

The Inverted Classroom in the Development of Student Competences: A Systematic Review

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Abstract

In recent years in the education sector there have been changes that have resulted from experiences aimed at improving the learning experience of students with the sole purpose of ensuring their learning and the development of their competences. Among them is the insertion of the inverted classroom methodology as an important action to achieve this; therefore, our objective is to identify which competences are developed by this methodology; to achieve this, a systematic review of 36 scientific articles from 2013 to 2022 in scientific journals of impact related to the inverted classroom and development of competences has been carried out. The results show that the use of the Flipped Classroom develops general competences, in particular, autonomous learning, communication and digital skills.

Keywords

Flipped Classroom 1, *competencies* 2, *learning* 3

1 Introduction

The flipped classroom is a teaching method that seeks to change the paradigms of traditional education to adapt them to the challenges posed by the technological era of the 21st century. This methodology has gained great relevance in recent years, especially in the wake of the COVID-19 pandemic, as indicated by [1]. This type of method aims for the student to learn by doing and not simply by memorizing lessons. It is a method that proposes that students study the lessons outside of class, that is, they access the content from their homes so that, in class, they have more time to develop the activities in a collaborative way, interacting with their classmates. This dynamic allowed many students to continue with their classes in higher education institutions, as educators identified that it was one of the student-centred alternatives [2], as the mode of teaching was forced to change from face-to-face to fully online due to the pandemic that both teachers and students had to adapt to digital teaching and learning environments. [3].

Therefore, it is necessary to identify the general aspects that this active methodology called flipped classroom or Flipped Classroom according to [4]. which implies knowing a pedagogical approach in instruction, since teaching moves from a collective environment to an individual space and in a second moment it is transformed into an interactive learning environment in which

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the teacher is the guide of the learners. In other words, it contemplates two phases or dimensions: pre-class activities, i.e. before class and outside class, and in-class activities. However, there is no clear consensus among the authors as to whether a particular medium must be used in the out-of-class learning phase to be defined as inverted classroom. [5].

This methodology is characterized by a new way of learning, in which the student obtains knowledge outside the classroom using digital resources. [6] that allow create unique opportunities for teachers to motivate students, improve the quality of teaching and engage them in the learning process [7]. For example, students review material before coming to class such as videos or other multimedia content at their own pace and if they need more time to understand and learn the theory, they can spend more time viewing them.

All these activities both before and after class allow the development of competences such as collaborative work, motivation, self-regulation and autonomy in their learning processes. In his work, [8] found that most of the research concluded that the implementation of the flipped classroom improves student learning, strengthens autonomy, provides confidence and motivation, encourages collaborative work, reduces anxiety and increases academic performance. This is complemented by the results of [9] who found that there was an improvement in self-regulated learning, and consequently, in the academic performance of students; even [10] mentions that autonomous learning is a satisfactorily achieved competence, as well as conflict resolution, effective communication and digital competences.

From the above, it is analyzed that the student develops some competences with the application of the flipped classroom. Therefore, it is necessary to systematize evidence of the transversal competences developed with the application of the active methodology known as Flipped Classroom and the implications that these competences have on their learning in the different areas of knowledge.

In order to answer this objective, the following research questions have been posed:

What competences does the application of the flipped classroom develop in students?

What is the educational level that most applies this method?

Is the flipped classroom methodology always associated with digital tools for its application?

2 Methodology

In order to answer the research questions and the objective, a systematic literature review has been carried out which, according to Grant and Booth, describes published materials that provide an examination of recently published scientific output, and which involve some process of inclusion or exclusion. Therefore, to ensure accuracy and meet quality requirements, a series of standardized stages have been established in the process of conducting a systematic review through the PRISMA methodology. These steps include defining concepts, identifying the need for the review, formulating research questions, determining the search equation and data sources, elaborating the process, establishing inclusion and exclusion criteria, creating a flow chart, and organizing the results.

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2.1 Procedure

The digital databases Scopus, Eric and Ebsco Host were searched to ensure that the search for indexed articles was of relevance and quality.

First, we searched the databases using the words:

Flipped Classroom, flipped learning, skills development, students.

These words when joined with the Boolean operators formed the equation in each database as shown in Table 1.

Table 1
Search equation

Database	Keywords
Scopus	flipped classroom OR flipped learning AND skills development AND students
Eric	flipped classroom OR flipped learning AND skills development AND students
Ebsco Host	flipped classroom OR flipped learning AND skills development AND students

Own elaboration

Inclusion and exclusion criteria were also applied, as shown in Table 2.:

Table 2
Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
- Articles related to flipped classroom and competence development.	- Non-empirical research
- Publications from 2013 to 2022	- Duplicated articles
- Location Europe - America	- Articles that do not address the topic of flipped classroom related to student competence development
- Language English - Spanish	
- Open access articles	

Own elaboration

Distribution of data by database

The first one refers to the Scopus database as shown in Table 3.

Table 3
Scopus database

Search equation: flipped classroom or flipped learning and competence development and learners				
Step 1	Step 2	Step 3	Step 4	Paso 5
	2013 – 2022	Idioma	Public access	By topic
	Continents	Spanish - English	Complete text	

323	104	104	18	10
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Own elaboration

The first relates to the Eric database as shown in Table 4.

Table 4
Eric database

Step 1	Step 3	Step 2	Step 4	Step 5
	2013 - 2022	Peer- reviewed - Full text available	Continents	By topic
74294	7507	9595	21	13

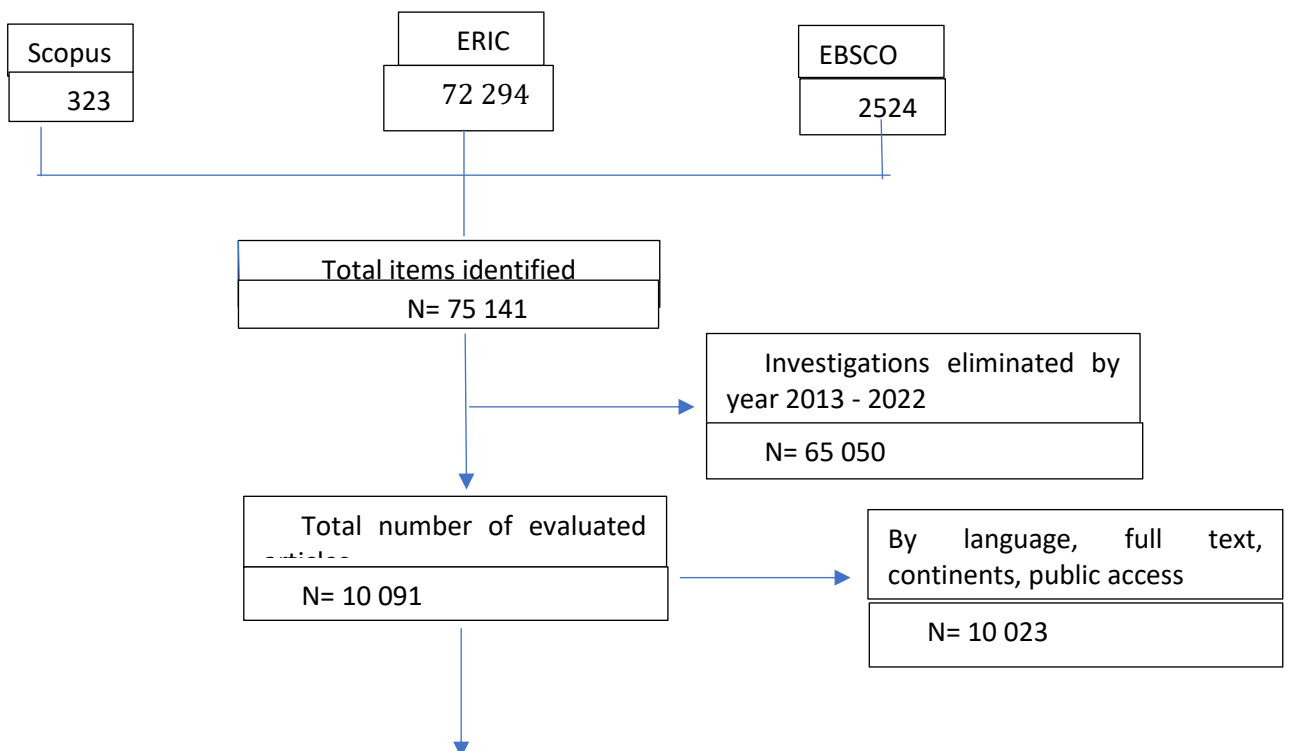
Own elaboration

The first refers to the Ebsco Host database as shown in Table 5..

Table 5
Ebsco Host database

Search equation: flipped classroom or flipped learning and skills development and students						
Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7
	2013 - 2022	Full text	Academic publications	English Spanish		By theme and public access
2524	2480	927	608	590	29	13

Own Elaboration



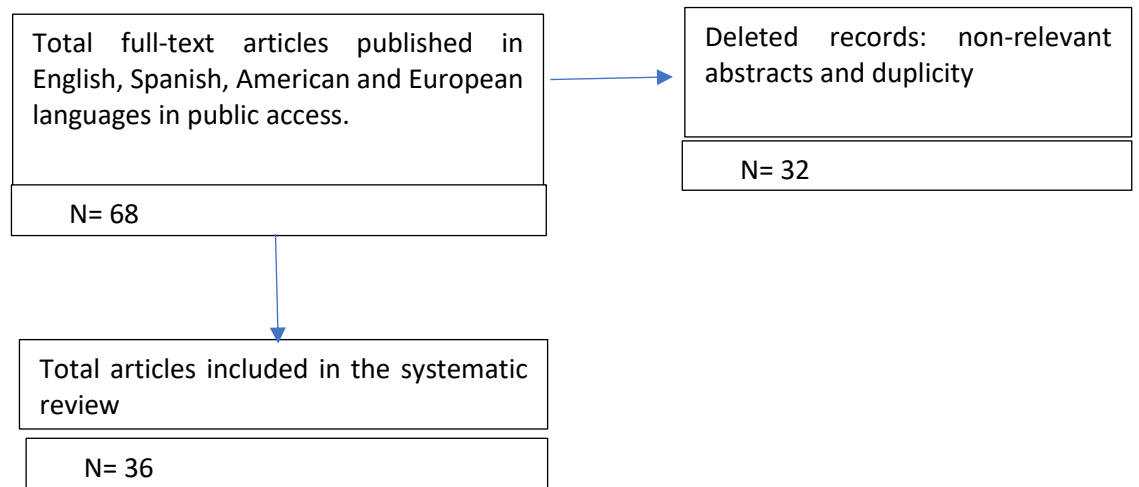


Figure 1: Inclusion and exclusion prism flowchart

3 Results and discussion

The present research reviewed 36 research articles on the flipped classroom and its relationship to competence development as shown in Figure 1:

The flipped classroom and the development of student competences

On the first research question: What are the competences developed by the application of the flipped classroom in students?

After analyzing the selected articles, it can be seen that the application of the flipped classroom can generate two types of competences: general (transversal) and specific. Therefore, the findings showed that the most developed general competences were as follows: 11 of the 36 articles analyzed show that the application of the flipped classroom generated the transversal competence called autonomous learning in students in the different degree courses and subjects in which the study was carried out. Meanwhile, 7 studies state that the implementation of the flipped classroom develops motivation, reflected in the students' greater commitment to the subject and, therefore, in the improvement of academic performance. In addition, 6 studies note that communicative competences are developed by participating in collaborative work in the classroom. Problem-solving and critical thinking skills are also evidenced to a lesser extent. On the other hand, 4 of the total number of articles studied indicate that specific competences specific to the degree course in which the research was carried out are also generated. Finally, 12 articles make no reference, as they emphasize the efficacy of the methodology.

Educational level at which the flipped classroom was applied

Concerning the level of education at which the flipped classroom was applied, of the 36 publications chosen, the findings were as follows: 33 researches were carried out at the Higher University Level which represents 92% of the research works analyzed. Two were carried out at the secondary level, representing 6% of the total, and one at the primary level, representing 2%.



Figure 2: Educational level at which the flipped classroom was applied

Digital tools applied in the implementation of the virtual classroom

The implementation of the flipped classroom is associated with the application of technological tools according to the systematic review that has been carried out. In the publications analyzed, it is evident that digital tools are necessary resources for the application of the flipped classroom. Thus, in several articles, mention is made of the digital competence that the teacher must develop in order to use this active methodology. It is important to highlight the commitment that the teacher must develop for the preparation and delivery of the material before class using the most appropriate and easily accessible technological tool for the student.

However, there are other resources such as Zeetings and Kahoot mentioned in the article by [11] on the use of digital platforms (virtual classroom), as well as in the article by [12], [13] that indicate that technology is part of this methodology, because the use of tools such as Power Points, YouTube is evident, although Wikis and Kahoot are especially highlighted as mentioned by [14]; that is to say, the insertion of ICT in the construction of experiences for students in a session is fundamental for its development. In addition, it is important to mention as another finding that, of the 36 articles analyzed, there is one that argues that technological tools are not a basic element to achieve learning, as there are other ways and channels to provide material to students before classes, but if it is not possible to stop implementing them.

After carrying out the systematic review and according to the results obtained, it is evident that the use of the flipped classroom promotes general or transversal and specific competences. Among the most outstanding general competences is the autonomous learning of students, as indicated by [15] in his research, as the implementation of the flipped classroom facilitates the development of independent learning; this is complemented by [16] when he mentions that it is considered a key competence developed with this model, because the student assumes responsibility for their learning process; another of the competences identified was collaborative work, which is achieved through work in groups that at the same time allows students to develop communicative skills and take advantage of the experiences and knowledge of others. Likewise, it confirms what was stated by [17] that with the application of the inverted classroom, text comprehension is improved, that is to say, that the development of reading comprehension is linked to the adequate planning of materials and the use of emerging technological tools.

Regarding the level of study at which the inverted classroom was applied, it is worth mentioning that 92% of the research was carried out at the higher university level as shown in Figure 2, which leads me to reflect on the scarce research being carried out in Regular Basic Education at all levels and in all areas [18] and [19]. It is important to carry out studies on the impact that the application of the flipped classroom can have on students at the basic level of education, since at this level the aim is to develop transversal competences, such as the digital

competences that are developed in virtual environments generated by ICT, as well as the development of autonomous learning at all levels and in all modalities [20]. Therefore, the use of this active methodology would be fundamental for the development of these competences.

It was also found that most research concludes that the implementation of the flipped classroom must be supported by technological tools in order to have a positive impact [21]. However, while it is true that the insertion of computer tools improves academic performance, it is sometimes complicated both for the teacher, who must have digital skills to use these tools efficiently, and for students whose families do not have the financial resources to buy a computer or cannot afford to pay for internet service [22] and [23].

On the other hand, the use of new technologies in the flipped classroom allows the student to be the centre of the learning process, facilitates collaborative work, active and meaningful learning. As a consequence, one of the benefits of the flipped classroom is that it develops technological competence [24]. It is important to mention that the main challenge today is the correct integration and use of technological tools and the design of materials [25]. It is also a challenge for institutions to provide the right technological infrastructure to obtain positive results in the application of the flipped classroom.

4 Conclusions

It is concluded that the research articles analyzed have focused more on identifying the general competences achieved through the application of the flipped classroom, as only two studies refer to the achievement of specific competences according to the subject and degree course in which the active methodology was applied. Therefore, on the basis of this systematic review, it is recommended that future research be carried out to identify which specific competences could be achieved through the application of the flipped classroom.

Finally, this study contributes to and is the basis for future lines of research, such as: investigating what characteristics the materials should have in terms of design, length, types, etc., and what would be the most appropriate technological tools to serve as a fundamental support for the flipped classroom. Likewise, research on the application of the flipped classroom and its impact on Regular Basic Education.

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