

A Critical Systematic Review of the Impact of the Flipped Classroom Methodology on University Students' Autonomy

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Abstract: In recent years, the Flipped Classroom methodology has garnered significant interest among educators due to its potential to provide students with the flexibility to learn wherever and whenever they want. It is believed that this change in teaching may enable students to self-manage, becoming more independent and autonomous. To investigate whether the use of Flipped Classroom can help students become more autonomous, a systematic review was conducted using the PRISMA method, searching through major national and international databases. A total of 38 studies (n = 2420 students) were collected and classified based on the validity of the research design employed. The analyses revealed that although Flipped Classroom can contribute to the development of students' learning autonomy, there are certain doubts regarding this assertion, as results from studies with higher validity point to mixed outcomes. In order to obtain a more accurate understanding of reality, it is highly recommended that future studies examining the impact of the Flipped Classroom methodology on students' learning autonomy address the limitations found in the literature, such as the scarcity of longitudinal designs with randomized control groups, the lack of studies conducted in non-university stages, and the small quantity of participants used in interventions.

Keywords: Flipped Classroom; autonomy; teaching/learning strategies; self-determination theory; active methodologies



Academic Editor: Eugénia Pedro

Received: 26 February 2025

Revised: 9 May 2025

Accepted: 13 May 2025

Published: 14 May 2025

Citation: Galindo-Domínguez, H.; Bezanilla, M.-J. A Critical Systematic Review of the Impact of the Flipped Classroom Methodology on University Students' Autonomy. *Trends High. Educ.* **2025**, *4*, 22. <https://doi.org/10.3390/higheredu4020022>

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1. Introduction

Considering previous evidence, there has been a growing interest over the years in investigating the impact of the Flipped Classroom methodology (e.g., [1–5]). The flipped classroom methodology is an approach that reverses the order of tasks compared to more traditional methodologies. Specifically, while in traditional classes, a significant amount of class time is devoted to theoretical content delivery, and practical tasks are assigned outside the classroom, with the Flipped Classroom methodology, this distribution is reversed. The theoretical content delivery is assigned as pre-class work, and class time is dedicated to clarifying doubts, discussing notes taken, and engaging in more practical tasks such as challenges or projects [6,7].

This shift in time and task allocation is consistent with previous theoretical models such as Bloom's Taxonomy [8], which defines different levels of thinking and cognitive skills from lower to higher complexity (i.e., remembering, understanding, applying, analyzing, evaluating, and creating) that students can acquire during the learning process. In more traditional methodologies, students tend to develop lower-order thinking skills, such as

remembering or understanding, through theoretical lectures in class, while they attempt to develop higher-order thinking skills, such as evaluating or creating, outside of class without the guidance of the teacher. In contrast, with the usage of Flipped Classroom methodology, students can develop higher-order thinking skills (i.e., analyzing, evaluating, or creating) to a greater extent in class with the assistance and feedback of the teacher, while lower-order thinking skills (i.e., remembering or understanding) can be developed to a greater extent outside of class [9,10]. Despite the criticisms that Bloom's Taxonomy has received over time—particularly regarding its rigid hierarchical structure, the oversimplification of cognitive processes, and its controversial application across different educational contexts—it might be a useful framework for understanding cognitive development, especially in higher education.

Similarly, this shift in times and skills is consistent with other previous theories such as the Cognitive Load Theory. This theory posits that our working memory has a limited capacity and, therefore, instructional design should consider how to teach content in a way that reduces cognitive load on students if the goal is for them to understand the subject matter by the end of the class [11]. Previous evidence suggests that having students prepare their work at a self-determined pace may help manage working memory more effectively [12]. In fact, recent studies argue that, in the case of the Flipped Classroom methodology, where students can manage the information obtained from educational resources at a personalized pace, this fact may contribute to improving their cognitive load [6].

What should be taken into account in this shift in times and skills is the fact that students are being asked for a higher degree of autonomy and responsibility, as it is the student themselves who must prepare the class outside of school hours [3]. Autonomy may be understood as a sense of volition, freedom, and self-endorsement actions [13], in which behaviors are conducted with an internally perceived locus of causality [14]. The importance of this construct has been reflected in various theories, such as Self-Determination Theory, which identifies the necessary elements to understand what leads individuals to grow through learning, with autonomy being a key element within this theory [15,16]. Similarly, the relevance of this construct as a facilitator of intrinsic motivation toward learning has been observed to be invariant regardless of the culture (Eastern or Western) in which students are immersed [13].

Despite the fact that certain studies have examined the impact of the Flipped Classroom methodology on student autonomy, especially based on Self-Determination Theory (e.g., [17]), it is true that, according to teachers, a significant number of students in earlier stages, (e.g., primary education) may not be prepared to utilize the Flipped Classroom methodology due to a lack of maturity in effectively managing the autonomy granted during the learning process [18]. However, recent studies (e.g., [19]) have revealed a positive causal relationship between student autonomy and the level of engagement with Flipped Classroom, with this relationship being moderated by students' perceived self-efficacy.

In fact, simply instructing students to watch videos or read books outside of class is a recipe for failure in the Flipped Classroom model [20]. This statement is based on the grounds that students may experience difficulties when comprehending the pre-course content when studying at home due to the lack of guidance from their instructors [21–23] or encounter a lack of motivation if they are accustomed to traditional instruction [24,25]. That is why, in order to improve the students' engagement with video watching or content mastery before class, different studies point out the necessity of finding new strategies for the implementation of the Flipped Classroom [26]. One of the most relevant strategies in this regard is highlighted by Wang [27], who, through structural equation modeling, observes how in-class behavioral engagement positively predicts out-of-class behavioral

engagement. This underscores the importance of designing meaningful activities for students, particularly during in-class time.

Finally, Galindo-Domínguez [3] state that continuing to explore the effectiveness of active teaching methods is crucial for educators who seek to base their practice on scientific evidence rather than unfounded trends. Given the aforementioned statements, this systematic review aims to shed light on an area that has recently been addressed by other systematic reviews and meta-analyses (e.g., [3–5]), which is the analysis of the potential benefits of the Flipped Classroom methodology. Thus, the goal is to provide teachers with relevant information that can guide their practice and rely heavily on the existing scientific evidence regarding this topic. Specifically, this systematic review seeks to answer the following research question: is the Flipped Classroom a methodology that allows for the development of student autonomy?

To answer this research question, this study conducts a systematic literature review with the objective of determining if the Flipped Classroom is a methodology that allows for the development of student autonomy.

2. Materials and Methods

2.1. Documentary Search

In order to address the objective previously outlined, a comprehensive search was conducted across a range of specialized databases. Specifically, we searched through databases such as Web of Science (<https://www.webofscience.com/wos/>, accessed on 1 February 2025), Scopus (<https://www.scopus.com/>, accessed on 1 February 2025), ProQuest (<https://www.proquest.com/>, accessed on 1 February 2025), ScienceDirect (<https://www.sciencedirect.com/>, accessed on 1 February 2025), EBSCOHost (<https://www.ebsco.com/>, accessed on 1 February 2025), ACM (<https://dl.acm.org/>, accessed on 1 February 2025), Emerald Insight (<https://www.emerald.com/insight/>, accessed on 1 February 2025), DOAJ (<https://doaj.org/>, accessed on 1 February 2025), Google Scholar (<https://scholar.google.es/>, accessed on 1 February 2025), ResearchGate (<https://www.researchgate.net/>, accessed on 1 February 2025), SciELO (<https://scielo.isciii.es/scielo.php>, accessed on 1 February 2025), and Dialnet (<https://dialnet.unirioja.es/>, accessed on 1 February 2025). These databases were chosen due to their reputation as some of the leading sources for indexing the highest-quality scientific journals.

The search yielded a series of documents resulting from the intersection between the methodology's own keywords (Flipped Classroom, Flipped Learning, Inverted Classroom, Inverted Learning) and the analyzed constructs (autonomy, autonomous, self-determination). All possible combinations were considered using the keywords in both English and Spanish. The reading and categorization of the studies were carried out by both researchers, first independently and then jointly to increase the validity of the study.

2.2. Inclusion Criteria

After conducting the initial search, a large number of documents were found ($n = 138$). However, some of them were rejected, as they did not meet the inclusion criteria set for the systematic review. The criteria followed were those shown in the following lines:

- Accessibility: All studies that were accessible through the selected databases were selected. Studies that were not accessible for the authors were excluded ($n = 8$).
- Language: Studies in Spanish and English were selected for the analysis. Therefore, studies that were written in other languages were rejected ($n = 1$).
- Methodology: Both quantitative and qualitative research approaches were accepted. Therefore, studies that just analyzed the research topic theoretically without field work or that proposed an intervention without applying it were rejected ($n = 16$).

- Object of study: Studies that addressed Flipped Classroom and autonomy were included. Therefore, studies that did not discuss this topic were rejected ($n = 16$).
- Subjects: Studies that focused on the students' role in higher education were accepted. Therefore, studies that analyzed the object of study in other role (e.g., in teachers or out of higher education) were excluded ($n = 24$).
- Time: No time restriction was applied. Any study up to the date of February 2025 was accepted.
- Format: All research formats were accepted, including papers, proceedings, books, and dissertations.

The data selection process was performed using a modified PRISMA flow diagram [28], as shown in Figure 1. During the process, only studies that met the specified criteria were used for further analysis. In total, 38 research studies that involved 2420 university students were considered. This systematic review is recorded in PROSPERO (ID: CRD420251001771).

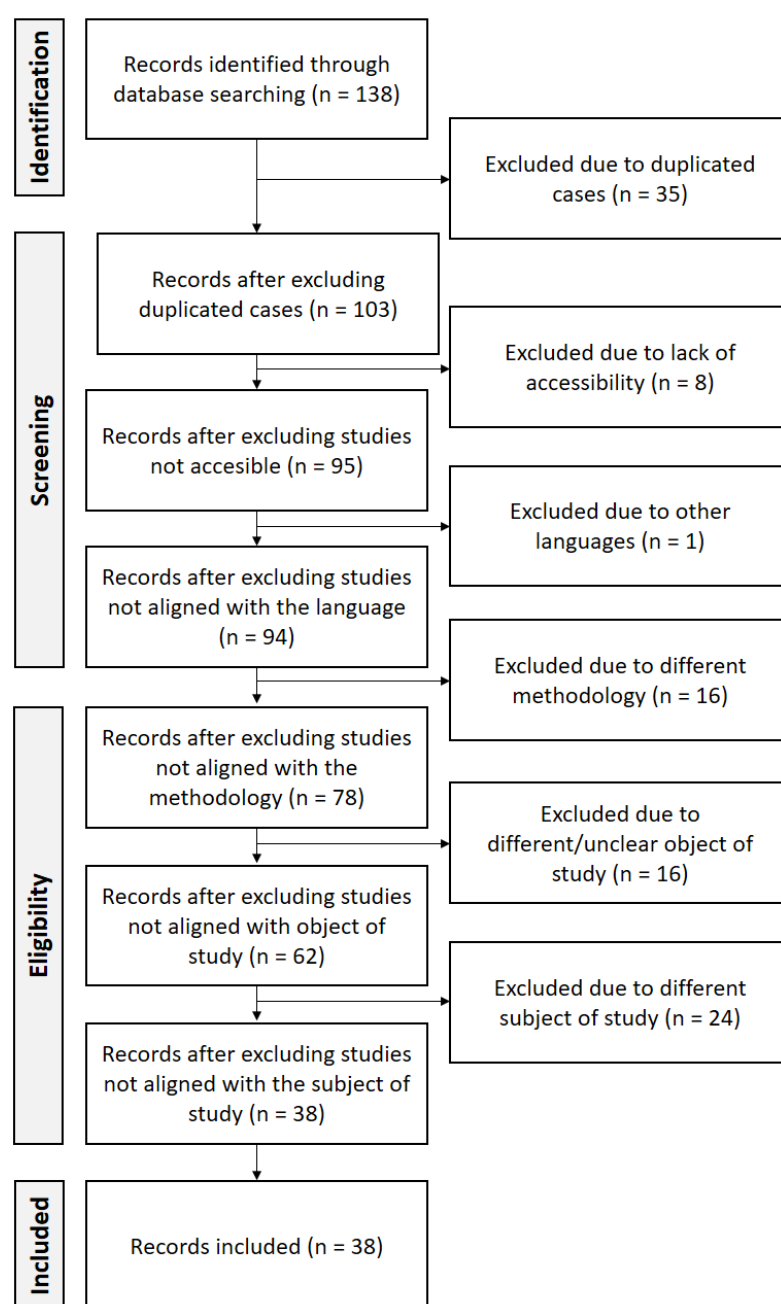


Figure 1. PRISMA diagram followed to include the selected studies.

2.3. Data Analysis

After collecting all the studies and excluding those that did not meet the inclusion criteria, the remaining studies were analyzed. First, the studies were ordered based on the potential validity of the results according to the research design employed. In this regard, studies with a qualitative methodology and quantitative studies with cross-sectional data were categorized as Validity 1 studies. Within Validity 1 studies, different types of designs were found. Specifically, these included (1) post-only design studies with 1 group, from which means and standard deviations were extracted; (2) post-only design studies with 2 groups, from which means, standard deviations of each group, and p-values were extracted; (3) frequency-based studies; (4) studies based on bivariate analysis, such as Pearson's r , chi-squared, linear regressions, or structural equation models; and (5) qualitative studies. Second, Validity 2 studies were quantitative studies with longitudinal data that lacked a control group. Third, Validity 3 studies were quantitative studies with longitudinal data that had a non-randomized control group. Finally, Validity 4 studies were quantitative studies with longitudinal data that had a randomized control group. For Validity 2, 3, and 4 studies, the means and standard deviations of each group were collected, as well as the estimated effect size, calculated through Cohen's d statistic.

As collected in Supplementary Material Table S1, out of the 38 studies, 24 (63.12%) were classified as Validity 1, 4 (10.5%) were classified as Validity 2, 5 (13.15%) were classified as Validity 3, and 5 (13.15%) were classified as Validity 4.

3. Results

As commented previously, to analyze the content of each study, the studies were divided based on the validity of the data according to the type of design followed in each study. This validity value ranged from 1 (lower validity for qualitative studies or quantitative studies with cross-sectional data) to 4 (higher validity for quantitative studies with longitudinal data and randomized control groups). A detailed table of the main results of this analysis can be found in Supplementary Material Table S1.

Based on the Validity 1 studies that followed a post-only experimental design with one experimental group, it can be observed from the mean analysis how autonomy values after implementing a Flipped Classroom approach range between moderate and high scores [29–33]. These studies contribute to the field by demonstrating that even in the absence of a control group, learners consistently report enhanced autonomy, particularly in writing courses (e.g., [29,30,33], CALL contexts [32], and through process-based approaches [31]. This suggests the versatility of the Flipped Classroom methodology across language learning environments and instructional designs.

The same pattern holds when analyzing studies that followed a post-only experimental design with one experimental group and one control group, where it can be observed how student autonomy scores after the intervention proposals were higher [34,35] for the group that employed the Flipped Classroom methodology compared to the control group. These studies add value by providing comparative data indicating that Flipped Classroom instruction can outperform traditional teaching in promoting learner autonomy in EFL contexts, confirming its effectiveness across cultural and institutional settings.

Another type of study within the same validity range used frequencies to measure the level of learning autonomy. After the intervention based on the Flipped Classroom methodology, in all studies that used frequency analysis as a research method, it was observed that the majority of items received responses ranging from good to excellent [36,37] indicating a high perception of the Flipped Classroom methodology's effectiveness in promoting autonomous learning, according to the students' perspective. These findings support the argument that student-perceived autonomy is positively impacted by the Flipped Class-

room, particularly in digital learning environments [36] and emergency remote teaching scenarios [37], highlighting its adaptability to different learning modalities.

Similarly, another type of Validity 1 study involved bivariate analysis with cross-sectional data. The vast majority of these studies examined the correlation between the use of the Flipped Classroom methodology and autonomy in learning, observing a positive and statistically significant correlation in all cases [38–41]. These studies expand current knowledge by providing quantitative evidence from various academic disciplines (engineering, psychology, business) and educational levels, suggesting a broad positive relationship between flipped instruction and learner autonomy. Furthermore, Hao and Lan [42] observed a positive and statistically significant correlation between student satisfaction after using the Flipped Classroom methodology and developed autonomy. This study contributes theoretically by presenting findings that align with Self-Determination Theory, suggesting that autonomy-supportive practices in Flipped Classrooms foster both satisfaction and autonomous motivation. Additionally, other studies have used regression methods to investigate how higher perceived autonomy during the use of the Flipped Classroom methodology leads to better engagement [43] and increased satisfaction in class [42]. These studies demonstrate that perceived autonomy plays a mediating role in predicting key educational outcomes like engagement and satisfaction, highlighting the motivational value of flipped learning environments.

Finally, regarding qualitative studies, in the majority of them, students valued the experience of using the Flipped Classroom methodology to develop their autonomy. They highlight how the Flipped Classroom methodology has allowed them to organize their time and use resources as they see fit, as well as become more self-reliant without anyone telling them how to do things [44–46]. These qualitative accounts emphasize the lived experiences of students, indicating that flipped learning fosters personal responsibility and decision-making, particularly in EFL and teacher training programs. It has also enabled students to be more participative in the classroom, express their opinions to a greater extent, and be more engaged in their learning, ultimately allowing them to be more autonomous [47]. This qualitative evidence adds depth to the quantitative findings, illustrating how Flipped Classrooms can enhance collaborative and participatory learning dynamics that underpin autonomous learning. Despite the positive results of all these studies with Validity 1, it should be noted that these studies have the main limitation of lacking a control group to compare the data with, as well as not analyzing the scores prior to the intervention proposal.

Regarding studies with Validity 2, studies with longitudinal data without a control group were considered, where the experimental group, in all cases, underwent an intervention using the Flipped Classroom methodology. The results of these studies were mixed. Nam's study [48] showed an improvement in student autonomy with a large effect size ($d = 1.30$), providing strong evidence of the potential impact of flipped learning on learner autonomy when multimedia resources are incorporated. Troncoso et al.'s study [49] pointed in the opposite direction. Similarly, other studies that employed this same design showed negligible differences between the pre-phase and the post-phase [50,51]. These divergent findings contribute to a nuanced understanding by illustrating that the success of flipped approaches in promoting autonomy may depend on contextual and design factors, such as feedback types [50] or the integration of critical thinking tasks [51]. However, these studies primarily had the limitation of not having a reference control group.

Regarding studies with Validity 3, studies with pre/post-longitudinal data and non-randomized control groups were considered, where the experimental group in all cases underwent an intervention using the Flipped Classroom methodology. The results of certain studies indicated a significant improvement in student autonomy after the interven-

tions, but only in the group that experienced the Flipped Classroom methodology [52,53]. These studies offer empirical support for the instructional effectiveness of the Flipped Classroom over traditional methods, despite the lack of randomization, by showing measurable learning gains in autonomy. However, other studies observed an improvement in student autonomy in both the control and experimental groups, with the latter group showing statistically superior results [54,55]. Parvaneh et al. [55] did not provide descriptive statistics, but they conducted an ANCOVA analysis and observed a statistically more favorable improvement in student autonomy for those who used the Flipped Classroom methodology in contrast to the control group. This study further supports the superiority of flipped learning in fostering autonomy, using robust statistical techniques to control for baseline differences. The main limitation of these types of studies was that the control group was not randomized, which means that pre-established groups could have introduced unanalyzed biases.

Finally, regarding studies with Validity 4, the results are mixed. On the one hand, certain studies indicate that both the control and experimental groups showed improvements in learning autonomy after the interventions, with very similar effect sizes [56,57]. These results suggest that flipped learning can be as effective as traditional methods in promoting autonomy when both interventions are well-designed. Similarly, other studies observed that while the experimental group improved after the intervention, the control group experienced a decline in perceived autonomy levels [58]. This contributes to the discussion by highlighting the protective role of flipped methodologies in sustaining student autonomy, especially in contrast to more teacher-centered approaches. On the other hand, other studies highlighted that after the intervention based on the Flipped Classroom methodology, the experimental group obtained significantly different scores compared to the control group, reflected in large effect sizes [59,60]. These high-validity studies provide compelling evidence of the effectiveness of the Flipped Classroom in fostering autonomy, with experimental rigor supporting its adoption in evidence-based educational practice.

4. Discussion

The aim of this study was to understand the impact of the Flipped Classroom methodology on student autonomy development. To this end, a systematic review was conducted following the PRISMA method, gathering published studies addressing this topic up to the present date. The results, in broad terms, confirm that the Flipped Classroom may be a methodology that helps foster student autonomy, similar to other methodologies [56,57] or even to a greater extent (e.g., [54,55,59–61], as observed in the studies with higher validity.

While the findings generally suggest that the Flipped Classroom methodology can foster student autonomy, it is important to consider the reasons behind the mixed results observed in the studies with higher validity. For instance, in some studies, the experimental group demonstrated higher autonomy levels, which may be attributed to factors such as the students' prior exposure to autonomous learning, their intrinsic motivation, or the teacher's ability to effectively implement the methodology. On the other hand, in studies where both the experimental and control groups showed similar results, it is possible that the level of student engagement or the specific content being taught could have influenced the outcomes. Additionally, the maturity level of students in managing their learning autonomously may have been a critical factor. These nuances highlight the complexity of measuring autonomy development and suggest that future research should explore these contextual factors more deeply to explain the variations in the effectiveness of the Flipped Classroom methodology.

This finding is entirely consistent with previous theories such as Bloom's Taxonomy [8] and Cognitive Load Theory [11]. It is true that implementing the Flipped Classroom

methodology requires initial effort from the teacher, as they need to assess whether their students possess a certain level of maturity to manage time and tasks autonomously [3], a certain motivation to learn in a different way [24,25], and some prior training for students to know how to work under this methodology [21–23].

These results have several theoretical and practical implications that need to be discussed. First, these findings are valuable in further building upon the existing body of research on the potential effects of the Flipped Classroom methodology on affective factors of learning, like motivation [62–64], self-regulation [65,66], self-concept [67], and self-efficacy [68–71]. Second, these findings are useful for educational researchers, as they highlight the existence of certain limitations that need to be addressed in future work. Among the identified limitations are the scarcity of studies following a longitudinal design with randomized groups (e.g., [56,57]) and the low number of participants in a large quantity of studies (e.g., [54]). Third, these findings are valuable for teachers, especially those at the university level who employ the Flipped Classroom methodology, as it allows them to reinforce their educational practice with greater confidence based on scientific evidence, particularly if their objectives include fostering student autonomy. Although achieving autonomous student work without teacher assistance at home may be somewhat challenging at the beginning, previous research has shown that this autonomous work carried out before class is essential for the development of thinking skills, both lower order (i.e., knowledge retention) and higher order (i.e., problem-solving) [27,72].

Fourth, these results are useful for policymakers, vice-rectors, and deans, as they provide valuable information regarding potential methodologies that may be recommended for inclusion, especially in higher education, when designing guidelines and curricula for study programs. This task has been addressed in previous works that have aimed to establish general guidelines to be considered at the institutional level when incorporating the Flipped Classroom methodology into the curriculum (e.g., how to prepare students for using the methodology, rules for pre-class work, active learning strategies for in-class activities. . .) [73,74].

Finally, this systematic review has certain limitations that need to be taken into account. First, the review excludes empirical studies that could have been validly included, but were unable to meet specific criteria (e.g., language not known to the researchers or inaccessible documents), despite the knowledge that they could have further strengthened the obtained results. Second, this systematic review does not consider certain variables related to students (e.g., socioeconomic status, attitude toward technology) and teachers (interventions provided by the same teacher or others, subject taught, experience with the use of the Flipped Classroom methodology), which could have partially biased the results. Despite these limitations, it is expected that the findings from this review will serve as a reference point for future empirical studies, and it is recommended that future systematic reviews take into consideration the limitations identified in this study.

5. Conclusions

The results of this systematic review suggest that the Flipped Classroom methodology may have a positive impact on student autonomy, especially in studies with lower validity. However, it is important to note that the findings across studies with higher validity show mixed results. While some studies indicate more favorable outcomes for the experimental group, others report that both the control and experimental groups obtained similar scores. This highlights that the effectiveness of the Flipped Classroom approach in promoting autonomy might vary depending on the study design, sample characteristics, and other contextual factors.

Although the majority of studies show significant improvements in the experimental group's autonomy, these results should be interpreted with caution. The lack of consistent outcomes across studies indicates that while the Flipped Classroom methodology has the potential to foster autonomy, its success may not be guaranteed in all contexts. Therefore, future research should explore the conditions under which this methodology can be most effective in enhancing student autonomy, considering factors such as class size, student readiness, and the specific implementation strategies used by teachers. All these studies should also consider conducting longitudinal research with control groups and randomized groups to provide more robust and reliable findings.

This review contributes to the growing body of evidence regarding the potential benefits of the Flipped Classroom, but it also underscores the need for further investigation to address the limitations identified, such as the scarcity of studies with randomized control groups and the small sample sizes in many of the analyzed studies. These aspects should be prioritized in future research to provide a clearer and more reliable understanding of the methodology's true impact on student autonomy.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/higheredu4020022/s1>, Table S1: Main results of the systematic review for all the quantitative and qualitative studies. References [29–61,75–79] are cited in the Supplementary Materials.

Author Contributions: Conceptualization, H.G.-D. and M.-J.B.; methodology, H.G.-D.; software, H.G.-D.; formal analysis, H.G.-D. & M.-J.B.; investigation, H.G.-D. and M.-J.B.; resources, H.G.-D. and M.-J.B.; writing—original draft preparation, H.G.-D. and M.-J.B.; writing—review and editing, H.G.-D. and M.-J.B.; visualization, H.G.-D.; supervision, H.G.-D. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: No new data were created or analyzed in this study.

Conflicts of Interest: The authors have no relevant financial or non-financial interests to disclose.

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