

# Flipped Classroom: A Systematic Review Of Literature

## Sala de Aula Invertida: Uma revisão sistemática da literatura

FEITOSA , Raphael A. 1; SILVA , Anne Karoline C. 2; MOTA , Erika F. 3; TEIXEIRA , Claudio S. 4; CERQUEIRA , Gilberto S. 5 & CACAU , Joquebede B. 6

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#### ABSTRACT:

Flipped Classroom is a teaching methodology in which students receive the lesson's content before class. In the classroom, teacher organizes individual or group activities. The aim of this text is to analyze, from a literature review in 2018, what has been studied about this model. Results point to sixteen articles that indicate that Flipped Classroom develops an active posture in the students. Difficulties of using this methodology are barriers with technological tools and with divergent conceptions around the theme.

**Keywords:** Flipped Classroom; Active Learning; Educational Technology.

#### RESUMO:

Aula invertida é uma metodologia de ensino em que os alunos estudam conteúdo das lições antes da aula. Em sala, o professor realiza atividades individuais ou grupais. O objetivo deste texto é analisar, com revisão literária feita em 2018, o que tem sido estudado sobre isso. Encontraram-se dezesseis artigos que indicam que a aula invertida desenvolve uma postura ativa nos alunos. Barreiras com o uso de ferramentas tecnológicas e as divergentes concepções sobre o tema dificultam o uso do método.

**Palavras chave:** Aula Invertida; Aprendizagem Ativa; Tecnologia Educacional

## 1. Introduction

Coming from a changing society, with a significant increase in the reach of the new.

Information and Communication Technologies, widely known and used for the production and dissemination of knowledge, they need to be debated and adapted in the various school contexts, with immediate, technological and connected characteristics, whose experiences are to address the use of different teaching and learning methodologies, as well as the technologies that support them, focused on the Flipped Classroom methodology.

The classroom inversion basically consists of doing in the classroom, doing at home, for example, activities related to the transmission of knowledge and, in class, the activities designated to be carried out at home, responsible for the assimilation of knowledge, how to solve problems and perform group work. The active methodology in which this work will be

based is the approach of Flipped Classroom (Bergmann; Sams, 2012, 2015, 2016), in which it is sought to change the logic of teaching organization, since its premise is that the student has access previously to the content that will be taught in class, emphasizing the use of technology to improve learning.

This systematized bibliographic research, an initial review of the specialized literature, brings the discussion and reflection of the reading of articles and books related to active teaching methodologies, inverted classroom and Information and Communication Technology. Thus, the aim of the present article is to analyze, from a literature review of the systematic type, in different databases, what has been studied about the inverted classroom. We chose as a method the systematic review, since it allowed us the process of meeting, critical and synthetic evaluation of the results of different studies (Clarke; Chalmers, 2018; Clarke, 2011).

With the significant increase in the reach of Information and Communication Technologies in society, we notice great and rapid changes in the way humans relate and communicate. Given this technological panorama and the fact that we are dealing with a different way of receiving information and communicating, it is necessary, at this point in our study, to understand how technologies are being incorporated into educational space, seeking to verify if their use if it is done in a satisfactory way for the students and that favors the teaching and learning process and thus can provide a critical thinking, aimed at a collaborative construction of knowledge, in order to make it meaningful.

For Mattar (2018), technologies are as old as the human species. The whole evolution of man is marked by technological elements created for the very survival of the species. Technologies have always been used in education. Today we have different technologies inserted in schools, among them ICT, widely known and used for the production and dissemination of knowledge. However, they need to be discussed and appropriated by the various school contexts, since they can help as facilitating tools to develop methodologies that are student-centered.

Mattar (2018) points out the articulation between education, power and technologies, highlighting the school as a training space for all in search of mastery of knowledge and better quality of life. In this way, methodologies that allow more active participation of the student, has been studied and implemented, in order to incorporate schooling, in a new technological context. Thus, when studying, in the school context, the use of methodologies that take account of actively integrating the student in the teaching and learning process, we come across the active methodologies.

Starting from the classic understanding brought by Mattar (2018) technology can be understood as the result of the fusion between science and technique. For this reason, it has been that the concept of technology thought in education can be explained from procedures, also called techniques that would have as fundamental importance to be facilitators of the process of teaching and learning through the use of different tools or, also called resources or instruments in order to allow transformations in education.

Among the possibilities that technology-supported education has brought to the field of education, Flipped Classroom stands out. For years the way of teaching is based on a model centered on the memory and faithful reproduction of what is taught, in which the student assumes a passive character, being the teacher the protagonist of the action. The active methodology, which will guide this research, is the inverted classroom approach (SAI), which seeks to change the logic of teaching organization, because its premise is that the student has prior access to the content that will be delivered in class, emphasizing the use of technologies for learning enhancement.

The active methodologies seek to value the student, who is seen as a responsible part of the teaching-learning process; becomes the protagonist and may be able to make decisions. It is understood that by interacting actively with the teaching and learning process, it tends to create opportunities for the construction of knowledge. In this way, the technologies are allied and can play an important role, allowing a greater significance of the content learned by the student.

In the history of education, educational methodologies were conceived in a variety of ways, seeking to meet educational needs and to better serve the school universe. In 2007, Bergmann and Sams (2016), then high school teachers in the United States, had constant frustration about the inability of their students to translate the content of their classes into useful knowledge that would allow them to do their homework. Because of this, Bergman and Sams decided to record their classes so that their students could attend them at home, so that they could use the time in the room, for discussions and verification of concepts not understood.

They emphasize as a differential the use of web technologies and digital media, which "increase the potential of this model exponentially. With the classroom reversed, students are exposed to concepts outside the classroom, usually by watching and analyzing videos. Classroom time is then used to do the difficult job of assimilating these new knowledge, through strategies such as problem solving, discussion or debate, and is fully dedicated to active learning experiences. Thus, through the use of technologies in the sharing of doubts and curiosities, the organization of the classroom changes, passing the learners to the central position, previously occupied by the teacher, promoting a greater dynamics in the classroom.

Basically, the classroom inversion consists of allowing the student to have contact with the content before the lesson, either through videos or other media. In face-to-face classes, time is used to deepen the content, through exercises and collaborative activities (Bergmann; Sams, 2012, 2015, 2016). Therefore, the focus of the lecture is taken away, in which the premise is that the teacher be the holder of the knowledge to be transmitted to the student.

In this way, we agree with Bergmann and Sams (2016), when they make us understand that with the previous access of the content, the information of a lesson, the teacher could organize his class in order to meet a more directed demand on the content. Instead of a lecture only, in which it is suggested that the teacher be the holder of the information and that will transmit the knowledge to the student (Bergmann; Sams, 2012, 2015, 2016) using low cost financial tools.

The central idea of the flipped classroom arose when its proponents were facing constant frustration over the inability of their students to translate the content of their classes into useful knowledge that would at least allow them to do their homework. In 2007, Bergmann and Sams (2015, 2016), then high school teachers in the United States, decided to record their classes so that they could attend them at home and then use classroom time for discussion and verification of concepts not understood. After a year using this method, the authors noticed a great difference in the learning level of their students.

There are numerous benefits provided by the SAI, but it is necessary to indicate the existence of challenges. One of them is the need for great involvement and time for educators to get acquainted with current technologies and familiarize themselves with software they will use, such as video production, for example; besides requiring more time in the preparation of the classroom / material used (Bergmann; Sams, 2015).

As Mattar (2018) reflects on the methodologies needed for our century, it is necessary that students also leave the passive posture to be able to cultivate a more active attitude towards the academic world. Having said that, we understand the need for an investigation that deepens our understanding of the inverted classroom methodology. In this way, we believe that in proposing this research we will try to help in the reflection and critique of active methodologies that are being applied in schools and that are worthy of analysis.

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## **2. Methodology**

Following the description of the Inverted Classroom (SAI) seen in the previous section of this article, we seek in the following investigation to analyze the literature that has been published in the area and its coalitions with education and education. Now we will reflect on the most recent literature on the "flipped classroom" or "inverted classroom model". To achieve this goal, we ventured through the harvest of the publications of the year 2018,

period and great profusion of research and experience reports on the inverted classroom. From the methodological point of view, we proceed through a literature review of the systematic type Clarke & Chalmers (2018). The purpose of a systematic review is to deliver a meticulous summary of all available primary research in response to a research question. A systematic review uses all the existing research and "[...] they are often required by research founders to establish the state of existing knowledge and are frequently used in guideline development". (Clarke, 2011, 64).

These reviews are considered retrospective observational studies or experimental studies of retrieval and critical review of the literature. In order to verify the content of the research already done, the abstracts of the papers were read. Based on this, the most relevant researches were selected and could dialogue with the theme of this research.

A methodological process was chosen to collect and interpret the data used in the instruments and modalities that contribute to the qualitative approach (Denzin, Lincoln, 2000). Therefore, one of the methods was the systematic review that pointed us to the relevance of our study object and authors that base our data analysis, therefore we will bring the interpretative analysis, based on the authors of the theoretical contribution built.

Following the methodological indication of the Cornell University Library (2018), we used the following methodological approach during the systematic review: (1) Identify the research question; (2) Define inclusion and exclusion criteria; (3) Search for studies; (4) Select studies for inclusion based on pre-defined criteria; (5) Extract data from included studies; (6) Evaluate the risk of bias of included studies; and (7) Present results and assess the quality of evidence.

In this way, we investigated two Brazilian portals: Scielo (Scientific Electronic Library Online) (<http://www.scielo.org/php/index.php>) and Capes Periodicals (<https://www.periodicos.capes.gov.br/>). The reason for this choice is due to the fact that both portals are widely used in public universities, with easy access to a large number of scientific journals. Periódicos Capes is a virtual library that gathers and makes available to educational and research institutions in Brazil a collection of more than 45 thousand titles of periods with full text in 130 reference bases. In turn, Scielo is a virtual library of free access with more than 950 periodicals and close to 500 thousand articles available.

The search terms used for the research were flipped classroom and inverted classroom model. Considering that the research proposed here follows the specific period of publications dating from 2018, we used as inclusion / exclusion criteria those scientific articles published exclusively in the year 2018. The second (and last) inclusion / exclusion criterion that was used in the research was the presence of search terms in the title of the work.

### 3. Results

In all, 16 (sixteen) works were listed, as shown in Table 1, below.

**Table 1**  
Analysis of the works obtained through the systematic review

<b>AUTHORS</b>	<b>TITLE</b>	<b>SCOPE</b>	<b>LOCAL</b>
ADAM & CĂLINICI	Alternative teaching and study methods: our flipped-classroom experience.	Medical education	Romania
BÄCKLUND & HUGO	The paradox of the Flipped Classroom: one method, many intentions.	Education	Swedwen
BASHIR et al.	Emergency medicine residents'	Medical education	Qatar

	acquisition of point-of-care ultrasound knowledge and their satisfaction with the flipped classroom andragogy.		
CHELLAPAN et al.	Flip or Not to Flip, That's the Question: findings from an exploratory study into factors that may influence tertiary teachers to consider a flipped classroom model.	Education	New Zealand
FARRAH & QAWASMEH	English Students' Attitudes Towards Using Flipped Classrooms in Language Learning at Hebron University.	Language	Palestine
HU	A Review of the Flipped Classroom Model.	Education	China
JANTAKOON & PIRIYASURAWONG	Flipped classroom instructional model with mobile learning based on constructivist learning theory to enhance critical thinking (FCMOC MODEL).	Education	Thailand
KOCH et al.	Teaching Technology Usage in the ENT Medical Subdomain via a Flipped Classroom Approach.	Technology education	USA
KAZANIDIS et al.	Can the flipped classroom model improve academic performance and training satisfaction in Higher Education instructional media design courses?	Media design	Greece
KURNAZ & AĞGÜL	Ters Yüz Edilmiş Sınıf Modeline Muhasebe Eğitimi Alan Öğrencilerin Bakış Açıları: Bayburt Üniversitesi ve Kafkas Üniversitesi Örneği [Perspectives of the accounting students on flipped classroom Model: Bayburt University and Kafkas University cases]	Business Administration and Economics	Turkey
MENDES NETO et al.	The Development and Evaluation of a Multi-Agent System for Supporting Flipped Classroom	Technology education	Brazil
MUNIANDY	Effectiveness of Flipped Classroom on Students' Achievement and Attitudes towards English Language in Secondary School.	Language	Malaysia

NUGROHO & INSANA	Flipped classroom, teaching solution for writing class (case study of Indraprasta Pgri University students).	Language	Indonesian
SAĞLAM & ARSLAN	The Effect of Flipped Classroom on the Academic Achievement and Attitude of Higher Education Students.	Language	Turkey
SHARMA	Flipped Classroom: A Constructivist Approach.	Education	India
VALERO et al.	A successful experience with the flipped classroom in the Transport Phenomena course.	Chemical Engineering	Spanish

Notably, the international literature published in the year 2018 carries with it some interesting considerations on the subject here in focus. In South America, specifically in Brazil, we find only the work of Mendes Neto and collaborators (2018). At the international level, there was no predominance of articles published on a specific continent, which shows the wide reach that the inverted classroom model has been gaining globally in recent years.

We found in the bibliographic research a work published in Sweden (BÄCKLUND; HUGO, 2018), one in the USA (Koch et al., 2018), one in China (HU, 2018), one made in Malaysia (Muniandy, New Zealand (Chellapan, 2018), two in Turkey (Kurnaz, Ağgöl, 2018, Sağlam, Arslan, 2018), one in Greece (Kazanidis et al., 2018), one Spanish (VALERO et al., Qatar (BASHIR et al., 2018), one from Romania (ADAM; CĂCLINICI, 2018, 249), one Indonesian (Nugroho, Insana, 2018), one from the State of Palestine (FARRAH; Qawasmeh, 2018) Thailand (Jantakoon; Piriyasurawong, 2018) and one from India (Sharma, 2018).

### 3.1. Discussion

Analyzing the content of these publications in Table 1, there is a large methodological predominance of quantitative analyzes, and the research strategy with pre- and post-tests is the most recurrent (Mendes Neto et al., 2018; Muniandy, 2018; Kurnaz, Ağgöl, 2018). This type of method consists in the application of a standard form and / or evaluation process before and after the application of the flipped classroom. Then, a comparison is made between the results, looking for a mathematical correlation that reveals the pattern of change (or permanence) before and after the intervention in the classroom.

Having made these initial considerations regarding the data collected in the bibliographical research, we separated some of these productions and discussed them related to some relevant points of the invested classroom proposal. For the discussion of these, we present the following topics in this text: Considerations about the virtual environment used in flipped; and, an analysis of successful experiences with the inverted classroom.

One of the first concerns that emerge in the literature is the need to have a multiagent technological apparatus to support the inverted classroom according to the needs of its users, in order to correct the inherent problem of the implementation of this learning theory

Considering that it is common to use technological support in the inverted classroom model to provide audio, video and text material for students in advance, some works have shown concern about the quality and possibilities of using these tools (Hu, 2018; Jantakoon, Piriyasurawong, 2018; Koch et al., 2018; Mendes Neto et al., 2018).

MENDES NETO et al. (2018, pp. 1667) express this concern indicating that: "However, when using this methodology, the problem that occurs during its application is the difficulty for the

teacher (facilitator) to follow the whole progress of the activities performed outside the classroom. "

Going into this perception, Hu (2018) also makes this concern clear. For the author, there are "two key elements for the flipped classroom to operate effectively: (i) students are appearing in class as well as engaging actively, and (ii) students are supposed to have prepared the learning materials" (HU, 2018, p.3688). For this to occur, it is necessary for the educator to use support mechanisms, with support in the digital / virtual world.

Mendes Neto et al. (2018) researched the inverted classroom in Brazilian universities, and highlighted as an alternative the "MOODLE" platform, which served as support for the monitoring of educational actions that occur outside the classroom. In this environment, it was possible to group from the videos about the subjects used in the room, to the follow-up of the students after the class, with chats, discussion forum and diagnostic tests.

To overcome the difficulty of the virtual environment that potentiates SAI in the medical field, Koch et al. (2018) used the Mediathread platform (<http://mediathread.columbia.edu/>). In it, these authors have created videos and supporting materials to sharpen experts in "[...] In order to train ENT specialists on the new diagnostic aids Rhinodiagnost. Will provide flipped classroom online lessons using the" Mediathread "tool of the Columbia University, as learning environment. "(p.31).

When dealing with this virtual support, one must have some inherent care with the tools that empower these space-time educational coexistence, as highlighted below.

An online platform for flipped classroom learning should support the creation of structured micro learning units, the integration of a wide variety of multimedia content (video, audio, images, texts etc.), the collection and management of external resources, the assignment of tasks, and should include easy-to-use functionalities for online cooperation, communication, discussion and feedback. (Koch et al., p. 32)

In addition to the operational difficulties with the platforms of support to the inverted classroom model, another difficulty raised was indicated by Bäcklund and Hugo (2018). In their work in Sweden, these authors researched the conceptions of teachers who develop pedagogical actions using the inverted classroom method. As a result, the researchers demonstrated that the informants' discourses indicate that there is a diversity of conceptions about who is being "inverted classroom". This, in turn, can generate differences in the methodological, procedural and epistemological approach of teaching work in action.

In the work of Bäcklund and Hugo (2018), all the respondents announced that they used the methodology of the inverted classroom. However, they did so for different purposes and their approach varied widely. Using the same terminology, it may appear that these teachers worked with the inverted classroom in similar ways, but the research results showed that they did not.

In the words of the authors, "Herein lies the problem: Teachers say they flip their classrooms, which they do, but they do not share the same goals or approaches, just the term." (Bäcklund, Hugo, 2018, p. In addition, researchers warn: "All of the informants express that they are flipping their classrooms, because they are all using the method of the Flipped Classroom. However, to the nine informants in this research, they do not share the same goal with the method used ". (Bäcklund; Hugo, 2018, pp. 462).

Bäcklund and Hugo (2018) point out that it is necessary to develop a more solid vision about the concept of SAI, as well as on the ways in which the method is used, its educational objectives and procedural means.

Despite the concerns exposed in the previous paragraphs, this survey of the literature of the year 2018 indicates that pedagogical actions were accomplished that were successful with the use of the flipp method. Moreover, this is what we will address next.

Even considering the concerns exposed above, it was evident in the literature that the researches are unanimous to point out that the updating of the inverted classroom model brings benefits to the field of teaching in the most diverse areas of knowledge. The paragraphs that follow bring some of these points.

The theoretical study developed by Sharma (2018) compiles some experiences with the theme, following a constructivist view of learning. The author suggests in the article that: "The flipped classroom approach is rooted in socio-constructivist theories of education and active learning. Popularized by Piaget and Vygotsky "(p.165). To articulate his constructivist proposition on the inverted classroom model, Sharma (2018) is the Four Pillars of Flipped Education: 1. Flexible environment 2. Learning culture 3. Intentional content 4. Professional educators.

Taking into account research in the systematic literature, the only work that focuses exclusively on teaching in primary schools has been developed by Muniandy (2018). The author reports on the experience with high school classes, with the topic of language and codes, more precisely from studies with English language.

The researcher used a statistical analysis of type t test, in pre-post-administered format to measure the students (Muniandy, 2018). According to what appears in the published material, the results were interesting, and showed a positive correlation after the use of the IAS method. A sample of the sample was conducted, and only "students in the flipped classroom appear to have a better attainment and attitudes on the method of delivery than the traditional classroom". (Muniandy, 2018, p.9).

According to the empirical data collected in the present systematic bibliographical research, the work of Muniandy (2018) appears as a kind of exception to the dominant rule - most of the articles published in the year 2018 focus his efforts in the higher education as exposed Next.

The work of Chellapan et al. (2018) focused on some professors in three institutions of higher education in New Zealand. The researchers investigated the perceptions of educators about the possibility of inserting the inverted classroom model. Going to the admonition made by Bäcklund and Hugo (2018), Chellapan et al. (2018) findings' advised a range or lack of common understanding of what the flipped classroom model earnings.

This may be due to the fact that some respondents saw no value in adopting a flipped classroom nor considered active learning to be the main idea behind the inverted classroom model (and that this was an old idea in a new guise); "[...] and some had or would like to implement the model, but had encountered or were anticipating some challenges in doing so" (Chellapan et al., 2018, p.6).

The research conducted in Turkey by Kurnaz & Ağgül (2018), a questionnaire was applied to students who have studied at Bayburt University and Kafkas University Department of Business Administration and Economics. It is aimed to determine the perspectives of the students regarding whether the flipped classroom model will be used in accounting education. The authors pointed out as main results that students at both universities have tools such as computer, smart phone and internet which are important for the application of the flipped model. In addition, the results of the questionnaire indicate that the on the application of this model in accounting education are positive.

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## **4. Conclusions**

Information and Communication Technologies plays an important role in Flipped Classroom, because with them interactions between teacher, student and information can be facilitated. There is much to be studied about the possibilities of the active classroom methodology inverted in elementary school. The inverted room without asserting itself in educational institutions, especially those at university level, which no longer hold the native technological student, that is, one that is already introduced in a society where digital technology is already part of everyday life and that allows access easy to any content and information.

The Inverted Classroom proposal allows for various forms of learning, always encouraging collaborative work between students and the teacher, in order to make the classroom an attractive place. It also allows teachers to give more support to students in their specific difficulties, so it should be studied and its implementation analyzed. It seems to be an active methodology adequate to the current technological panorama. And in this methodology the



knowledge is constructed with active student participation, interfering in the retention of knowledge of its peers.

With a focus on the SAI, the 16 papers were compiled, where Flipped Classroom has contributed to several fields such as: medical education, education, language, technology education, Chemical Engineering, media design, business administration and economics. Where the Flipped model has been gaining space internationally.

The research presented here revolves around publications in journals from various countries. The results show that, on the one hand, it is difficult to guarantee the learning of our students, but on the other hand, if we try in our pedagogical practice to reflect, when using active methodologies, especially the inverted classroom, object of our study, we find potentialities to develop in active classes.

Undoubtedly, it is also necessary to develop further investigations that bring a more critical view on the subject and the development of activities with Flipped Classroom. The studies need to have a greater description of the proposed activities, which was not always clear during the reading of the papers presented in the systematic review.

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1. Department of Biology, Universidade Federal do Ceará, Brazil. <https://orcid.org/0000-0003-3008-3508>. [raphael.feitosa@ufc.br](mailto:raphael.feitosa@ufc.br)

2. Master Student at Postgraduate Program in Teaching Sciences and Mathematics, Instituto Federal de Educação, Ciência e Tecnologia do Ceará, Brazil. <https://orcid.org/0000-0002-2237-2142>. Email: [akarol.cardoso@gmail.com](mailto:akarol.cardoso@gmail.com).

3. Department of Biology, Universidade Federal do Ceará, Brazil. [erika.mota@ufc.br](mailto:erika.mota@ufc.br)

4. Master Student at Postgraduate Program in Morphofunctional Sciences, Department of Morphology, Faculty of Medicine, Federal University of Ceará, Brazil.

5. Postgraduate Program in Morphofunctional Sciences, Department of Morphology, Faculty of Medicine Universidade Federal do Ceará, Brazil. [giufarmacia@hotmail.com](mailto:giufarmacia@hotmail.com)

6. Master Student at Postgraduate Program in Teaching Sciences and Mathematics, Science Department, Universidade Federal do Ceará, Brazil. [joquebedecacau@gmail.com](mailto:joquebedecacau@gmail.com)

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