

Evaluation of a Study on Flipped Learning and the Use of Digital Tools in Higher Education: Teacher Training

Déborah Martín Rodríguez, Raúl Santiago Campión
Universidad Complutense de Madrid, Universidad de La Rioja, Spain

Abstract: *This paper discusses a university-level study on training secondary school teachers in innovative teaching practices based on the Flipped Learning pedagogical model. The study was conducted on the subject entitled Learning and Personality development, which is part of the Master in Secondary and Baccalaureate Teacher Training, in a Blended Learning context and, specifically, based on the Flipped Learning, Just in time teaching and Bring Your Own Device (BYOD) models. This paper describes the competencies to be developed, the instructional design, the ICT and LKT tools (Information and Communication Technologies and Learning and Knowledge Technologies) used during the learning process and selected according to the educational purpose of the subject and the evaluation system considered. We provide a descriptive analysis of the learning results in addition to the quantitative and qualitative evaluation made by the students of this learning experience. The conclusions drawn from the study serve to highlight the similarities in the findings and observations of other similar studies.*

Keywords: *Learning and knowledge technologies, Teacher Training, Flipped Learning, Active Learning, Motivated Learning*

1. Introduction

The evaluation presented below, assesses a university-level educational study based on the Flipped Learning model [0]. The study was conducted during the 2015-16 academic year for the subject entitled "Learning and Personality Development" which is part of the Official Master Course in Secondary and Baccalaureate Teacher Training imparted by the ICE (Institute of Educational Sciences) of the Universidad Politécnica de Madrid.

This study was a follow-up to an earlier project on innovative teaching practices for the same subject, conducted in the previous academic year and based on the same model. Following a quantitative and qualitative analysis of this study, the improvements proposed were included in the study made during the academic year of 2015-16 [1].

The course has an allocation of 3 ECTS credits (European Credit Transfer System), equivalent to a student workload estimation of 75-90 hours. This includes 22 contact hours, dedicated to clarifying doubts, discussions, meetings, case method learning, learning through gamified questionnaires, all of these activities are conducted in the classroom, either individually or as a

team. The 53-68 remaining hours are dedicated to individual or collaborative student work based on watching videos, replying to interactive questions and completing the collaborative tasks assigned.

1.1 Theoretical Foundation

The Bologna process and the development of the European Higher Education Area (EHEA) have led to a change in the teaching-learning process model. The methodological principles and the Transfer and Accumulation System (ECTS) mark a shift from a teacher-centred model to a learner-centred system [2]. The ECTS credit is defined as a transfer and accumulation system and measures a student's workload required to acquire the necessary competencies for the qualification which, in our case, is teacher training at a secondary school, baccalaureate or vocational skills level.

This global, multidimensional approach is necessarily accompanied by a methodological change in the classroom. That is, the use of active, inductive and collaborative methodologies [3] and [4]. Furthermore, this new approach requires the detailed planning of the in-class sessions and the preparation of a well-designed teaching program for the ultimate purpose of ensuring that students acquire the appropriate competencies to improve their employability [4] and [5].

In actual fact, this proposal marks a shift from a teacher-centred model to a learner-centred model. This new model proposes that the classroom should not just be a place for the set curriculum, but should also make room for personal motivation, interests and learning [6].

The educational reforms and the approach proposed by international organizations (OECD 2006) towards the development of the necessary skills for the 21st century (Washington Partnership 21 and Melbourne ATCS21) in compulsory education therefore require the incorporation of new methodologies in schools and educational centres.

In addition to these pedagogical approaches, we need to add the intrusion of technology in our personal, professional and social lives. In the face of these new demands, schools cannot and should not remain detached. As Tourón has already pointed out [7], if learning is mobilised, then so is education. In fact, what is known as mobile learning has now become a reality.

Although technology is being increasingly incorporated into the educational environment, in many cases it is offered as a substitute in the classroom rather than an integrated tool in the teaching-learning process. "Technology should be considered to be a tool, not a result of learning" [6].

In order to ensure coherence between education and technology and that technology is used in the proposed sense, we first need to decide on the

teaching model to be used in the classroom and then subsequently select the most appropriate technology or tools to be integrated into this model.

For this reason, when addressing a change in methodology and the use of ICT tools or mobile learning, there is a greater need than ever for teachers to receive initial training. In their role as students, prospective teachers will try out a number of active methodologies as well as the use of technology in the classroom, with the ultimate goal of experiencing significant, deeper learning. This will then ensure that they are well-positioned to subsequently transfer this to secondary school teaching.

The Flipped Learning (FL) model is a learning-centred model. Teachers take on a role as facilitators or "guides" to help students in class. To do so, they transfer certain teaching-learning processes (lectures and content transfer) to the home. This information is generally made available through micro-videos, presentations, podcasts, lectures, etc. whilst the in-person class time is used for activities, dynamics and didactic techniques are proposed to facilitate the teacher-student and student-student interactions, under the systematic supervision of the teaching staff.

This model, which has aspects that are common to Mastery Learning, "demands a high degree of planning, a highly structured development and a thorough formative evaluation" [8].

The quality of instruction [...] has to do with the indications or directions provided to the student, with the student's participation in the learning activity [...] and with the reinforcement which in some way links the student with the learning. As most school teaching is group teaching and given the fact that any attempt at group teaching is linked to error and difficulty, a feedback system should also be included in the quality of instruction [9].

In the Flipped Learning model, the students are responsible for watching the videos and noting down any questions. The teacher offers qualitative feedback to the students' queries and tasks, indicating which indicators have been achieved and which need to be improved. A scoring guide, such as a rubric, is available to students at all times, for evaluation purposes. This allows each student to decide on his/her target level, yet again taking responsibility for his/her own learning.

In the specific context of the course considered, entitled "Learning and Personality Development", the student, as a prospective teacher, must have a thorough knowledge of the cognitive learning processes and the evolutionary development of teenagers and, therefore, in order to "know how to apply", "critically assess" and "autonomously learn", he/she must experience his/her own metacognitive process. "To experience the model as a student could lead to its subsequent use in Secondary school classrooms, thereby leading to a change in methodology in schools today" [1].

2. Materials and Methods

The study was implemented during the first term of the academic year of 2015-16. The collection of information commenced with the analysis and evaluation of an earlier Flipped Learning study conducted by the same team of teachers during the academic year of 2014-15 for the same master's subject and in the same place.

During this second study, the data were obtained after each delivery of the tasks performed, after the gamified questionnaires completed in the classroom and after the final exercise. In order to ascertain the students' opinion with regard to the methodology, a questionnaire was prepared, adapted from one by Thomas Driscoll and which was included in Moodle, our usual platform. Participation in the questionnaire was voluntary and anonymous. The items included in the said questionnaire are presented later on in this paper.

A mixed methodology was used for the data analysis. On the one hand, the SPSS 20.0 statistical package was used to make a descriptive analysis whilst, on the other hand, the Atlas.Ti version 7.5.10 software was used to make a qualitative analysis of the responses given by the students to the open-ended questions in the final questionnaire. Inductive, open coding was used. The analysis shows what the students think of the master course, with regard to the impact that the model has had on their learning, any aspects that have either benefited or hindered them, and their suggestions for improvement.

2.1 Sample

A total of 60 students took part in this second study, all enrolled in the three specialisations of the Master, imparted in this academic year (Physical Education, Artistic Education and Technology). We obtained the data for the qualifications and results of all the students enrolled. With regard to the data on the students' view of the model, 31 responded to the questionnaire.

2.2 Procedure

The educational innovation study commenced with the evaluation and analysis of the data obtained from the earlier study (academic year 2014-15), where the students highly rated the experience as part of their teacher training. The first step was to reflect on the drawbacks that hindered optimal learning, as mentioned by the students of the previous academic year, in addition to their suggestions for improvement [1]:

- Complement the video with a visual document to support the presentation.
- Use shorter videos, preferably with a duration of less than 10 minutes.

- Include a brief summary at the end to provide an overall view.
- Include more practical cases of secondary school students.
- Improve some of the techniques in order to make it easier to retain or remember concepts, for videos that were seen some time ago.

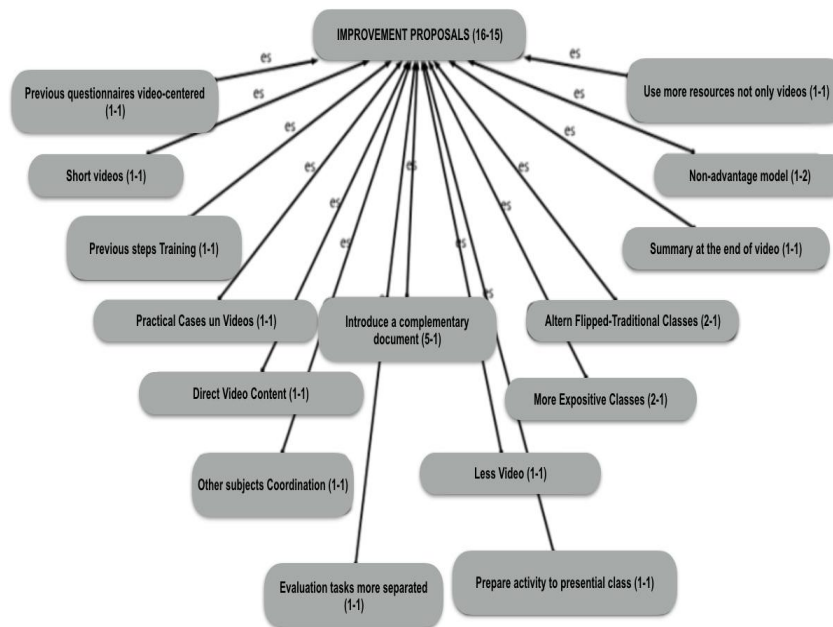


Figure 1. Coding diagram for the improvement suggestions, made by students of the academic year 2014-15 [1]

Following the complete analysis of this data, the review of the competencies to be developed by students, and the proposed learning outcomes for the subject, the team of teachers designed the learning guide with in-class and out-of-class learning activities, taking account of the suggestions for improvement listed by the students from the previous academic year.

Active methodology was used for the didactic programming, given the fact that, according to the investigation conducted by Prince [11] it better predicts academic achievement.

The students prepared, either individually or as a team, the activities described below, associated with general competencies (CG), specific competencies (CE) and/or learning outcomes (RA)[12] (A description of each competence is attached in the appendix at the end of this document)

- a) **Individual work. Watching videos and reading prior** to the in-class sessions and participation in the interactive questionnaires. CG2, CG5, CG6, CG7, CE1, CE2, CE2, CE4, CE5, CE21
- b) **Group work: Preparation of a WebQuest** directed at teaching staff, on the characteristics of teenagers, teaching styles and learning styles. CG2, CG6, CE1, CE3, CE21, CT2, CT3
- c) **Individual. Gamified questionnaires** for each thematic block. CG2, CG5, CG6, CG7, CE1, CE2, CE2, CE4, CE5, CE21
- d) **Group work: Preparation and defence of a classroom poster.** (This task was performed in coordination with the subject "Means and techniques for communication support"). The students were required to prepare a poster for a secondary school classroom, identifying a problem and possible solutions. They were allowed the use of any ICT tools considered appropriate. All the posters were to be put on display in the classroom. The students were given time to look at the posters before taking part in a round table, directed at obtaining more information and pooling ideas and suggestions. CG5, CG7, CE2, CE4, CE5, CE21, CT2, CT3
- e) **Individual exercise** of competencies. (CG2, CG5, CG7, CE4, CE5; RA2, RA5, RA3, RA6).

The subject-matter of the course was divided into two parts: a) prior to the in-class session and b) the in-class session.

2.2.1 Prior to the in-class session

The video(s) recorded by the teachers, with specific content, were viewed before each in-class session, specifically before 10 pm on the day before our face-to-face class. The recording and editing were made with Camtasia Studio 8 and Powerpoint. All the videos were included in Moodle (platform for the management of learning). The videos had a duration of between 8 - 12 minutes. During this course, the teaching staff paid particular attention to the duration of the videos, given the fact that this was a suggestion for improvement made by the students in the previous course.



Figure 2. Example of a video image on coexistence in schools.

Each week, the contents (specific videos, infographics and/or documents) corresponding to the topic to be worked on from the previous session, were opened in the Moodle platform. In this way, students had the entire week to view the contents at their own pace, making any appropriate notes and watch the video as often as they wished in order to explore those concepts that most attracted their attention and/or to note down any questions.

All the videos were interactive and were viewed from the Educanon platform. Students responded to pop-up questions during the video, obtaining automatic feedback. Furthermore, these responses served as a basis and starting point for the subsequent in-class sessions directed at reviewing or clarifying concepts. The teaching staff reviewed the responses before the session (for this reason it was closed at 10 pm on the evening before), based on the *Just in time teaching* [13] method, in order to analyse doubts, adapt class time to provide any necessary clarifications and to value the effectiveness of the video.

| | DESARROLLO FÍSICO Y COGNITIVO | | | | Desarrollo Cognitivo | | | |
|-------------|-------------------------------|------|------|------|----------------------|------|---|----|
| | Q 01 | Q 02 | Q 03 | Q 04 | Q 05 | Q 06 | | % |
| liano, | A | A | A | A | 0 | 0 | 😊 | 43 |
| e, | A | A | A | A | 0 | 0 | 😊 | 43 |
| a Gago, | A | A | B | A | 0 | 0 | 😊 | 57 |
| z, | A | A | A | A | 0 | 0 | 😊 | 43 |
| z Gómez, | A | A | A | A | 0 | 0 | 😊 | 43 |
| de Tangil, | A | A | A | A | 0 | 0 | 😊 | 43 |
| | A | A | A | A | 0 | 0 | 😊 | 43 |
| tberingola, | A | A | B | A | 0 | 0 | 😊 | 57 |
| z Palacios, | A | A | B | B | 0 | 0 | 😊 | 43 |

Figure 3. Students results in the interactive question of a video on the Educanon platform

2.2.2 During the in-class session

The physical layout of the classroom was similar to the one shown in Figure 3. The students worked in class in base teams with either three or four members. Groups were randomly chosen, seeking heterogeneous groups with regard to speciality and gender. Each team was required to bring at least a laptop, tablet and mobile phones (BYOD) [14] in order to be in a position to work in the classroom.

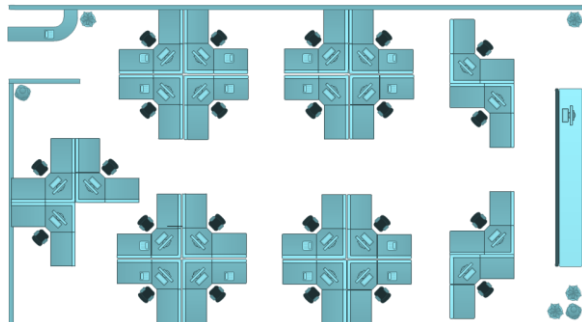


Figure 4. General layout of the physical structure of the classroom.

Furthermore, before starting a task to be performed as a team, a document called "team plan" needed to be completed, naming a coordinator, supervisor, spokesman or secretary, their duties and commitments. This plan was reviewed at the end of each activity, evaluating whether the objectives had been met, which aspects should be improved as a team in the following task, and peer evaluation was used to agree on the grade to be assigned to each member.

The in-class session had a duration of 100 minutes and was structured as follows:

1. Query resolution phase. This first part was generally very participative. Dialogue was encouraged between everyone, in order to trigger discussions or new queries, facilitating true learning. On occasions, we used the Kahoot "*Discussion*" or "*Survey*" section to trigger discussions or the Mentimeter open-ended questions in "*Speech Bubbles*" as shown in Figure 5. Both tools were used with the students' mobile phones whilst the answers are projected on the digital whiteboard.



Figure 5. Students' concepts projected onto the digital whiteboard through their mobile phones.

2. Learning consolidation phase. On occasions the topic required some activities to be performed in a large group and/or individually. Specifically, in this course we performed the following:

- Group dynamics
- Discussions
- Case studies to look more deeply into concepts, based on Piaget's cognitive development.
- Learning styles test (CHAEA - Honey - Alonso Learning Styles Questionnaire).
- Kohlberg's moral dilemma questionnaire.
- Group and individual interactive quizzes, requiring a Smartphone, Tablet or laptop. The most frequently-used tools were **Kahoot** (for individual quizzes) and the **Socrative Space Race** area (in group quizzes) as shown in Figure 6.



Figure 6. Students responding to a questionnaire using their mobile phones.

- Holding a meeting to promote coexistence amongst students, with a circular physical layout.
 - Video conference with two Secondary Schools, through the Google **Hangout**. The teachers at these schools are following the Flipped Classroom model.
3. Collaborative Work Phase, in the specific task required at this time (Carrying out a **Webquest** and preparing a classroom poster for a secondary school). The teacher personally deals with any doubts and questions that the different teams or members may have, maintaining constant interaction. At this moment in time, the teacher acts as a guide, moving around the classroom, available to all.
 4. Formative Evaluation Phase. At the end of each content block, we used **Quizalize** quizzes on an individual, non-anonymous basis. Each person answered the quizzes individually and at their own pace, using mobiles, tablets or laptops to do so, as shown in Figure 7. In this case, their results were given a score as part of the final grade.



Figure 7. Students from the master's course, replying to online quizzes with classroom feedback.

2.3 ICT and LKT tools used

In order to conduct this study, we made use of the technological tools shown in table 1, for the learning management and also for information searches, content creation, collaborative work and formative evaluation.

| | NAME | FUNCTION |
|----------------------------|----------------------------------|-------------------------------------------------------------------------|
| Video Editing | Camtasia Studio 8. | Video Editing |
| | Powerpoint | Video recording and presentation |
| Learning Management | Moodle | Management platform at the University |
| | Edmodo | Platform for information sharing between teachers and students |
| Collaborative | Mural.Ly | Creation of collaborative resource murals |
| | Google Drive | Creation of collaborative documents. |
| | Dropbox | Folder to allow students to voluntarily share tasks between each other. |
| | Padlet | Creation of murals with resources between all students. |
| Cognitive | Easel.Ly Picktochart | Preparation of content infographics |
| | Cacoo Spycinodes CmapTools | Preparation of conceptual maps |
| Gamification | Kahoot | Questionnaires and quizzes in the classroom. |
| | Space Race- Socrative | Group questionnaires and quizzes in the classroom. |
| | Quizzalize | Individual knowledge questionnaires in the classroom. |

| | | |
|-------------------------|--------------|-----------------------------------------------------------|
| Communication | Hangout | Sharing initiatives with other students in other schools. |
| Content creation | Google sites | Tool to allow students to prepare a Webquest. |
| | Wix.com | Webquest preparation. |
| | Powtoon | Creation of video content by students. |
| | Slideshare | Creation of documentation or presentation by students. |

Table 1. ICT and LKT tools used

2.4 Learning assessment

The assessment was continuous, formative and summative. Students received constant, extensive feedback on those points that could be improved in each task and also on knowledge acquired. The final grade was obtained through two distinct parts: 50% corresponded to the tasks individually performed and 50% to group work. The weightings are itemised below:

- Video viewing. Individual. (10%)
- Gamified questionnaires in which the correct answers are taken into account. Individual (10%)
- Webquest. Group. (30%)
- Poster Group. (20%)
- Exercise of competences. Individual. (30%)

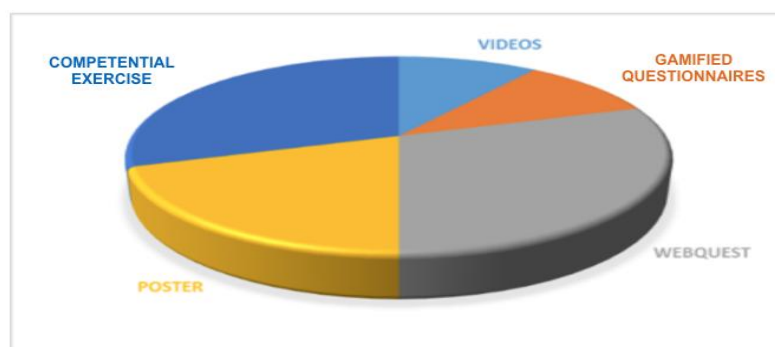


Figure 8. Pie chart showing the distribution of the assessment tasks.

Students were issued with rubrics with indicators and distinct mastery levels, to provide them with information on work performance and assessment and to allow them to take responsibility for their own learning.

For group work, involving the preparation of the Webquest and the poster, the grades were individually awarded to each student through a peer assessment and self-assessment process.

To pass the subject, a student needed to achieve 50%.

3. Results

The grades obtained for each assessment task and for the subject are shown in Figure 6.

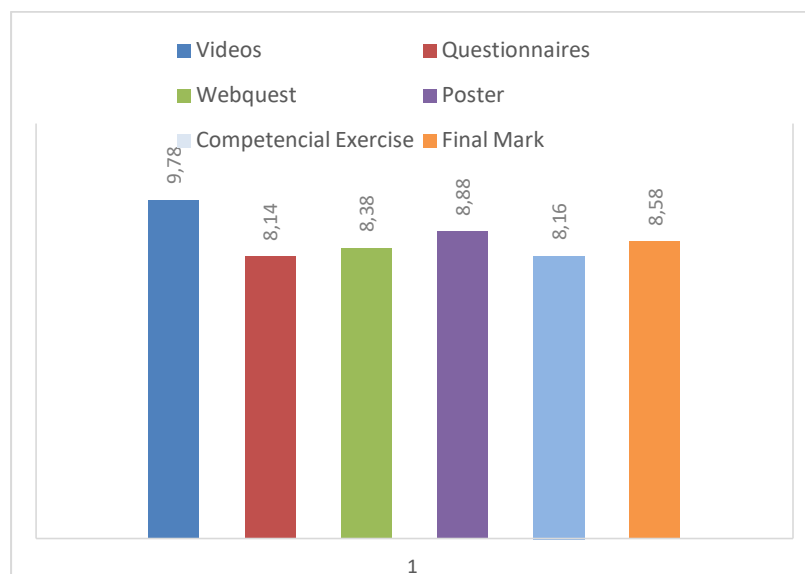


Figure 9. Average grade per task. Scaled to 10.

The descriptive analysis of the learning results and the student grades are shown in table 2.

Table 2. Descriptive analysis Results.

| Statistics | | | | | | | | |
|------------------------------------------------------------------|-------|----------|-----------|----------|-------------------|--------------------|---------------|-------------|
| | | VIDEOS | QUIZALIZE | WEBQUEST | POSTER | EXERCISE COMPETENC | EXAM EXTR AOR | FINAL GRADE |
| Maximum value obtainable | | 1 | 1 | 3 | 2 | 3 | 5 | 10 |
| N | Valid | 61 | 61 | 61 | 61 | 61 | 61 | 61 |
| | Lost | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | | .9784 | .8143 | 2.5154 | 1.7752 | 2.4480 | .0500 | 8.5813 |
| Median | | 1.0000 | .8500 | 2.6400 | 1.8300 | 2.5500 | .0000 | 8.6500 |
| Mode | | 1.00 | .90 | 2.82 | 1.83 ^a | 2.60 | .00 | 8.35 |
| Stand. deviation | | .05598 | .16494 | .48433 | .35645 | .39013 | .39051 | .75138 |
| Minimum | | .75 | .00 | .00 | .00 | 1.30 | .00 | 6.19 |
| Maximum | | 1.00 | 1.10 | 3.00 | 2.25 | 3.13 | 3.05 | 10.0 |
| a. There are a number of modes. The lowest value shall be shown. | | | | | | | | |

The final grades tend to have a normal distribution, as can be seen in the normality test, table 3, and the histogram in Figure 7.

Table 3. Normality test

| Normality tests | | | | | | | |
|--------------------------------------------------|------------|---------------------------------|----|-------|--------------|----|------|
| | Cours e | Kolmogorov-Smirnov ^b | | | Shapiro-Wilk | | |
| | | Statistics | gl | Sig. | Statistics | gl | Sig. |
| FINAL GRADE | 1516 | .072 | 61 | .200* | .976 | 61 | .276 |
| *. This is the lower bound of true significance. | | | | | | | |
| b. Lilliefors significance correction | | | | | | | |

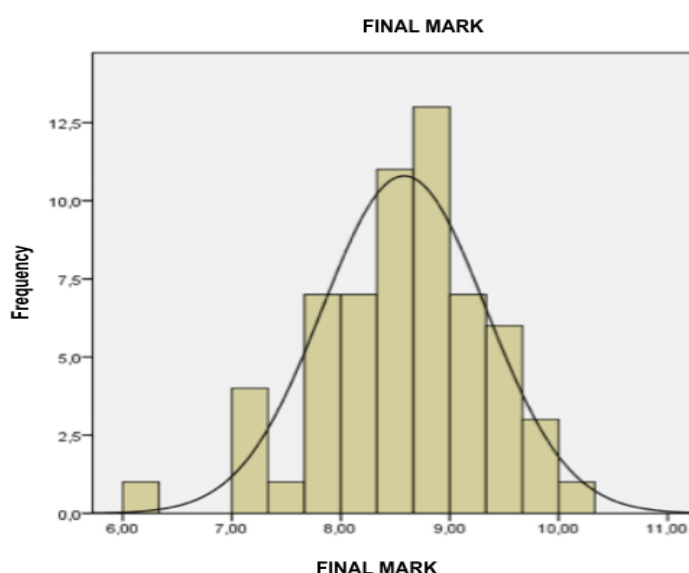


Figure 10. Histogram and normal curve for the final grades.

To get the students' opinion on the methodology used for the subject, a questionnaire was prepared with *google drive-form* incorporated in the *Moodle* platform. Participation in the questionnaire was voluntary and anonymous. Students were asked to participate once the term had ended and during the holiday period. 31 students responded (51% of those enrolled).

The questionnaire was based on the model proposed by Thomas Driscoll with a Likert response scale from 1 to 5, where "1 highly disagree" and "5 highly agree". The items are shown in table 4.

| Question | 1 | 2 | 3 | 4 | 5 |
|---------------------------------------------------------------------------------------------------------------|---|---|---|---|---|
| My interactions with the teacher during the class were more frequent. | | | | | |
| My interactions with the teacher during the class were more positive. | | | | | |
| My interactions with my classmates during the class were more positive. | | | | | |
| I have better access to learning materials and content | | | | | |
| I can select the types of material that best suit my learning style | | | | | |
| I have a better opportunity to work at my own pace | | | | | |
| I can see more possibilities of showing the teacher or my classmates what I have learned. | | | | | |
| I have played a more active part in decision making by collaborating with other classmates. | | | | | |
| I have had a greater opportunity to take part in problem solving and to develop my critical thinking ability. | | | | | |
| I consider that the learning is more active and experiential. | | | | | |
| The teacher takes greater account of my strengths, weaknesses and interests. | | | | | |
| More time was required than with traditional methodology | | | | | |
| I liked this methodology better than the "traditional" one | | | | | |
| I have improved my learning process | | | | | |
| My learning achievement has increased | | | | | |

Table 4. Items from the questionnaire on perception.

11. The results of the rating given by the students are shown below in Figure 11.

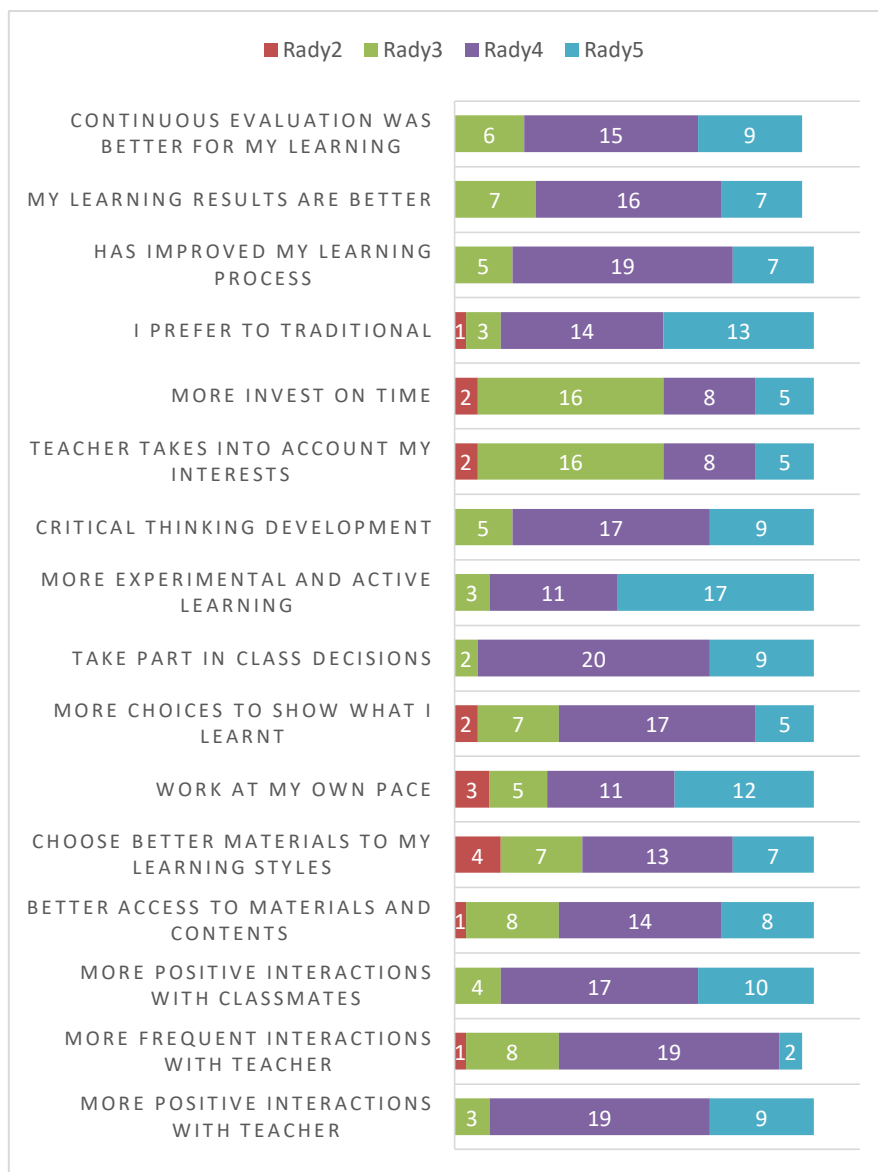


Figure 11. Results of the response obtained from the perception questionnaire, Likert scale.

In addition to the closed-ended questions of the Likert scale, there were 4 open-ended questions:

1. Which teaching characteristics or activities have helped you in your learning?
2. Which didn't help you?
3. Give us your opinion with regard to the exercise of competencies
4. What improvements would you introduce?

The results of which are shown below. With regard to the teaching actions, activities or characteristics that most aided student learning, the following were ranked in order of frequency cited, and more than once:

- The type of exercise of competency
- The use of active, experiential methodologies in the classroom.
- To experience deeper learning
- Significant activities
- Collaborative work in the classroom.

All these factors are shown in the coding diagram in Figure 12.

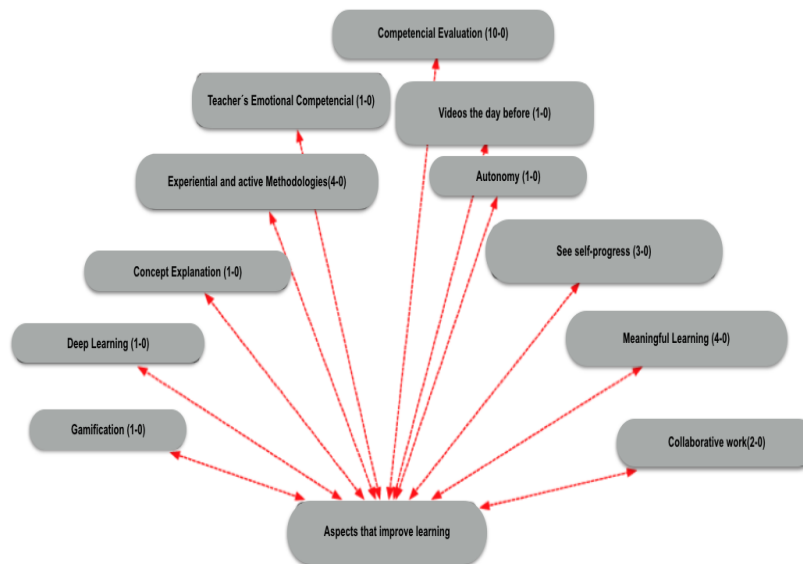


Figure 12. Diagram of factors that benefit learning, according to frequency cited.

All these aspects are supported by the following quotes, obtained from the open-ended responses:

"The flipped classroom seems to me to be a really interesting initiative that has allowed me to improve my learning"

"I've noted that the activities are easily transferable to real-life situations, conducting discussions and initiatives that can be found in daily life and I think that this is also an essential part of learning".

"I think group work is very important and helps in our development and to learn as a whole".

"The type of individual exercise"

"The practical activities related to the videos"

"Go over in the class, the key points seen in the videos"

"I think group work is very important and helps us to develop and to learn as a whole".

"The teacher's close rapport and friendliness (encouraged us to take part in the discussion)"

"By looking at the theory by myself with the videos and then doing Kahoot and tests in class, I've been able to see what I've actually learned and what I still need to go over".

There are basically two aspects that have not been of benefit to their learning:

- Collaborative work is not always beneficial.
- They are not accustomed to teamwork in the classroom.

This is shown in the diagram in Figure 13

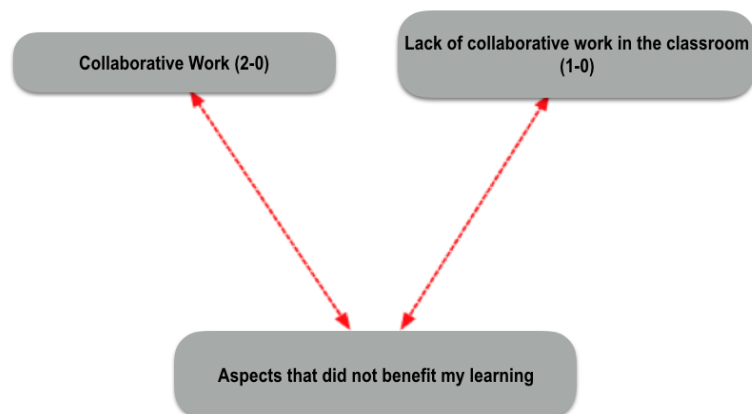


Figure 13. Diagram of the factors that have not had a beneficial impact on learning.

The students gave the following arguments:

"Sometimes, in the group work in class (with the Webquest) we weren't very efficient when left to our own devices. I think that the problem here lies in ourselves, as we're not used to it and we're too laid back, we don't consider it to be a very productive hour"

"If you're unlucky enough to be in a group that doesn't collaborate much, then you either become demotivated or work three times harder than you should".

Finally, the students were asked to give suggestions for improvement. These suggestions are shown in figure 11. The following are ranked by order of frequency, from the most to the least cited, and always more than twice:

- Do something similar to a one-minute paper after watching the video and take it to class the next day.
- The task assessment rubrics should consider the process and not just the result.
- Collaborative work should only be performed for some tasks, not all of them.

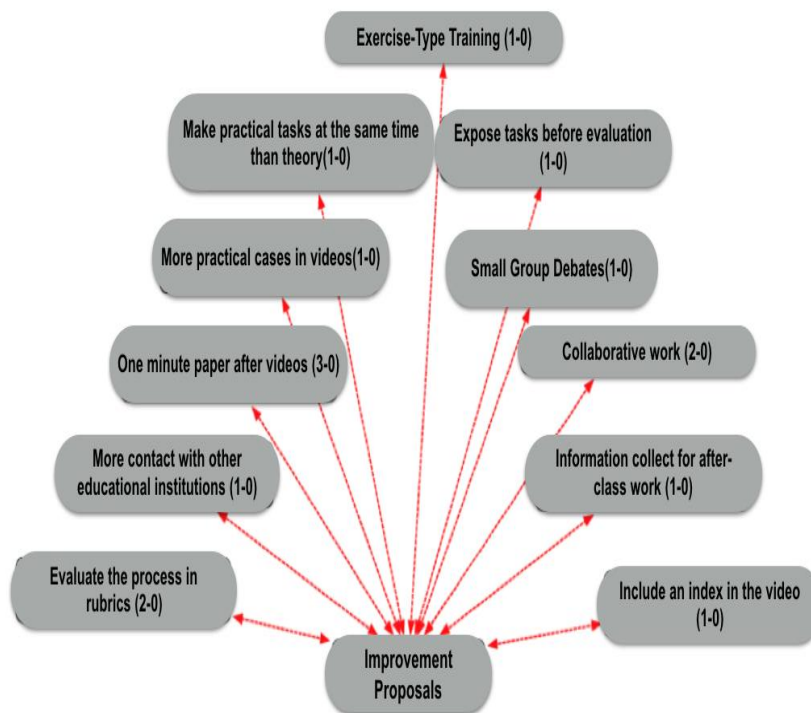


Figure 14. Coding diagram linked to the suggestions for improvement.

The students' responses are detailed below:

As the group was large and the levels were very different, I occasionally became distracted and stopped paying attention. For this reason, I think that the initiative to work in small groups for certain topics and then have a general discussion is better than directly having a general discussion in which the same people usually do all the talking.

Correction with rubrics doesn't make sense if the rest of the written work is not taken into account. One of two things can happen, either the rubric covers everything or else, when using the rubric to correct the work, a lot of content will be lost and you may end up assessing things that are not so important.

Having the opportunity to present some work, such as the Webquest or the teaching guide, before correction.

It would be of interest to start the practical work before or else to ensure that this subject and the rest of the generic module were done at the same time as the practical work, in order to apply what we have learned and to use the practicum as a learning guide.

I would suggest the One-Minute Paper be used as a way to control class attendance. Writing always encourages reflection and, in this way, people could bring in their notes to comment on the topic to be developed in the next subject.

Improve the pace of the videos and with an index because, at times, it's difficult to find specific points in the video in order to go over concepts.

I think that videos with examples or anecdotes could enliven the flipped model. For my liking, another less authoritative approach is still missing.

I would add, going over the theory of the videos in class. Because, although it's true that, at the start of the class, the teachers asked us whether or not we had any queries or doubts, many of us had in fact watched the videos a number of days beforehand and we'd either forgotten what questions we needed to ask, or we weren't easy about asking just like that. I think that a quick recap would open the way and would allow us to bring to mind any queries we had, so as to improve our learning.

4. Discussion

The Flipped Learning model and the use of digital technologies in the teaching-learning process is still considered to be a somewhat groundbreaking way of stimulating learning. Although, in principle, students may feel that the pace is very different to the one that they are accustomed to, the large majority of students generally prefer this methodology to the traditional one. Students discover an active, significant and deeper learning system, leading them to take decisions, to greater collaboration with their classmates and to a more positive interaction with the teacher, compared to other teaching models. Students indicate that this model improves their learning processes, adapts to their pace, allows them to select their materials and to check their progress, leading to increased performance. However, there may be no significant differences between the grades achieved in this subject and other subjects taught in the traditional style.

As has been observed in other research studies, the Flipped model requires clear instructions at the beginning, as well as a self-reliant attitude and the ability to put back any doubts and queries until class time; students are not generally accustomed to situations of this type. However, in-class activities then become significant and operative. Whenever we have asked students as to the amount of time dedicated to this subject compared to other subjects taught with other teaching models, the general opinion is that they didn't need more time and, at least, the same amount of time. Another aspect that is generally much appreciated is the in-class collaborative work although, on occasions, students request that the assessments should not always be based on team work. Finally, the digital tools have not only facilitated the learning process of our students, but have also indirectly allowed them to be trained in digital competencies. This is something that is highly valued, as it generally makes learning enjoyable, offers creative possibilities and, through the use of gamified questionnaires, students can assess their own progress throughout the course.

In short, a study that was highly valued by students and which has offered some extremely positive results for the students and team of teachers alike. The suggestions for improvement have been taken on board for inclusion in the next study.

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Appendix

- CG2 Plan, develop and evaluate the teaching and learning process by enhancing educational processes that facilitate the acquisition of the respective competences of the respective teachings, taking into account the level and previous formation of the students like that Such as their orientation, both individually and in collaboration with other teachers and center professionals
- CG5. Design and develop learning spaces with special attention to equity, emotional and values education, the Equal rights and opportunities between men and women, citizens' training and respect for human rights. Human relations that facilitate life in society, decision-making and the construction of a sustainable future.
- CG6. Acquire strategies to stimulate the student's effort and promote their ability to learn for themselves and with Others, and develop thinking and decision skills that facilitate autonomy, confidence and initiative Personal information.
- CG7. To know the processes of interaction and communication in the classroom, to master the skills and social skills necessary to Promote learning and coexistence in the classroom, and address issues of discipline and conflict resolution.

- EC1. To know the characteristics of the students, their social contexts and motivations.
- EC2. Understand the development of the personality of these students and possible dysfunctions that affect learning.
- CE3. Develop proposals based on the acquisition of knowledge, skills and intellectual and emotional skills.
- CE4. Identify and plan the resolution of educational situations that affect students with different abilities and Different rhythms of learning.
- EC5. To know the processes of interaction and communication in the classroom and in the center, to address and solve possible problems.
- CE21. Encourage a climate that facilitates learning and values the contributions of the students.
- CT2. Acquire skills and skills for team leadership.
- CT3. Develop creativity.
- RA1. Understand the main theoretical perspectives in learning psychology.
- RA2. Know the individual differences in the learning process and the main problems related to it.
- RA3. Acquire tools to design educational proposals that facilitate learning and development in the context of secondary education.
- RA4. Know and understand the main characteristics and changes typical of adolescence.
- RA5. Develop strategies that allow students to help their social development and to deal with crises characteristic of this evolutionary stage.
- RA6. To promote socio-emotional competences in the classroom.

***Déborah Martín Rodríguez** works on Faculty of Education on Complutense University of Madrid in Spain.*

***Raúl Santiago Campión** works on Faculty of Education on University of La Rioja in Spain.*

Déborah Martín Rodríguez
Faculty of Education
Universidad Complutense de Madrid
Edificio La Almudena
Rector Royo Villanova s/n
Ciudad Universitaria
28040 -
Madrid, Spain
E – mail: info@pedagogiaparaexitos.com

Raúl Santiago Campión
Faculty of Education
Universidad de La Rioja
Edificio Vives c/Luis de Ulloa s/n-26004 Logroño. La Rioja, Spain
E – mail: raul.santiago@unirioja.es