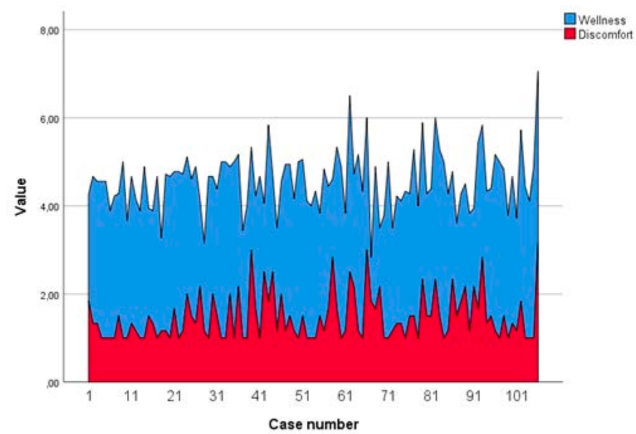


Figure 6. Emotional Balance of the Experience



DISCUSSION

The results show that the learning experience implemented for the training of teachers of Secondary Education and Vocational Training was successful. We provided training in the active methodologies necessary to implement the flipped learning model in the classroom for future professionals. The students experienced a wide range of activities and used different digital tools, which will allow them to design their own experiences. In this sense, the program offered training in the content of the subjects as well as the pedagogical and technological knowledge necessary to offer quality teaching in the students' professional future. The didactic potential of the flipped learning model for the design, implementation, and evaluation of formative actions and to promote the pedagogical activity of students is evidenced (Cid et al., 2018; Sola Martínez et al., 2019).

Focusing on the Methodological Strategies, we determined that the results are significant for all active methodologies, with large and very large effect sizes. This shows that the student degree of knowledge and use of different methodologies worked, except for the role-playing games and case method. With respect to role-playing games, it was implemented only in one of the activities carried out and it is evident that it was not sufficient for the mastery of this methodology, given that the effect sizes were low. About the case method, it was used in two activities: the students show knowledge with a medium effect and in terms of student use it was low. In the future, these methodologies must be deepened, the principles that govern them emphasized, and the differences with others more assimilated. Given that the effectiveness of the flipped model depends on the knowledge of different active methodologies that must be implemented in the classroom space (Chou et al., 2020; Moreno-Guerrero et al., 2021; Ordoñez Ocampo et al., 2021), we highlight the effectiveness of the training program presented in this study. the proper implementation of the model has been evidenced in the work of Martín et al. (2021), which demonstrated an improvement in didactic and digital competence in teachers in training when they implemented a program based on the flipped model in a virtual environment. Therefore, activities based on active methodologies, cooperative learning, and project-based learning should be designed.

Regarding the design of activities, the results show that the students have learned the design of them. Again, these results corroborate the mastery of one of the pillars of the flipped model. Since it is through the activities that the contents previously worked outside the classroom are put into practice, strengthening them is important and thus generates significant learning (Prieto & Giménez, 2020; Santiago & Bergmann, 2018; Thai et al., 2017). The implementation of appropriate tasks based on pedagogical principles ensures an improvement in the teacher's skills. In the study carried out by Sousa et al. (2021), students preferred the flipped model over the traditional one because of the increased learning based on practice. In this sense, it is appropriate to highlight the central role of the activities developed in class (Prieto & Gimenez, 2020).

The effectiveness of the implementation of the flipped model requires not just pedagogical knowledge but training in technological tools, both to present the contents through enriched videos or documents and to carry out activities. In this sense, the results for Teaching Self-efficacy were very favorable with respect to knowledge and use of digital tools to implement the different activities, except for Mindmeister. It is important to highlight the dominance given the sizes of the effect of the Edpuzzle and Perusall tools. Both are used to move the presentation of content out of the classroom space and to review the preparatory work done by the students. Previous studies show that this review allows teachers to approach the session in the most appropriate way to attend to the diversity of students and increase their academic performance (Hew & Lo, 2018; Van Alten et al., 2019). The study by Ordónez et al. (2021), highlighted the central role of technological resources in the flipped model to carry out both preparatory and preclass activities, as well as those carried out in the classroom. In fact, the technological self-efficacy of Secondary Education teachers is a key factor for the development of good practices with the flipped learning model (He, 2020; López Belmonte et al., 2019a; Moreno-Guerrero et al., 2021).

Offering a comprehensive and formative evaluation is another pillar of the flipped model, so it is necessary to educate future teachers in evaluation techniques and instruments that provide feedback on the learning process. In this sense, the results presented in Techniques and Evaluation Instruments indicate that the students learned to use some necessary instruments to carry out a continuous evaluation of learning, as seen in the sizes of the effect achieved (large or very large) and the scales of observation, virtual forums, and rubrics. These instruments are of great interest and allow a bidirectional communication between teachers and students in virtual forums. As for the observation scales, they are very suitable for monitoring students during the learning processes, with the rubric being one of the main instruments used to make the final assessment of the classroom activities implemented when using the flipped model. In short, the students were trained in those most relevant and useful instruments for the application of the model. The formative evaluation carried out by the students allowed them to learn the strategies and instruments necessary to put into practice the different activities in the classroom (Fernández-Ferrer & Cano, 2019; Prieto et al., 2021).

The good results achieved in the assessment of students about the learning experience are reflected in the high satisfaction achieved. The students valued very positively the methodology used (Cañada et al., 2018), which will possibly affect its application in the classroom in the future (Sacristán et al., 2017). In addition, the students perceived an increase in their digital competence (Sosa Díaz & Palau Martín, 2018), their autonomy (Pozo Sánchez et al., 2021b; Ventosilla Sosa et al., 2021; Zainuddin & Perera, 2017), and in general an improvement in their learning (Maya Díaz et al., 2021). In addition, the study by Cuevas-Monzonís et al. (2021) used the flipped model for training students in the Pedagogy degree and the usefulness of the model to train in pedagogical knowledge and skills was perceived. Specifically, the students expressed that it increases the feedback received from the teacher and encourages group work as well as autonomous and meaningful learning. It should be noted that the increase in feedback is an element systematically highlighted by students in the satisfaction studies of the model (Báez & Clunie, 2019; Martin et al., 2021).

This training program allowed students to experience positive emotions (recognition, satisfaction, stimulation, and enthusiasm) as compared to negative emotions (frustration, anxiety, and boredom), which can often be associated with a type of experiential learning such as that used in this study. Cañada et al. (2018) determined that the application of the flipped model for the training of future teachers generates positive emotions and reduces negative ones.

CONCLUSIONS

The training program based on the flipped learning model is effective and adequately trained students in the main active methodologies and design of learning activities. In addition, the students learned to properly integrate different digital tools and to design different evaluation instruments according to the methodology used. All of this has favored the learning process of students and their training in pedagogical and technological skills, both of which are essential in a good teacher trained to implement the flipped model in the classroom. This is revealed by Kwan & Foon (2017), Martín R. & Tourón (2017), Ojando Pons et al. (2019), and Pozo Sánchez et al. (2021b), which determine that one of the main causes of not using this model is the lack of knowledge of it and the scarce training in active methodologies and digital skills. Therefore, despite the evidence that this model stands as one of the alternatives that can respond to the new educational paradigm (Parra-González et al., 2020; Prieto et al., 2020; Prieto et al., 2021), it is not implemented in the classroom as often as expected.

One of the key points of this study is the good results obtained from carrying out the planning and implementation of the intervention and. The experience of the flipped learning model allowed the pedagogical and technological training necessary for teachers in training in the future to apply it in the classroom.

On the other hand, as is often the case in applied research, the sample size for this study is modest, and given the results presented, we propose to expand this study, seeking to replicate it in other subjects of teacher training of Secondary Education and Vocational Training, and to continue deepening in the implementation of the flipped learning model.

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