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# Flipped classroom in higher education in the area of health: A systematic review of the literature.

## *Aula invertida en la educación superior en el área de la salud: Una revisión sistemática de la bibliografía.*

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## ABSTRACT

This study aimed to analyze the benefits, challenges, trends, and recommendations reported in recent scientific literature on the implementation of the flipped classroom in health higher education. To this end, a systematic review was conducted using an interpretive qualitative approach, with the PRISMA method as the methodological guide. The final corpus comprised 27 empirical studies published between 2021 and 2025, selected according to thematic relevance, full-text availability, and methodological focus. The findings identified three major benefits of the model: (i) strengthening autonomous learning by fostering self-regulation and independent knowledge management; (ii) improving academic performance, with statistically significant differences across several assessments compared with the traditional model; and (iii) developing clinical skills, particularly through simulation contexts, case resolution, and autonomous practice. However, structural challenges were also identified, including insufficient faculty training, technological limitations, assessment constraints, and institutional resistance. In conclusion, the flipped classroom is an effective pedagogical strategy for developing key health competencies, but successful implementation requires progressive curricular redesign, comprehensive faculty development, and flexible adaptation to each institution's disciplinary and technological context.

**Keywords:** Flipped classroom, higher education in health, autonomous learning, academic performance, clinical skills

## RESUMEN

El presente estudio se planteó como objetivo general analizar los beneficios, desafíos, tendencias y recomendaciones reportadas en la literatura científica reciente sobre la implementación del aula invertida en la educación superior en salud. Para ello, se desarrolló una revisión sistemática de la bibliografía bajo el enfoque cualitativo interpretativo, utilizando el método PRISMA como guía metodológica. El corpus final estuvo compuesto por 27 estudios empíricos publicados entre 2021 y 2025, seleccionados según criterios de pertinencia temática, acceso completo y enfoque metodológico. Los hallazgos evidenciaron tres grandes beneficios del modelo: (i) fortalecimiento del aprendizaje autónomo, al fomentar la autorregulación y la gestión independiente del conocimiento; (ii) mejora en el rendimiento académico, con diferencias estadísticamente significativas en diversas evaluaciones respecto al modelo tradicional; y (iii) desarrollo de habilidades clínicas, particularmente en contextos de simulación, resolución de casos y práctica autónoma. No obstante, también se identificaron desafíos estructurales como la falta de capacitación docente, limitaciones tecnológicas, carencias evaluativas y resistencia institucional. En conclusión, el aula invertida representa una estrategia pedagógica efectiva para el desarrollo de competencias clave en salud, pero la efectividad en su implementación requiere un rediseño curricular progresivo, formación docente integral y adaptación flexible a los contextos disciplinares y tecnológicos de cada institución.

**Palabras clave:** Aula invertida, educación superior en salud, aprendizaje autónomo, rendimiento académico, habilidades clínicas.

## INTRODUCTION

Training highly qualified health professionals is a major challenge for higher education, especially given the complexity and dynamism of today's global healthcare environment. Historically, pedagogical approaches in this field have been strongly teacher-centered, shaping a dynamic that

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limits students' protagonism in their own learning process (Mascolo, 2009). This teacher centrality—together with the predominance of one-way lectures—has often encouraged passive knowledge assimilation, weakening the critical and practical capacities professionals need to respond to the sector's technological change and demands (Gatica & Rubí, 2021).

In this context, it is essential to rethink methodological approaches in health higher education. The integration of pedagogical strategies that foster active participation, reflective thinking, and autonomous learning has become an urgent need to overcome the limitations of the traditional model and better meet professional-context demands (Durán & Vigueras, 2023). The flipped classroom has gained prominence as a didactic alternative capable of transforming educational practices by placing the student at the center of the process and increasing involvement in learning.

The flipped classroom reshapes pedagogical relationships by moving prior theoretical learning to virtual environments, using digital resources—videos, podcasts, interactive presentations, and guided readings—that students can review at their own pace (Xi, 2022; Prieto et al., 2021). This reorganization of instructional time frees face-to-face sessions for discussion, collaborative work, case analysis, problem solving, and practical application of knowledge, creating a participatory setting that strengthens meaningful learning.

Health education is particularly well suited to flipped-classroom adoption because it must connect theoretical knowledge with clinical skills that can only be developed through well-guided practical experiences (López et al., 2021). International and local evidence indicates that this approach can improve academic performance, autonomy, and student motivation, while promoting stronger engagement and active participation in class (Moreira & García, 2024). However, effective implementation also faces barriers, including faculty resistance to change, insufficient technological infrastructure, limited training in the pedagogical use of digital tools, and still-limited systematized evidence to clarify the model's real impact in this field.

Accordingly, there is an urgent need for studies that examine the effects of the flipped classroom in health higher education in depth, considering both reported benefits and the conditions that enable or constrain its effectiveness. It is also crucial to understand stakeholder perceptions—students' and instructors' experiences and valuations—to generate recommendations that guide adoption and support sustainable integration into educational programs.

Within this framework, the present study is proposed as a systematic review of scientific literature published between 2021 and 2025 on flipped-classroom implementation in health higher education. Through rigorous compilation and analysis of empirical studies, it aims to clarify its real impact; document benefits in autonomous learning, academic performance, and clinical skills; identify common challenges; and synthesize trends, good practices, and recommendations to better leverage its educational potential in university health programs. This contribution seeks to strengthen pedagogical processes in health education toward more participatory, reflective, and contextualized learning, helping prepare professionals for 21st-century sector demands.

The flipped-classroom strategy has achieved broad international recognition in health higher education. Evidence—especially from quasi-experimental studies and controlled reviews—suggests that its application yields meaningful gains in academic performance, practical skill development, and student motivation (Evaristo et al., 2019; Hew & Lo, 2018). Across multiple contexts, digital resources (videos, presentations, readings) are provided before face-to-face sessions so that class time can focus on participatory dynamics such as debates, clinical cases, and problem solving (Barranquero et al., 2022). International meta-analyses report improvements in grades ($d \approx 0.33$; $p < 0.001$) when the flipped classroom includes initial diagnostic assessments (Hew & Lo, 2018), as well as positive effects on autonomy and active participation (Moreira & García, 2024). At the same time, benefits appear moderated by educational context: for instance, studies in Asia describe mixed student perceptions, including overload or lower efficiency when institutional support or resources are insufficient (Barranquero et al., 2022).

In Latin America, progress has been more limited but still generally positive. Mariscal et al. (2024) note that most regional studies come from Mexico, Spain, Peru, Chile, Colombia, and Brazil. In Peru, Evaristo et al. (2019) found that dentistry students taught with a flipped approach outperformed peers in biostatistics taught traditionally (32.6 vs. 27.9; $p < 0.001$), and Brazilian studies report improvements in nursing and dentistry (da

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Silva et al., 2025). In Colombia, the experience is more incipient, but Mora (2020) highlights the combination of the flipped classroom with problem-based learning as a promising practice to strengthen clinical reasoning. Ecuador has also joined this expansion: Aguilera et al. (2024) report that medical students using the flipped classroom achieved averages close to 96/100 (Kruskal–Wallis, $p = 0.000$) compared with conventional methods, helping counter demotivation and low performance.

The flipped classroom is theoretically grounded in constructivism and active learning, emphasizing students' central role in knowledge construction (Díaz et al., 2024; Biggs, 1999). It reorganizes the traditional instructional sequence into three phases: pre-class, in-class, and post-class (Barranquero et al., 2022). In pre-class, students access content at home at their own pace; in-class focuses on problem solving, clinical case analysis, and competency practice in collaborative settings with the instructor as facilitator; and post-class consolidates learning through exercises or summative assessments integrating the content (Prieto et al., 2019).

In line with Bloom's taxonomy, the flipped model shifts more memoristic learning (remembering, understanding) to virtual environments and reserves face-to-face time for higher-order operations (applying, analyzing, evaluating) (Phillips & Wiesbauer, 2022; Díaz et al., 2024). This logic also informs the "adaptive flipped classroom," which seeks to personalize in-person sessions based on prior diagnostics and attention to students' zone of proximal development (Prieto et al., 2019; Díaz et al., 2024).

Benefits of the flipped classroom in health education have been widely documented: consistent improvement in academic performance (Hew & Lo, 2018; Barranquero et al., 2022), stronger engagement and self-regulation of learning (Moreira & García, 2024), and development of transversal competencies such as teamwork, critical thinking, and communication (Evaristo et al., 2019; Barranquero et al., 2022). Student evaluations also suggest that flexible study timing, clear objectives, and opportunities to deepen content during face-to-face sessions enhance overall satisfaction with training (Hew & Lo, 2018; Barranquero et al., 2022).

Faculty likewise report that inverting classroom time enables closer, more personalized guidance, supporting deep learning and stronger integration between theory and practice (Prieto et al., 2019). Nevertheless, studies note that preparing materials and redesigning instruction increases faculty workload and may generate resistance when adequate training and institutional support are lacking (Phillips & Wiesbauer, 2022; Barranquero et al., 2022).

Key challenges include the digital divide and limited resources in some educational contexts—especially in Latin America (da Silva et al., 2025; Prieto et al., 2019)—students' reliance on self-discipline to prepare in advance (Barranquero et al., 2022), and resistance to change among faculty or students accustomed to traditional dynamics (Phillips & Wiesbauer, 2022). Gaps also remain regarding long-term effects and impacts on real clinical performance or patient health outcomes (Barranquero-Herbosa et al., 2022). To address these obstacles, studies converge on the need for pedagogical and technological training for instructors, equitable access to digital resources, careful planning of all model phases, a participatory and collaborative classroom culture, and assessment strategies aligned with active-learning principles (da Silva et al., 2025; Prieto et al., 2019). They also recommend piloting projects, gradual integration into curricula, and academic communities that share experiences and good practices to strengthen sustainability and expansion of the flipped classroom in health higher education (Aguilera et al., 2024; Prieto et al., 2019).

## METHODOLOGY

This study is a systematic review of the scientific literature aimed at examining empirical evidence on the implementation of the flipped classroom in health higher education. The review was conducted and reported in accordance with PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), ensuring a structured, transparent, and reproducible process across the core phases of identification, screening, eligibility, and inclusion (Figure 1).

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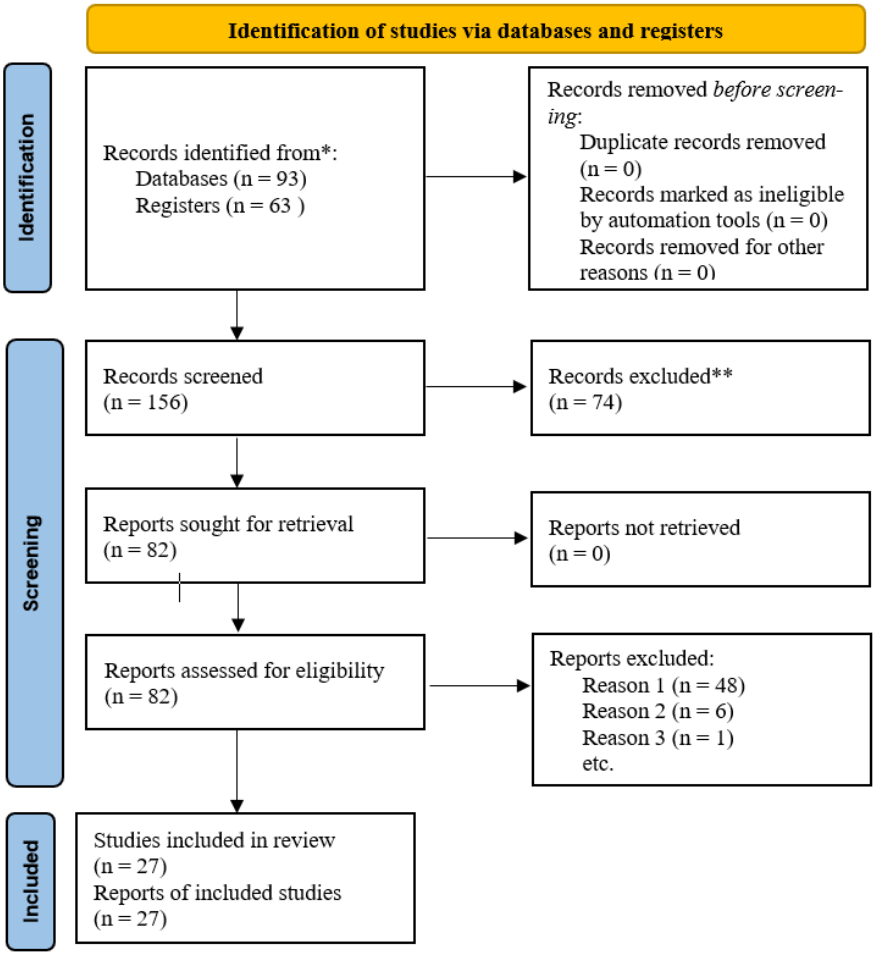
***Figure 1***. PRISMA Flow Diagram




## Design and epistemological approach

The review adopts a qualitative documentary approach within an interpretive paradigm, prioritizing the qualitative interpretation of findings and avoiding overgeneralization. The goal was to reconstruct and understand the evidence on the flipped classroom by identifying patterns, regularities, and divergences across reported experiences in university-level health programs. Findings were organized inductively around the review objectives: reported benefits, barriers/obstacles, and recommendations for effective implementation.

## Data sources and search process

An advanced search was conducted in major academic databases: Scopus, Web of Science, PubMed, SciELO, Redalyc, and Dialnet. The search and selection process yielded 156 records in total: 93 identified through databases and 63 identified through other sources. Before screening, the following were removed: duplicate records (n = 0), records marked ineligible by automation tools (n = 0), and records removed for other reasons (n = 0). Subsequently, 156 records were screened, and 74 were excluded at title/abstract level. Full texts were then sought for retrieval (n = 82), with 0 not retrieved, and 82 reports were assessed for eligibility. After eligibility assessment, 55 reports were excluded with reasons: 48 narrative reviews, 6 meta-analyses, and 1 letter to the editor. The final corpus included 27 empirical studies (Figure 1).

## Eligibility criteria

Inclusion criteria were: (a) empirical research published between January 2021 and May 2025; (b) implementation of the flipped classroom in university-level health programs; (c) availability of full-text; (d) indexed in recognized databases or retrievable through systematic complementary sources; and (e) written in English or Spanish.

Exclusion criteria included: (a) narrative reviews, (b) methodologically unsupported essays, (c) letters to the editor, (d) studies outside higher

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education, and (e) studies that did not report measurable results related to autonomous learning, academic performance, or clinical skills. In the final eligibility stage, the excluded full-text reports corresponded to 48 narrative reviews, 6 meta-analyses, and 1 letter to the editor (as reflected in the PRISMA flow).

**Table 1**

*Risk of bias judgment by included study*

| Study | Between-group Comparison | Objective academic outcome | Objective clinical/skills outcome | Overall RoB |
|---|---|---|---|---|
| Dong et al. (2021) | Yes | Yes | Yes | Moderate |
| Yang et al. (2021) | Yes | Yes | Yes | Moderate |
| Yang et al. (2024) | No | No | No | High |
| Li & Yang (2021) | No | No | No | High |
| Yeh (2022) | No | No | Yes | High |
| Joseph et al. (2021) | No | Yes | Yes | High |
| Behmanesh et al. (2022) | No | Yes | Yes | High |
| Teo et al. (2022) | No | No | Yes | High |
| Rehman & Fatima (2021) | No | Yes | Yes | High |
| El Sadik & Al Abdulmonem (2021) | No | No | Yes | High |
| Sivarajan et al. (2021) | No | Yes | Yes | High |
| Khodaei et al. (2022) | No | No | Yes | High |
| Londgren et al. (2021) | No | Yes | Yes | High |
| Sointu et al. (2023) | No | No | No | High |
| Wehling et al. (2021) | No | No | Yes | High |
| Zhu & Zhang (2022) | No | Yes | Yes | High |
| Chick et al. (2021) | No | Yes | No | High |
| Ortego et al. (2021) | No | No | Yes | High |
| Plaza & Cabezón (2025) | No | No | No | High |
| McLean & Attardi (2021) | No | No | Yes | High |
| Álvarez et al. (2022) | Yes | Yes | Yes | Moderate |
| Beltrán et al. (2025) | No | No | No | Unclear |
| Garrido et al. (2024) | No | No | No | Unclear |
| Antezana (2023) | Yes | Yes | No | Moderate |
| Ñique & Díaz (2021) | No | Yes | Yes | High |
| Aguilera et al. (2024) | No | Yes | No | High |
| Andrade & Guevara (2022) | No | No | Yes | High |

## Scope (population and sample logic)

The target "population" comprised all studies globally evaluating flipped-classroom strategies in health higher education. The "sample" was an intentional selection of studies meeting the above criteria and offering analytic value across diverse health disciplines (e.g., medicine, nursing, dentistry, pharmacy, physiotherapy, biochemistry) and geographic regions (including Latin America, Europe, Asia, and North America), as represented in the included corpus.

## Data extraction and synthesis

Data were extracted using structured matrices capturing: authors, year, country/setting, discipline, design, sample size/type, outcomes and benefits (autonomous learning, academic performance,

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clinical/skills development), limitations, and implementation features (tendencies and good practices). Analysis followed an inductive logic: meaningful units were coded and then grouped into thematic categories aligned with the review objectives (benefits, barriers, recommendations). Interpretation emphasized (i) the relationships between reported outcomes and contextual conditions, (ii) applicability across settings, and (iii) enabling and limiting factors for implementation.

### Methodological quality / risk of bias assessment

To provide a formal and transparent assessment of methodological quality / risk of bias, we applied a pragmatic, study-level RoB judgment based solely on what was explicitly reported in the extraction matrix: (1) presence of an explicit between-group comparison, (2) reporting of objective academic outcomes (e.g., grades/scores/pass rates rather than perceptions only), (3) reporting of objective clinical/skills outcomes, and (4) whether key outcomes were not reported (NR). Using an a priori decision rule, studies were rated Moderate RoB only when they reported a between-group comparison plus at least one objective outcome; they were rated High RoB when these safeguards were absent; and Unclear RoB when missing/NR reporting prevented a defensible judgment. The study-by-study RoB classification is reported in Table 1.

### Ethics and academic integrity

Because this review used only previously published studies and secondary sources, it did not involve human participants and therefore did not require ethics committee approval. Academic integrity was ensured through responsible citation, respect for copyright, and full traceability of consulted sources through the PRISMA-guided selection process and the extraction matrices.

## RESULTS

### Benefits of implementing the flipped classroom in health-related degree programs

The benefits of implementing the flipped classroom in health-related degree programs have been widely documented and can be grouped into three broad categories that demonstrate its positive impact on university training. First, the strategy stands out for its contribution to autonomous learning, self-regulation, and active student participation. Evidence indicates that the flipped-classroom model strengthens pre-class engagement through resources such as videos, guides, quizzes, and other multimedia materials that enable students to manage their time and study pace, fostering metacognitive skills that are essential in health education (Dong et al., 2021; Yang et al., 2021; Khodaei et al., 2022).

For example, Joseph et al. (2021) reported that 100% of students accessed the videos before class and 78% acknowledged improvements in motivation and concentration, while Álvarez et al. (2022) and Garrido et al. (2024) highlight advance planning, note-taking, and self-management as key indicators of autonomy. Likewise, studies such as Yang et al. (2024) and Rehman and Fatima (2021) describe that the flipped classroom strengthens reflection and the habit of independent study, supporting self-regulation, which is indispensable in professional health training. Regarding academic performance, the findings are also consistent.

Several studies have documented statistically significant improvements in final grades and in assessments that evaluate both theoretical and applied knowledge. Dong et al. (2021) reported higher mean scores in the experimental group compared with the traditional group (79.22 vs. 73.31, $p < 0.001$), Aguilera et al. (2024) reported an overall mean close to 98.32/100 with highly significant differences ($p = 0.000$), and Yang et al. (2021) recorded improvements in post-class tests and clinical analysis (FC: 35.81 ± 1.66 vs. LBT: 27.42 ± 1.91; $p = 0.0016$). In addition, Chick et al. (2021) reported a significant increase in pre-class scores (from 67% to 80%; $p = 0.031$), and Antezana (2023) highlighted an average increase of 1.4 points in nursing compared with biochemistry ($p = 0.02$).

These findings are consistent with El Sadik and Al Abdulmonem (2021) and Ñique & Díaz (2021), who note that the flipped classroom promotes deeper reasoning, more durable understanding, and effective transfer of knowledge to new assessment contexts. Finally, clinical skills development is another domain in which the strategy has shown notable benefits. Yeh (2022) reported that recorded simulations strengthen

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understanding of technical procedures and learning in nursing settings, while Joseph et al. (2021) documented that integrating clinical cases and simulations into the flipped class enhances applied skills. Similarly, Yang et al. (2021) found improvements in patient management ($p = 0.0007$), critical thinking ($p = 0.0014$), and teamwork ($p = 0.0117$) through guided discussions of real cases. Sivarajan et al. (2021) showed that students in the flipped group improved technical skills such as orthodontic wire bending ($p < 0.01$), supporting the model's value for hands-on content. Likewise, Behmanesh et al. (2022) and Rehman and Fatima (2021) reported improvements in procedures such as probing, suturing, and exam interpretation due to advance preparation with videos and interactive resources.

**Table 2**

*Benefits of implementing the flipped classroom (NR = not reported)*

| Study | Autonomous learning | Academic performance | Clinical skills |
|---|---|---|---|
| Dong et al. (2021) | Promotes autonomous study via videos/cases; supports self-regulation, reflection, metacognition. | Experimental > traditional (79.22 vs. 73.31, $p < 0.001$). | Improved critical thinking (41.8% vs. 23.3%, $p = 0.007$), self-confidence (42.9% vs. 23.3%, $p = 0.004$), and teamwork. |
| Yang et al. (2021) | Facilitates self-learning at own pace through interactive videos; improves understanding, autonomy, preparation. | Better post-class performance (78.06 vs. 65.16; $p = 0.0024$) and clinical analysis (FC: 35.81 ± 1.66 vs. LBT: 27.42 ± 1.91; $p = 0.0016$). | Higher perceived usefulness; improved patient management ($p = 0.0007$), critical thinking ($p = 0.0014$), teamwork ($p = 0.0117$) via guided real-case discussions. |
| Yang et al. (2024) | Significant gains in standardized assessment (M = 4.29), independent study (M = 4.23), reflection (M = 4.22); more pre-class autonomy. | No standardized testing; reports better analytic capacity and application of theory in clinical contexts (satisfaction/self-evaluation). | Better case analysis, clinical-question formulation, and participation in problem solving through real-case discussions. |
| Li & Yang (2021) | Encourages self-learning, self-regulation, active participation; interactive learning with continuous teacher feedback; flexible repeated access. | Not measured directly; increased self-efficacy (indirect predictor of academic improvement). | NR |
| Yeh (2022) | Flexible repeated access improved pre-class preparation and self-regulation habits. | Not measured directly; perceived better preparation/comprehension for exams and practicals. | Improved technical execution and clinical understanding via recorded simulations and autonomous practice. |
| Joseph et al. (2021) | 100% viewed pre-class videos; 78% reported better motivation/concentration; pre-quizzes strengthened preparation. | Significant improvement in overall performance and clinical-analysis items ($p < 0.0001$). | Although theoretical, used problem-solving exercises based on relevant clinical cases. |
| Behmanesh et al. (2022) | Better pre-class preparation; higher motivation and learning efficiency. | Significant gains in knowledge and practical skills ($p < 0.05$); higher satisfaction and positive learning attitude. | Better IV injections, probing, suturing; perceived efficacy and improved pre-class audiovisual review. |
| Teo et al. (2022) | Not explicit; inferred improvement in autonomous understanding via in-class interaction with clinical reality. | Slight improvement in oral comprehension/reading (listening: +0.7; reading: +0.6). | NR |
| Rehman & Fatima (2021) | Strengthened self-regulation through resources (videos, guides, VLE, WhatsApp); active-learning approach; >50% assumed responsibility for learning. | Significant improvement (19.67 to 24.60 points, $p < 0.05$) attributed to active instructional design. | Effective clinical analysis and decision-making via interactive cases centered on pregnancy. |
| El Sadik & Al Abdulmonem (2021) | Supported self-study via videos/readings; study at own pace; fostered self-directed/continuous learning. | Significant gains in cognition and analysis (Cohen's d = 1.41 and 1.01), | NR |

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| Study | Autonomous learning | Academic performance | Clinical skills |
|---|---|---|---|
| | | improving deep anatomy understanding. | |
| Sivarajan et al. (2021) | Early access to videos enabled individual practice and pre-class preparation strategies. | Significant improvement in complex components (e.g., Adams clasp, Z-spring); FC more effective for advanced tasks. | Effective development of orthodontic practical skills via autonomous pre-practice and instructor guidance. |
| Khodaei et al. (2022) | Significant increases in self-management, self-control, and desire to learn ($p \leq 0.001$) using LMS/WhatsApp; improved self-regulation and confidence. | Not measured directly; strengthened metacognitive skills as indirect performance predictors. | No direct clinical practice; included simulated theoretical exercises (cardiovascular/renal diseases). |
| Londgren et al. (2021) | Pre-class preparation with available materials increased active involvement and responsibility. | No grades reported; instructors perceived better cognitive preparation. | Class time fully dedicated to supervised clinical practice with immediate feedback; strengthened technical competencies. |
| Sointu et al. (2023) | Improved self-regulation, time management, responsibility via structured pre-materials and clear initial guidance. | No grades; student satisfaction linked to better understanding and motivation. | NR |
| Wehling et al. (2021) | Promoted pre-class preparation with interactive videos; active learning focused on clinical problems. | NR | Oriented to clinical practice (otolaryngology); useful to contextualize and solve clinical problems. |
| McLean & Attardi (2021) | Strong promotion of self-regulation/reflection via modules/quizzes; students valued active role and instructor as facilitator. | Not measured quantitatively; positive perceptions of deep, applied, critical learning. | Not directly applicable; strengthened transversal skills (critical analysis, collaboration) relevant to clinical settings. |
| Chick et al. (2021) | Increased pre-class preparation through videos; promoted autonomy. | Clear improvement in pre-class scores, especially in less advanced residents ($p < 0.05$). | Not directly measured; preparation enabled more effective in-class clinical discussions. |
| Zhu & Zhang (2022) | Pre-access to recorded classes supported autonomous preparation at the student's pace. | Perceived improvement; scores questioned due to possible online cheating. | Home-delivered simulations/materials; limited effectiveness as a replacement for in-person practice. |
| Ortego Maté et al. (2021) | Promoted self-regulation, autonomy, responsibility. | High perceived utility to acquire knowledge and pass the course. | Supported communication and key palliative-care skills, though not direct practical skills. |
| Plaza del Pino & Cabezón-Fernández (2025) | Fostered autonomous and collaborative learning. | NR | Benefits in clinical interpersonal skills (not technical skills). |
| Álvarez Vázquez et al. (2022) | Increased self-regulation, responsibility, motivation; encouraged active pre-class preparation. | Significant improvement in partial-exam results vs. traditional approach. | Facilitated pathology analysis through simulated clinical cases; no direct clinical practice. |
| Beltrán et al. (2025) | Promoted self-regulation, independent work, and pre-class preparation. | NR | NR |
| Garrido-Urrutia et al. (2024) | Encouraged self-paced study, self-regulation, responsibility; used videos, readings, note guides. | NR | NR |
| Antezana Heredia (2023) | Not explicit; inferred improved pre-organization and independent review via technological resources. | Significant improvement in experimental-group grades ($p = 0.02$), average increase up to 1.4 points (e.g., Nursing POST = 63.7 vs. Biochemistry/Pharmacy POST = 50.8). | Improved analysis, problem solving, integrated clinical thinking, teamwork. |
| Ñique-Carbajal & Díaz- | Promoted self-learning, self-regulation, interest, active reflection. | Improved retention and understanding of contents. | Not directly applied; improved communication, teamwork, and theoretical application. |

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| Study | Autonomous learning | Academic performance | Clinical skills |
|---|---|---|---|
| Manchay (2021) | | | |
| Aguilera-Meza et al. (2024) | Supported through pre-activities and personalized pace. | Very high experimental-group mean (93.22/100); significant differences (p = 0.000). | NR |
| Andrade-Encalada & Guevara-Vizcaíno (2022) | Stimulated via digital technologies, motivation, and mastery of the virtual environment. | NR | Not specified; mentions general skills linked to the healt |

Zhu and Zhang (2022) demonstrate that the flipped classroom is adaptable to remote simulation environments through tools such as Virtual Canadian Vista or supervised home practice, facilitating higher levels of technical competence. Overall, the synthesized evidence confirms that the flipped classroom is an effective educational strategy in health higher education, positively impacting autonomous learning, academic performance, and clinical skills development.

## Challenges and limitations in implementing the flipped-classroom strategy

Studies examining the implementation of the flipped classroom in health higher education have identified a set of challenges and limitations that must be understood to ensure an effective and equitable adoption of the model. One of the most significant difficulties concerns technological gaps and structural inequalities, particularly in rural settings or contexts with limited connectivity, where lack of access to devices and stable internet restricts the autonomous participation on which this strategy depends (Rehman & Fatima, 2021; Zhu & Zhang, 2022; Yeh, 2022). In addition, faculty workload and resistance have been repeatedly documented as barriers. Reconfiguring the teaching role—from transmitter to learning facilitator—requires substantial time and effort to design pedagogical resources and digital materials, often without sufficient institutional support, which generates demotivation and slows innovation (Khodaei et al., 2022; McLean & Attardi, 2021; Chick et al., 2021; Yeh, 2022).

Another key obstacle is the limited culture of autonomous learning among students. Many students have not developed strong habits of independent study, self-regulation, or intrinsic motivation, largely due to prior educational experiences that favored passive models (Li & Yang, 2021; Ortego et al., 2021). As a result, face-to-face sessions are not always fully leveraged for the active work the flipped classroom requires.

A further challenge is the lack of pedagogical training among faculty in active-learning strategies and the use of technological tools. As noted by Beltrán et al. (2025) and Aguilera et al. (2024), in many contexts instructors do not receive specialized preparation to redesign their practice under this approach; consequently, implementations can become superficial and end up reproducing lecture-based dynamics under new formats.

Limitations in assessment also emerge as a major barrier, because traditional instruments do not align well with the flipped-classroom logic, hindering the appraisal of deep learning and critical thinking in clinical environments (Sointu et al., 2023; Andrade & Guevara, 2022). Likewise, scarcity of institutional resources can compromise implementation quality: insufficient infrastructure, interactive platforms, educational software, and well-designed audiovisual material negatively affect the model's effectiveness (Wehling et al., 2021; Antezana, 2023).

In addition, the complexity of adapting clinical and procedural content to the flipped-classroom format poses specific challenges in the health sciences. Certain technical skills require direct supervision and practice in real settings; therefore, virtual content must be articulated with guided face-to-face sessions that enable the consolidation of clinical competencies (Sivarajan et al., 2021; Teo et al., 2022).

Finally, a cross-cutting limitation is the weak measurement of objective outcomes supporting the impact of the flipped classroom. Many studies report positive student perceptions but lack empirical evidence demonstrating concrete improvements in grades, practical performance, or the acquisition of

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clinical competencies, which limits their capacity to persuade institutions regarding the model's effectiveness and sustainability (Garrido et al., 2024; Londgren et al., 2021). Taken together, these barriers indicate that expanding the flipped classroom in health higher education depends on a systemic approach that includes technological resources, faculty development, curricular redesign, coherent assessment strategies, and a clear institutional commitment to active and autonomous learning.

**Table 3**

*Challenges and limitations in implementing the flipped classroom in health-related degree programs*

| Category | Observed consequences (brief) | Reference |
|---|---|---|
| Technological Limitations | Hinders students' pre-class preparation and reduces learning autonomy. | Rehman & Fatima (2021); Zhu & Zhang (2022) |
| Faculty workload | Increases work-related stress and undermines sustainability without institutional support. | Khodaei et al. (2022); McLean & Attardi (2021) |
| Resistance to pedagogical change | Delays institutional adoption and reduces model effectiveness. | Chick et al. (2021); Yeh (2022) |
| Low student motivation or preparation | Wastes class time and weakens the effectiveness of face-to-face sessions. | Li & Yang (2021); Ortego et al. (2021) |
| Lack of faculty training | Leads to superficial implementations that do not change traditional classroom dynamics. | Beltrán et al. (2025); Aguilera et al. (2024) |
| Assessment difficulties | Evaluations fail to capture real development of practical skills or deep cognitive learning. | Sointu et al. (2023); Andrade & Guevara (2022) |
| Limited institutional resources | Poor materials demotivate students and reduce the model's impact. | Wehling et al. (2021); Antezana (2023) |
| Difficulty adapting clinical content | Risk of superficial practical understanding unless complemented with guided in-person sessions. | Sivarajan et al. (2021); Teo et al. (2022) |
| Limited impact evaluation | Insufficient robust evidence to support institutional-scale implementation. | Garrido et al. (2024); Londgren et al. (2021) |

## Trends, best practices, and recommendations

The analysis of recent studies on the flipped classroom in health education reveals a coherent set of trends, best practices, and recommendations that guide its effective curricular implementation. The reviewed research consistently highlights that this pedagogical strategy has contributed significantly to strengthening autonomous and self-regulated learning, by enabling students to access content in advance, manage their time more efficiently, and assume greater responsibility for their learning process (Li & Yang, 2021; Khodaei et al., 2022; Garrido et al., 2024). This autonomy is supported not only by the model's didactic structure but also by the use of technological resources such as virtual learning environments (VLEs), academic messaging platforms, and multimedia materials, which allow students to study at their own pace and revisit content according to their cognitive needs.

A prominent trend is the increasing integration of the flipped classroom with other active methodologies, such as problem-based learning, clinical case studies, and simulation in virtual environments, which strengthens the transition from theoretical knowledge to simulated clinical practice. This methodological integration has been shown to foster analytical skills, critical thinking, and problem solving—competencies that are central to contemporary medical education (Behmanesh et al., 2022; Zhu & Zhang, 2022; Ortego et al., 2021). In parallel, several studies emphasize that the model is particularly beneficial for students with lower prior academic performance, because it provides greater exposure to content, ongoing formative feedback, and increased opportunities for active participation in class (Chick et al., 2021; Joseph et al., 2021). This feature positions the flipped classroom as a strategy with potential to reduce educational gaps and inequalities.

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**Table 4**

*Evidence on the flipped classroom in health education*

| Dimension | Subcategory | Key evidence (brief) | Studies |
|---|---|---|---|
| 1. Research trends | Flipped classroom as a self-regulation tool | Promotes autonomy, active learning, responsibility, and self-management (with or without technological mediation). | Li & Yang (2021); McLean & Attardi (2021); Sointu et al. (2023); Aguilera et al. (2024) |
| | Combined approach: flipped classroom + active methods | Integrated with simulation, gamification, and service-learning to strengthen clinical thinking. | Yang et al. (2024); Yeh (2022); Beltrán et al. (2025); Dong et al. (2021) |
| | Impact on vulnerable/low-performing groups | Benefits tend to be greater among students with prior difficulties or low academic performance. | Joseph et al. (2021); Chick et al. (2021) |
| | Post-COVID transition to hybrid models | Consolidated as a post-pandemic hybrid strategy; emphasis on flexibility and accessibility. | Zhu & Zhang (2022); Wehling et al. (2021); Garrido et al. (2024) |
| 2. Pedagogical best practices | Structured pre-class preparation and asynchrony | Use of sequenced, flexible-access multimedia resources (videos, podcasts, guides). | El Sadik & Al Abdulmonem (2021); Rehman & Fatima (2021); Antezana (2023) |
| | Intentional use of digital platforms and collaboration tools | Platforms such as Moodle, Canvas, WhatsApp, Zoom, H5P, and institutional VLEs support learning. | Khodaei et al. (2022); Garrido et al. (2024); Zhu & Zhang (2022) |
| | Formative assessment and continuous feedback | Rubrics, formative quizzes, and immediate feedback aligned with active learning. | Sivarajan et al. (2021); Yeh (2022); McLean & Attardi (2021) |
| | Clinical contextualization within the flipped model | Simulation, clinical cases, debates, medical-record analysis, and remote practical tools. | Behmanesh et al. (2022); Teo et al. (2022); Londgren et al. (2021) |
| | Emotionally safe, collaborative environments | Instructor–student interaction and emotional support facilitate implementation. | Sointu et al. (2023); Plaza & Cabezón (2025) |
| 3. Curricular implementation recommendations | Technical and pedagogical faculty development | Training needed in instructional design, educational technologies, and active-learning dynamics. | Li & Yang (2021); Khodaei et al. (2022); Chick et al. (2021) |
| | Progressive, institution-level curricular redesign | Gradual integration recommended; avoid cognitive overload and align with training level. | Yang et al. (2024); Dong et al. (2021); Beltrán et al. (2025) |
| | Mixed-method impact evaluation | Combine objective outcomes (tests, grades) with perceptions and metacognition. | Yeh (2022); Aguilera et al. (2024); Ortego et al. (2021) |
| | Methodological flexibility by discipline and level | Avoid mechanical standardization; adapt to content, skills, and clinical context. | McLean & Attardi (2021); Zhu & Zhang (2022); Andrade & Guevara (2022) |

Another relevant finding is that flipped-classroom implementation has accelerated and consolidated as part of emerging hybrid models after the COVID-19 pandemic. The asynchronous nature of many resources supports pedagogical continuity even in contexts of disruption or remote education, expanding institutional legitimacy of the flipped classroom as a sustainable and resilient teaching strategy (Zhu & Zhang, 2022; Beltrán et al., 2025).

Regarding best practices, studies stress the need to offer high-quality materials intentionally designed for pre-class preparation. The use of short videos, interactive guides, directed readings, and pre-class quizzes has been widely valued by students, who report that these inputs improve understanding, motivation, and readiness for in-class work (McLean & Attardi, 2021; El Sadik & Al Abdulmonem, 2021). This is reinforced by the importance of accessible technological environments that not only facilitate content access but also enable interaction, individualized monitoring, and instructor feedback—especially relevant in practice-oriented programs such as Medicine, Nursing, and Dentistry.

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Studies also recommend transforming assessment practices by prioritizing formative assessment and continuous feedback, rather than relying exclusively on summative exams. This approach supports metacognition, learning regulation, and progressive improvement in student performance (Sivarajan et al., 2021; Yeh, 2022). Face-to-face sessions, freed from the burden of theoretical exposition, can then be devoted to simulated clinical activities, debates, case analysis, or collaborative exercises that consolidate knowledge transfer to real or simulated situations. This reorganization of instructional time is consistently identified as a structural strength of the model (Londgren et al., 2021; Antezana, 2023).

In terms of recommendations, the reviewed evidence clearly indicates that successful flipped-classroom implementation requires comprehensive faculty development, encompassing not only technological tool mastery but also instructional redesign, multimedia material production, and the management of student-centered methodologies. Instructors must move from the role of lecturer to that of mediator, guide, and facilitator of active learning—an evolution that requires continuous professional development and institutional support (Khodaei et al., 2022; Aguilera et al., 2024).

In addition, the flipped classroom should not be integrated into curricula in an improvised or fragmented manner; rather, it should be part of a progressive and contextualized curricular redesign that considers the type of course, training level, learning objectives, and real infrastructure conditions. Integration should be gradual, flexible, and continuously evaluated to ensure alignment with the pedagogical goals of health programs (Yang et al., 2024; Beltrán et al., 2025). In this regard, studies recommend adopting mixed methods to evaluate the model's impact, combining quantitative indicators (e.g., grades, pass rates, academic progression) with qualitative analyses (e.g., student perceptions, satisfaction, reflection, or knowledge appropriation), thereby enabling a more comprehensive understanding of this modality's pedagogical effects (Yeh, 2022; Ortego et al., 2021).

Finally, studies agree that there is no single flipped-classroom model applicable to all contexts. Implementation should respond to the particular characteristics of each institution, course, cohort, and region, adapting resources, timing, and methodologies to ensure equity, inclusion, and pedagogical sustainability. This flexibility is crucial so that the flipped classroom is not understood as just another technique, but rather as a structural commitment to a more participatory, critical, and student-centered health education.

## DISCUSSION

The findings confirm that the flipped classroom tends to enhance autonomous learning and improve academic outcomes, in line with international evidence. In this review, we identified clear benefits in self-regulation, grades, and the development of clinical thinking, reflecting patterns reported in prior literature. Similarly, Hew and Lo (2018) found in a meta-analysis a significant overall effect in favor of the flipped classroom in health education (SMD≈0.33; $p<0.001$), and Naing et al. (2023) reported that flipped-classroom students achieved better academic performance (SMD≈0.57) and higher satisfaction (SMD≈0.48) compared with traditional teaching. Banks and Kay (2022) also indicate that most health-sciences studies observe improvements in academic performance (67% of cases) and student satisfaction (54%) after implementing the flipped model. These figures align with our results: several included articles showed statistically significant increases in grades and clinical case resolution in the flipped group, along with high levels of self-reported satisfaction and motivation. Likewise, reviews in nursing highlight neutral-to-positive academic outcomes with the flipped classroom (Betihavas et al., 2016) and predominantly favorable results in knowledge, skills, and attitudes (Youha-san et al., 2021), which is consistent with our overall pattern of learning improvement.

Concordantly, prior literature emphasizes that the flipped classroom stimulates self-directed learning. This analysis specified how students use videos and pre-class materials to study at their own pace, as shown by Li & Yang (2021) and other cited authors, who found that most Chinese students considered this method highly useful for strengthening self-learning capacity, problem solving, and teamwork. Banks and Kay (2022) attribute positive performance changes to well-designed curricula that promote self-efficacy, noting that participants reported greater autonomy, preparation of their own summaries, and reflection on their study—elements consistent with self-regulation effects. From a clinical perspective, although the

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prior evidence base is smaller, observations of improved reasoning and case-based participation align with individual studies (e.g., Yang et al., 2021) suggesting advances in critical thinking and application of concepts in simulated contexts. However, as Li et al. (2020) also point out, there are practically no data measuring long-term effects on professional practice or patient outcomes. This underscores that the contribution to clinical skills remains preliminary and requires more longitudinal research, as recent reviews recommend.

Nevertheless, discrepancies and limitations also emerge. Some authors report variability in benefits or less conclusive evidence. In this review, we observed that changes in the teaching role, workload, and technological gaps can reduce the expected impact. This is consistent with Li et al. (2020), who warned that students reported greater workload and perceived inefficiency compared with traditional classes. Our analysis also highlighted that producing interactive content often demands substantial faculty time, as other studies likewise indicate. Similarly, Chen et al. (2017), reviewing flipped medical classrooms, detected highly heterogeneous effects on knowledge (effect sizes from –0.27 to 1.21, median ~0.08), suggesting that in many cases differences versus traditional teaching are not statistically robust. Evans et al. (2019) also concluded that, although most studies report specific improvements, the evidence is not "conclusive" regarding the flipped classroom's effectiveness beyond traditional instruction.

In our sample, we observed conditions similar to those described in prior reviews: limited longitudinal follow-up, infrequent use of objective metrics (standardized tests, real performance), and the frequent absence of randomized control groups—limitations noted both in our study and in the review by Naing et al. (2023). This aligns with broader critiques of combining subjective data (perceptions, surveys) with hard academic outcomes to draw robust conclusions.

Regarding pedagogical constraints, we identified that factors such as infrastructure and educational culture influence outcomes. Several included studies mention inequitable access to technological resources and resistance among some students to autonomous methods—issues also reported in international research. For example, just as this study confirmed challenges in faculty training and adapted curricular design, the systematic review by Banks and Kay (2022) emphasized the need for well-structured training strategies to improve satisfaction and self-efficacy. In this sense, both the global evidence base and the present study recommend that the flipped classroom be implemented gradually, with adequate technological support and, when possible, with multimedia resources developed by experts to optimize instructor time and didactic quality.

Finally, the results of this review contribute some original perspectives to the existing corpus. We included very recent studies (up to 2025) and contexts less represented in earlier reviews. For instance, we synthesized current Latin American and Middle Eastern research pointing to emerging trends: combinations of the flipped classroom with clinical simulations, problem-based learning, or gamification—elements only marginally addressed in previous meta-analyses. This expansion also includes, for example, adaptive educational designs inspired by Díaz et al. (2024) that personalize prestudy according to individual level, a still-emerging topic in the international literature. Moreover, the present study's emphasis on validating results with objective indicators (as reflected in the "weak measurement of outcomes" category) responds to an explicit call by authors such as Naing et al. (2023), who advocate for better-designed studies.

Overall, while this review aligns with prior reviews regarding the flipped classroom's core benefits, it extends the discussion by highlighting specific barriers and actionable interventions (optimal video length, interactive tools, use of collaborative platforms) that complement general recommendations in the literature and offer more detailed practical guidance for health educators..

## CONCLUSION

This review clarified the pedagogical foundations underpinning the flipped-classroom strategy in university-level health programs, highlighting its constructivist basis and its capacity to reconfigure traditional teaching through student autonomy and active participation. The literature indicates that this model positively influences self-regulation, personal organization, and intrinsic motivation, enabling face-to-face time to be used more effectively for problem solving and reflection on professional practice. Evidence also shows that the flipped classroom contributes to improved academic performance, with statistically significant gains in

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knowledge tests and theoretical–practical assessments, alongside greater retention and understanding of course content. Likewise, its implementation has proven particularly useful for strengthening clinical skills development by facilitating the integration of theory and practice through simulations, case-based learning, and preparatory materials that optimize in-person sessions.

However, the review also identified challenges such as faculty resistance to methodological change, workload increases associated with instructional redesign, insufficient technological training, and unequal student access to digital resources—factors that condition the strategy's effectiveness depending on the institutional context. Among the most notable trends is the integration of the flipped classroom with other active methodologies, such as problem-based learning, simulation, and gamification, which can amplify its impact and promote collaborative and reflective engagement. The evidence also points to best practices, including the production of well-designed digital content, continuous formative assessment, and the reorganization of class time toward complex problem solving.

Recommendations emerging from the reviewed studies include providing targeted pedagogical training for instructors, ensuring adequate technological conditions, integrating the model gradually into curricula, and implementing evaluation processes that combine objective measures with qualitative appraisals. As a limitation of the present work, we acknowledge that the review prioritized international studies and, in some cases, relied on participants' self-reported outcomes, without consistently incorporating standardized indicators of clinical performance. Even so, this synthesis offers a rigorous contribution to understanding the scope of the flipped classroom and the conditions required for its effective implementation in health higher education.

## BIBLIOGRAPHY

Aguilera, C., Delgado, E., Montes, C., Moreira, J. Zambrano, W. (2024). Eficacia del modelo aula invertida en el rendimiento académico de estudiantes universitarios. *Revista Ciencias Pedagógicas E Innovación*, *12*(2), 27-38. https://doi.org/10.26423/rcpi.v12i2.791

Álvarez, M., Hernández, C., de Diego, C. & García, L. (2023). Aplicación del aula invertida adaptativa en Histología. Impacto y satisfacción del alumnado. In *II Jornada «Aprendizaje Eficaz con TIC en la UCM»* (pp. 75-86). Ediciones Complutense. https://produccioncientifica.ucm.es/documentos/63ddb46d2a23c12be0a22666

Antezana, E. (2023). Impacto del aula invertida en el rendimiento académico: Una experiencia en estudiantes de salud. *Revista UNO*, *3*(5), 51–60. http://doi.org/10.62349/revistauno.v.3i5.21

Banks, L. & Kay, R. (2022). Exploring flipped classrooms in undergraduate nursing and health science: a systematic review. *Nurse Education in Practice*, *64*, 103417. http://doi.org/10.1016/j.nepr.2022.103417

Barranquero, M., Abajas, R. & Ortego, C. (2022). Effectiveness of flipped classroom in nursing education: A systematic review of systematic and integrative reviews. *International Journal of Nursing Studies*, *135*, 104327. https://doi.org/10.1016/j.ijnurstu.2022.104327

Behmanesh, F., Bakouei, F., Nikpour, M. & Parvaneh, M. (2022). Comparing the effects of traditional teaching and flipped classroom methods on Midwifery students' practical learning: the embedded mixed method. *Technology, Knowledge and Learning*, 1-10. https://doi.org/10.1007/s10758-020-09478-y

Beltrán, A., Riquelme, C., Sandoval, J. & Chuhuaicura, P. (2025). Metodologías de amplio impacto en la formación odontológica en la Universidad de La Frontera, Chile. *International Journal of Odontostomatology*, *19*(1), 40–44. https://doi.org/10.4067/S0718-381X2025000100040

Betihavas, V., Bridgman, H., Kornhaber, R. & Cross, M. (2016). The evidence for 'flipping out': A systematic review of the flipped classroom in nursing education. *Nurse education today*, *38*, 15-21. https://doi.org/10.1016/j.nedt.2015.12.010

Cantuña, A. & Cañar, C. (2020). Revisión sistemática del aula invertida en el Ecuador: aproximación al estado del arte. *Estudios pedagógicos (Valdivia)*, *46*(3), 45-58. http://dx.doi.org/10.4067/S0718-07052020000300045

Chen, F., Lui, A. & Martinelli, S. (2017). A systematic review of the effectiveness of flipped classrooms in medical education. *Medical education*, *51*(6), 585-597. https://doi.org/10.1111/medu.13272

Chick, R., Adams, A., Peace, K., Bohan, P. & Schwantes, I., Clifton, G. & Vreeland, T. (2021). Using the flipped classroom model in surgical education: efficacy and trainee perception. *Journal of surgical education*, *78*(6), 1803-1807. https://doi.org/10.1016/j.jsurg.2021.05.008

Clark, R., Kaw, A. & Braga, R. (2022). Adaptive learning: Helpful to the flipped classroom in the online environment of COVID?. *Computer Applications in Engineering Education*, *30*(2), 517-531. https://doi.org/10.1002/cae.22470

da Silva, E., Moura, E., Bezerra, A. & Lima, S. (2025). Flipped classroom in higher health education: a system-

SOUTHAMERICAN RESEARCHJOURNAL
ISSN 2806-5638

atic review. *Research, Society and Development*, *10*(14), e434101422083. https://doi.org/10.33448/rsd-v10i14.22083

Díaz, M., Nuñez, R., Brito, X., Jameson, A., Moscoso, F. & Riquelme, P. (2024). Flipped Classroom as an Active Strategy in Higher Education. *American J Sci Edu Re: AJSER-217*. https://www.cmjpublishers.com/wp-content/uploads/2024/11/flipped-classroom-as-an-active-strategy-in-higher-education.pdf#:~:text=is%20opposed%20to%20rote%20learning,out%20by%20Vygotsky%20is%20that

Dong, Y., Yin, H., Du, S. & Wang, A. (2021). The effects of flipped classroom characterized by situational and collaborative learning in a community nursing course: A quasi-experimental design. *Nurse Education Today*, *105*, 105037. https://doi.org/10.1016/j.nedt.2021.105037

Durán, M. & Vigueras, J. (2023). Aula invertida inteligente como estrategia didáctica emergente para la enseñanza aprendizaje de matemática. *Revista Cubana de Educación Superior*, *42*(1 ene-abr), 243-259. https://www.researchgate.net/profile/Jose-Vigueras-Moreno-2/publication/378347543

El Sadik, A. & Al Abdulmonem, W. (2021). Improvement in student performance and perceptions through a flipped anatomy classroom: Shifting from passive traditional to active blended learning. *Anatomical Sciences Education*, *14*(4), 482-490. https://doi.org/10.1002/ase.2015

Evaristo, T. & Mattos, M. (2019). Flipped learning for teaching biostatistics to peruvian dental students. *Journal of Oral Research*, *8*(2), 159-165. https://doi.org/10.17126/joralres.2019.025

Garrido, C., Rojas, F., & Raiqueo, E. (2024). Metodología de aula invertida en educación remota de emergencia para estudiantes de Odontología. Antofagasta, Chile. *EDUMECENTRO*, 16, e2718. http://scielo.sld.cu/pdf/edu/v16/2077-2874-edu-16-e2718.pdf

Gatica, M. & Rubí, P. (2021). La clase magistral en el contexto del modelo educativo basado en competencias. *Revista Electrónica Educare*, *25*(1), 321-332. http://dx.doi.org/10.15359/ree.25-1.17

Hew, K. & Lo, C. (2018). Flipped classroom improves student learning in health professions education: a meta-analysis. *BMC medical education*, *18*, 1-12. https://doi.org/10.1186/s12909-018-1144-z

Joseph, M., Roach, E., Natarajan, J., Karkada, S. & Cayaban, A. (2021). Flipped classroom improves Omani nursing students performance and satisfaction in anatomy and physiology. *BMC nursing*, *20*, 1-10. https://doi.org/10.1186/s12912-020-00515-w

Khodaei, S., Hasanvand, S., Gholami, M., Mokhayeri, Y. & Amini, M. (2022). The effect of the online flipped classroom on self-directed learning readiness and metacognitive awareness in nursing students during the COVID-19 pandemic. *BMC nursing*, *21*(1), 22. https://doi.org/10.1186/s12912-022-00804-6

Li, L. & Yang, S. (2021). Exploring the Influence of Teacher-Student Interaction on University Students' Self-Efficacy in the Flipped Classroom. *Journal of Education and Learning*, *10*(2), 84-90. https://eric.ed.gov/?id=EJ1290544

Li, S., Liao, X., Burdick, W. & Tong, K. (2020). The effectiveness of flipped classroom in health professions education in China: a systematic review. *Journal of Medical Education and Curricular Development*, *7*, 2382120520962838.

Londgren, M., Baillie, S., Roberts, J. & Sonea, I. (2021). A survey to establish the extent of flipped classroom use prior to clinical skills laboratory teaching and determine potential benefits, challenges, and possibilities. *Journal of Veterinary Medical Education*, *48*(4), 463-469. https://doi.org/10.3138/jvme-2019-0137

López, M., Hincapié, D., Rodríguez, M., Peña, A., Pinzón, N. & Consuelo, N. (2021). Consideraciones acerca del aula invertida AI (FLIPPED CLASSROOM). *Revista Repertorio de Medicina & Cirugía*, *30*(2), 188-194. https://revistas.fucsalud.edu.co/index.php/repertorio/article/view/1087

Mariscal, S., Mariscal, N., Santur, J. & Mariscal, Z. (2024). El uso del aula invertida a nivel universitario en Latinoamérica y España. *TECNOLOGI-K*, *7*(1), 60-79. http://revista.istb.edu.ec/index.php/tecnologi-k/article/download/55/39

Mascolo, M. (2009). Beyond student-centered and teacher-centered pedagogy: Teaching and learning as guided participation. *Pedagogy and the human sciences*, *1*(1), 3-27. https://scholarworks.merrimack.edu/phs/vol1/iss1/6/

McLean, S. & Attardi, S. (2018). Sage or guide? Student perceptions of the role of the instructor in a flipped classroom. *Active Learning in Higher Education*, *1*–13. https://doi.org/10.1177/1469787418793725

Mora, J. (2020). La educación basada en problemas y la clase invertida para los procesos de enseñanza aprendizaje en medicina. En D. L. Durán, C. A. Barajas, M. C. Tocancipá, M. Torres, I. Silva, O. A. Martínez, M del P. Bonilla & M. Y. Arandia. *Formación y manejo del cuerpo desde la educación para la salud y la antropología* (1 edición, pp. 121-137) Fundación Universitaria Juan N. Corpas. Centro Editorial Ediciones FEDICOR. https://doi.org/10.26752/9789589297445.7

Moreira, D. & García, M. (2024). Motivation in academic performance. *International Research Journal of Management, IT and Social Sciences*, *11*(1), 30-38. https://doi.org/10.21744/irjmis.v11n1.2403

Naing, C., Whittaker, M., Aung, H., Chellappan, D. & Riegelman, A. (2023). The effects of flipped classrooms to improve learning outcomes in undergraduate health professional education: a systematic review. *Campbell Systematic Reviews*, *19*(3), e1339. https://doi.org/10.1002/cl2.1339

SOUTHAMERICAN RESEARCHJOURNAL
ISSN 2806-5638

Ñique, C. & Díaz, R. (2021). *Nivel de satisfacción de los estudiantes de bioquímica sobre la metodología de aula invertida aplicada durante la pandemia por COVID-19 en una escuela de enfermería*. *FEM: Revista de la Fundación Educación Médica*, *24*(5), 245–249. https://doi.org/10.33588/fem.245.1144

Ortego, M., Briones, E., Melero, M., Palacios, B., Prieto, A., & Fernández, R. (2021). Valoración del Aula Invertida como metodología en la educación para el final de la vida por estudiantes de Enfermería. *Revista del Congrés Internacional de Docència Universitària i Innovació (CIDUI)*, (5). https://www.raco.cat/index.php/Revista-CIDUI/article/download/389935/486503

Paredes, K., Salazar, J. & Simancas, L. (2024). Modelo del docente: Profesionalización y mejora del desempeño pedagógico y tecnológico. *European Public & Social Innovation Review*, *9*, 1-16. https://doi.org/10.31637/epsir-2024-1845

Phillips, J. & Wiesbauer, F. (2022). The flipped classroom in medical education: A new standard in teaching. *Trends in Anaesthesia and Critical Care*, *42*, 4-8. https://doi.org/10.1016/j.tacc.2022.01.001

Plaza, F. J., & Cabezón, M. (2025). Training intercultural competence in nursing studies through flipped classroom and podcasts / Formación en competencias interculturales en los estudios de enfermería a través del método del aula invertida y el uso de pódcast. *Culture and Education*, *37*(2), 526-541.https://doi.org/10.1177/11356405251330734

Prieto, A., Barbarroja, J., Álvarez, S. & Corell, A. (2021). Eficacia del modelo de aula invertida (flipped classroom) en la enseñanza universitaria: una síntesis de las mejores evidencias. *Revista de educación*, (391), 149-177. https://uvadoc.uva.es/handle/10324/73963

Prieto, A., Barbarroja, J., Lara, I., Díaz, D., Pérez, A., Monserrat, J. & Álvarez, M. (2019). Aula invertida en enseñanzas sanitarias: recomendaciones para su puesta en práctica. *FEM: Revista de la Fundación Educación Médica*, *22*(6), 253-262. https://dx.doi.org/10.33588/fem.226.1031

Rehman, R. & Fatima, S. (2021). An innovation in Flipped Class Room: A teaching model to facilitate synchronous and asynchronous learning during a pandemic. *Pakistan journal of medical sciences*, *37*(1), 131-142. https://dx.doi.org/10.12669/pjms.37.1.3096

Sivarajan, S., Soh, E., Zakaria, N., Kamarudin, Y., Lau, M., Bahar, A. & Naimie, Z. (2021). The effect of live demonstration and flipped classroom with continuous formative assessment on dental students' orthodontic wire-bending performance. *BMC Medical Education*, *21*, 1-12. https://doi.org/10.1186/s12909-021-02717-5

Sointu, E., Hyypiä, M., Lambert, M., Hirsto, L., Saarelainen, M. & Valtonen, T. (2023). Preliminary evidence of key factors in successful flipping: Predicting positive student experiences in flipped classrooms. *Higher Education*, *85*(3), 503-520. https://doi.org/10.1007/s10734-022-00848-2

Teo, T., Khazaie, S. & Derakhshan, A. (2022). Exploring teacher immediacy-(non) dependency in the tutored augmented reality game-assisted flipped classrooms of English for medical purposes comprehension among the Asian students. *Computers & Education*, *179*, 104406. https://doi.org/10.1016/j.compedu.2021.104406

Wehling, J., Volkenstein, S., Dazert, S., Wrobel, C., van Ackeren, K., Johannsen, K. & Dombrowski, T. (2021). Fast-track flipping: flipped classroom framework development with open-source H5P interactive tools. *BMC Medical Education*, *21*(1), 351. https://doi.org/10.1186/s12909-021-02784-8

Xi, J. (2022). Research on flipped classroom of university curriculum using eye movement analysis and LSTM neural network. *Wireless Communications and Mobile Computing*, *2022*(1), 2559864. https://doi.org/10.1155/2022/2559864

Yang, F., Lin, W. & Wang, Y. (2021). Flipped classroom combined with case-based learning is an effective teaching modality in nephrology clerkship. *BMC Medical Education*, *21*, 1-7. https://doi.org/10.1186/s12909-021-02723-7

Yang, W., Zhang, X., Chen, X., Lu, J. & Tian, F. (2024). Based case-based learning and flipped classroom as a means to improve international students' active learning and critical thinking ability. *BMC Medical Education*, *24*(1), 759. https://doi.org/10.1186/s12909-024-05758-8

Yeh, Y. (2022). Student Satisfaction with Audio-Visual Flipped Classroom Learning: A Mixed-Methods Study. *International Journal of Environmental Research and Public Health*, *19*(3), 1053. https://doi.org/10.3390/ijerph19031053

Youhasan, P., Chen, Y., Lyndon, M. & Henning, M. (2021). Exploring the pedagogical design features of the flipped classroom in undergraduate nursing education: a systematic review. *BMC nursing*, *20*, 1-13. https://doi.org/10.1186/s12912-021-00555-w

Zhu, M. & Zhang, Y. (2022). Medical and public health instructors' perceptions of online teaching: A qualitative study using the Technology Acceptance Model 2. *Education and information technologies*, *27*(2), 2385-2405. https://doi.org/10.1007/s10639-021-10681-2

Zumstein-Shaha, M. & Grace, P. J. (2023). Competency frameworks, nursing perspectives, and interdisciplinary collaborations for good patient care: Delineating boundaries. *Nursing Philosophy*, *24*(1), e12402. https://doi.org/10.1111/nup.12402

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