Systematic review: Impact of the flipped classroom on primary school students' learning

Revisión sistemática: impacto del aula invertida en el aprendizaje de estudiantes de educación primaria

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Abstract

This research seeks to highlight the relevance of the flipped classroom in teaching and learning processes. The study aims to analyze the impact of this methodology on the learning of primary school students. To this end, a systematic review of the literature published during the last four years (2019-2023) was conducted. The methodological process included searching academic databases such as Scopus and Web of Science, using key terms in Spanish and English related to the impact of the flipped classroom. After applying rigorous selection criteria, 84 articles were initially identified, which were subjected to an exhaustive review. Ultimately, only 12 met the requirements established for inclusion in the analysis. The findings show that the flipped classroom has been implemented in primary education with the purpose of optimizing learning in various areas of knowledge. This allows us to conclude that this methodology has been consolidated as an effective strategy at this educational level, demonstrating a positive impact on multiple dimensions of the educational process.

Keywords: flipped classroom, primary school, learning, strategy.

Resumen

La presente investigación busca destacar la relevancia del aula invertida en los procesos de enseñanza y aprendizaje. En este sentido, el estudio tiene como finalidad analizar el impacto de dicha metodología en el aprendizaje de estudiantes de educación primaria. Para ello, se llevó a cabo una revisión sistemática de la literatura publicada durante los últimos cuatro años (2019-2023). El proceso metodológico incluyó la búsqueda de información en bases de datos académicas como Scopus y Web of Science, utilizando términos clave en español e inglés relacionados con el impacto del aula invertida. Tras aplicar criterios de selección rigurosos, se identificaron inicialmente 84 artículos, los cuales fueron sometidos a una revisión exhaustiva. Finalmente, solo 12 cumplieron con los requisitos establecidos para su inclusión en el análisis. Los hallazgos evidencian que el aula invertida se ha implementado en educación primaria con el propósito de optimizar los aprendizajes en diversas áreas del conocimiento. Esto permite concluir que esta metodología se ha consolidado como una estrategia efectiva en dicho nivel educativo, demostrando un impacto positivo en múltiples dimensiones del proceso formativo.

Palabras clave: aula invertida, primaria, aprendizaje, estrategia.

Introduction

Current education presents increasing challenges for teaching staff, making it essential to delve into the context in which these challenges arise. Educators have recognized that student generations have evolved alongside technological incorporation and advancement. Specifically, contemporary students maintain constant contact with streams of information to which they connect almost addictively, prioritizing interactions based on graphic media that capture their attention for only brief moments. This dynamic has created a differentiated learning profile, where students feel more comfortable interacting with technological devices than collaborating with peers, participating in evaluative activities, or receiving oral corrections in classrooms with more than 25 students.

These realities directly impact their intrinsic motivation, favoring technology-mediated learning experiences. In this scenario, it is imperative for educational institutions to provide specific methodological and didactic guidelines by level, capable of responding to changing classroom contexts that demand new pedagogical tactics. In this regard, Rodríguez Jiménez et al. (2024) identify the flipped classroom as a methodology with a positive impact on education. This approach reverses traditional logic: activities that were previously conducted in class now take place at home, while collaborative and practical work is moved to the classroom under the guidance of the teacher.

The design of student-centered learning environments depends on both the context and the teachers involved. In this line, methodologies have been developed to increase student motivation for optimizing competence acquisition. Among these, the flipped classroom has gained special relevance. According to Ros & Laguna (2021), this model places the student at the center of the process, allowing them to engage with theoretical content at home and deepen their understanding through guided practice in the classroom. However, Alarcón Díaz & Alarcón Díaz (2021) warn that this is not a recent innovation but rather a historical strategy revitalized by ICT, which facilitates flexible content and enhances teacher-student communication.

This practice, known as the flipped classroom, flipped learning, or reverse teaching, seeks to enhance student activity in class by applying knowledge previously acquired at home through digital resources. From this perspective, the teacher's role shifts from being the axis of the educational process to becoming a facilitator, while the student assumes greater autonomy by reinforcing their learning from home (Vera-Medranda & Castro-Bermúdez, 2024).

For Morán (2021), one of the main concerns in the educational context lies in ensuring effective student learning. Currently, educational settings are undergoing significant transformation, driven by the incorporation of digital technologies and the prioritization of active student participation. This paradigm shift underscores the urgent need to reevaluate traditional educational approaches to adapt them to contemporary demands.

Thus, researching strategies like the flipped classroom acquires substantial academic relevance. This pedagogical approach allows for the analysis of how this methodology can support and enrich learning processes. Its implementation facilitates student access to materials prior to classes, which they can review independently and subsequently discuss or analyze in the classroom with the teacher. With this prior knowledge, teachers' explanations and guidance are received more receptively, thereby enhancing the assimilation of new content.

However, while numerous studies support the notion that the flipped classroom favors learning, Farooqi & Naeem (2023) caution that its implementation faces significant challenges. On one hand, teachers may encounter

resistance when abandoning traditional teaching methods, necessitating a process of adaptation and ongoing training. On the other hand, although this methodology aims to foster student participation, many educators express concern about the limited engagement of some students with preparatory activities, which becomes a critical barrier. Additionally, researchers highlight that students' prior preparation is crucial, as their level of commitment directly influences their participation and performance during in-person sessions.

In this same vein, the study by Rakovic et al. (2023) identifies that the lack of self-regulation skills among students represents a key obstacle to the success of the flipped classroom. Since this methodology requires students to manage their learning through pre-class activities, the absence of competencies such as planning, goal-setting, or progress tracking can lead to procrastination, insufficient preparation of materials, and consequently, reduced participation during classes. This cycle, according to the authors, generates demotivation and frustration, negatively impacting academic performance.

For their part, Yang et al. (2023) acknowledge that while the flipped classroom and the use of digital tools offer pedagogical advantages, they also present considerable challenges. Among these, they highlight the demand for prior preparation from students, which is especially complex for those with limited self-regulation skills. They also note that the inherent technological dependence of this model could exclude students with insufficient access to digital resources, thereby deepening existing educational gaps.

From the above, the following research question arises: What is the scientific evidence regarding the primary impacts of the flipped classroom on the learning of primary education students? Based on this inquiry, the central objective of the study is formulated as follows: to analyze the available scientific evidence concerning the primary impacts of the flipped classroom on the learning of primary education students.

Methodology

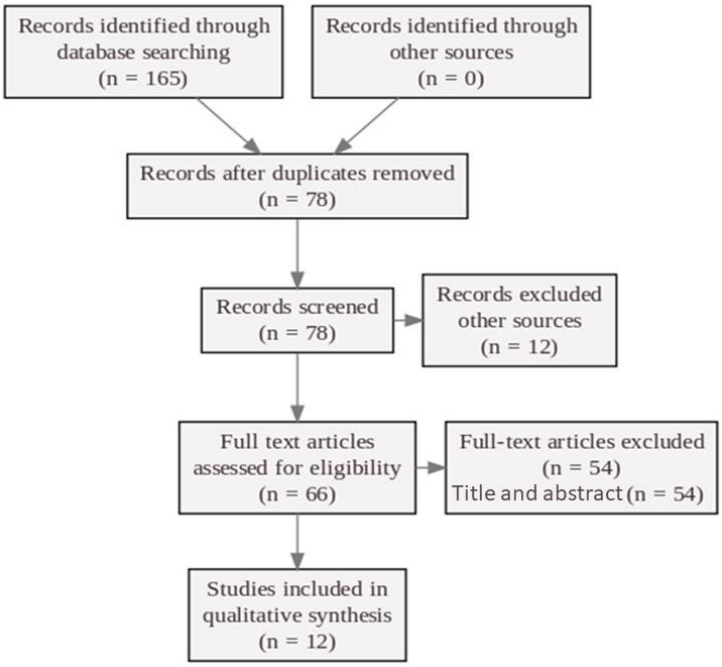
This research was conducted through a systematic literature review, a methodology aimed at analyzing scientific evidence to address a specific research question. This type of work contributes to elevating the quality of findings, as it employs rigorous methods throughout the research process, minimizing potential biases (Quispe et al., 2021). A systematic review (SR) not only follows a methodical process in the search for information but is also characterized by addressing the topic of study from its epistemological, theoretical, and conceptual contextualization, enriching the depth of the analysis (Sandoval, 2024).

In terms of eligibility criteria, the inclusion requirements were established as follows: publications indexed in Scopus, articles published between 2019 and 2023 in Spanish or English, and availability of open access. Conversely, works that did not align with the objective or central question of the SR were excluded.

The search strategy utilized keywords such as "*flipped classroom*", "*primary*", "*schoolchildren*" y "*pupils*", generating the following search string: (*TITLE-ABS-KEY* ("*flipped classroom*") *AND TITLE-ABS-KEY* ("*primary*") *OR TITLE-ABS-KEY* ("*schoolchildren*") *OR TITLE-ABS-KEY* ("*pupils*")) *AND PUBYEAR* > 2018 *AND PUBYEAR* < 2026 *AND* (*LIMIT-TO* (*OA* , "*all*")) *AND* (*LIMIT-TO* (*LANGUAGE* , "*English*") *OR LIMIT-TO* (*LANGUAGE* , "*Spanish*")).

For the article selection process, the PRISMA protocol was applied, a standardized methodological guideline that establishes 27 key questions and is structured into three main phases: Identification, Screening, and Inclusion.

Figure 1
PRISMA diagram



Results

Table 1
Impact of flipped classroom in primary education

N	Author	Impact of flipped classroom
1	Ugwuanyi (2022)	Verified that the implementation of the flipped classroom significantly contributes to basic science learning in primary education, with a notable effect size of 0.953.
2	Chen et al. (2023)	Highlighted the relevance of gamification as a complementary strategy to the flipped classroom through the use of an interactive book that benefits primary students.
3	Girmen & Kaya (2019)	Emphasized the Flipped Classroom Model (FCM) for its positive impacts not only on language skills but also on cognitive development in primary students.
4	Wang et al. (2023)	Asserted that the application of the flipped classroom has enhanced not only motor skills acquisition but also students' emotional performance.
5	Custodio & Pintor (2021)	Demonstrated that the flipped classroom plays a key role in physical education for primary students, also strengthening social competencies.
6	Wasriep & Lajium (2019)	Reported significant improvements in primary students with the flipped classroom, although they warned about the challenges in achieving consistently positive results.
7	Loizou & Lee (2020)	Confirmed that the Flipped Classroom model promotes inquiry-based learning among primary students.

8	Zakaria & Yunus (2020)	This study evidenced a positive perception towards the flipped classroom in teaching English at the primary level.
9	Botella et al. (2021)	Utilized the flipped classroom through a Parkour teaching unit, verifying an increase in children's motivation during physical education classes.
10	Ruiz et al. (2020)	Reported benefits in environmental education by applying active methodologies like the flipped classroom with primary students.
11	Gómez-García et al. (2020)	Evidenced that flipped classroom methods promote greater motivation, autonomy, and self-regulation in students regarding academic content.
12	Parati et al. (2023)	Highlighted the benefits of the flipped classroom in primary education, particularly in English learning.

The results demonstrate that the flipped classroom constitutes an innovative methodology in primary education, evidencing a positive impact across multiple dimensions of learning. This approach allows students to review materials in advance, facilitating a more active and participatory role during in-person sessions. Various studies confirm that its implementation significantly contributes to the understanding of concepts, particularly in areas such as basic sciences. For instance, Ugwuanyi (2022) reports a notable effect size of 0.953 in science learning, suggesting that this methodology promotes a more solid and effective assimilation of content.

In this context, gamification emerges as a key strategy within the flipped classroom, enhancing not only academic achievements but also the intrinsic motivation of students. Chen et al. (2023) emphasize that the use of gamified interactive books especially benefits primary students, encouraging their active participation and enriching their educational experience. Furthermore, Girmen & Kaya (2019) demonstrate that this model positively impacts language and cognitive skills, highlighting its versatility for language teaching and its ability to foster holistic learning.

In the realm of physical education, research by Wang et al. (2023) and Custodio & Pintor (2021) reveals that the flipped classroom not only optimizes motor skills but also strengthens social and emotional competencies. These findings underscore its relevance in the holistic development of students, transcending academic boundaries to enhance their collaborative and group interaction skills. Additionally, Loizou & Lee (2020) confirm that the approach fosters inquiry-based learning, empowering students to take a leading role in their education.

Student perception and motivation towards this methodology are also crucial. Zakaria & Yunus (2020) and Parati et al. (2023) provide evidence of a positive evaluation of the flipped classroom in English learning, highlighting its effectiveness in improving linguistic competence at the primary level. Botella et al. (2021) report an increase in motivation during physical education classes when implementing strategies like Parkour, suggesting that this approach makes learning more dynamic and relevant.

Moreover, Ruiz et al. (2020) demonstrate that integrating the flipped classroom into STEAM projects (such as robotics) generates environmental benefits and raises awareness of local issues. Gómez et al. (2020) add that these methods enhance autonomy and self-regulation, essential skills for lifelong learning. Nevertheless, while the methodology shows significant improvements, authors like Wasriep & Lajium (2019) warn of inherent challenges in its implementation, which require systematic attention.

Discussion

The flipped classroom model, due to its intrinsic characteristics, necessitates a redefinition of the boundaries between teaching and learning processes. In this way, students become active protagonists of their own learning and collaborative work, a concept promoted by educational research for decades and that now represents one of the central paradigms of contemporary education. In this regard, Pluas et al. (2024) agree that pedagogical decision-making requires reflective teachers, capable of adapting to the individual dynamics of their students beyond the general characteristics of the group. Each student possesses a unique learning style, leading to an accumulation of content in working memory that, if not adequately consolidated, fails to transfer to long-term memory.

Moreover, the rapid changes in cultural and technological consumption habits prior to the pandemic have radically transformed current educational scenarios. As Cadena (2024) notes, many students showed a clear

inclination towards passive content consumption on streaming platforms, preferring animated series and low intellectual rigor programs over reading books. However, the pandemic accelerated a restructuring in the use of time and technology, increasing student participation in social networks and digital environments, reflecting a new dynamics of interaction and access to knowledge.

In this context of cultural and technological transition, a key pedagogical opportunity arises: the design of flexible educational proposals by teachers, centered on projects and distanced from the rigid structures of traditional learning. This approach contrasts with methodologies based solely on the transmission of standardized content, disconnected from the interests and realities of students. Particularly at initial levels, learning should be oriented towards guided discovery, stimulation of curiosity, and meaningful construction of knowledge.

The findings of this study confirm that the implementation of active methodologies, particularly the flipped classroom model, generates significant benefits in terms of motivation, participation, and depth of learning. As Gómez-Delgado & Fuertes (2024) point out, the challenge lies not only in adopting new methodologies but in integrating them coherently with the didactic and organizational demands of the educational context. This implies redefining the teacher's role and having institutional support that allows active learning to permeate all spaces and stages of the educational process.

However, there are persistent resistances associated with traditional evaluative practices and institutional inertia, which hinder the full adoption of these approaches. The "stagnant reputation" still surrounding certain pedagogical innovations reflects an educational culture historically centered on unidirectional knowledge transmission, limiting both teacher creativity and the student's leading role in their own learning.

While the positive impact of the flipped classroom is evident in aspects such as motivation, engagement, and learning quality, it is crucial to recognize that its effectiveness depends on contextual and organizational factors. Previous research has demonstrated that successful implementation requires not only teacher willingness but also favorable structural and cultural conditions within the educational environment.

In this framework, Medrano (2024) emphasizes that the flipped classroom should not be understood as an isolated or complementary technique but as an integral conception of the teaching-learning process. This model redefines the meaning of the classroom by articulating various didactic techniques aimed at fostering critical thinking, autonomy, and student responsibility for their education. The key lies in designing activities prior to in-person sessions that transcend mechanical tasks, functioning as formative experiences that facilitate a comprehensive and constructivist access to content.

Thus, the flipped classroom consolidates as a methodological alternative representing a profound transformation in the conception of learning. Beyond reorganizing time and space, it promotes a pedagogical approach centered on the student, their context, and their ability to learn actively, reflectively, and situated within reality.

Conclusions

This systematic review has consolidated scientific evidence supporting the positive impact of the flipped classroom on the learning of primary education students. This methodology has proven effective in improving academic performance in areas such as basic sciences, physical education, English language learning, and the development of cognitive-emotional skills. The active participation of students, prior preparation for in-person sessions, and the mediating role of the teacher have emerged as key factors in enhancing motivation, autonomy, and meaningful understanding of content.

The results also demonstrate that the flipped classroom fosters the development of transversal skills, such as self-regulation, collaborative work, and problem-solving. Through strategies like gamification and the use of interactive digital resources, student engagement in their own learning process has increased. These tools not only strengthen the connection between content and student context but also contribute to creating a more dynamic, inclusive, and needs-centered educational experience.

Nevertheless, the implementation of the flipped classroom faces significant challenges. Among these are the need for students to develop self-regulation skills, the requirement for prior preparation outside the classroom, and the reliance on adequate technological resources. These conditions could limit the benefits of the methodology if a conducive institutional environment and strategic teacher support are not in place. Therefore, it is essential for educational institutions to provide continuous training and support for both teachers and students, ensuring an effective and sustainable adoption of this pedagogical practice.

Finally, it is concluded that the flipped classroom should not be viewed as an isolated technique but as a transformative pedagogical approach to the traditional teaching model. Its success depends on its integration with other active didactic strategies and its adaptation to the specific characteristics of the school context. This research

reaffirms that the flipped classroom can serve as a powerful tool for strengthening teaching-learning processes in primary education, provided it is implemented with solid pedagogical criteria, structured planning, and ongoing institutional commitment.

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