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LITERATURE REVIEW: TRANSFORMATION OF CLASSROOM ENVIRONMENTS THROUGH TOUCH SCREENS, AN EXPERIENCE OF EDUCATIONAL INNOVATION

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Abstract
The integration of touchscreen technology in classroom environments represents a significant transformation in higher education teaching and learning processes. This literature review, based on the SALSA methodological framework, explores scientific evidence on the pedagogical impact of interactive technologies in university classrooms, with a focus on the experience of Universidad Tecnológica Israel (Ecuador). Findings reveal that such tools enhance student motivation, active learning, inclusion, and the development of digital competencies, particularly when combined with active methodologies such as flipped classroom and cooperative learning. Additionally, touchscreen technologies foster greater student engagement, support diverse learning styles, and facilitate the use of multimodal educational resources. However, critical challenges persist, including the need for technopedagogical training for faculty, curricular adaptation, and institutional sustainability. In the Ecuadorian context, initiatives driven by local governments and universities demonstrate progressive efforts toward digital equity, although further systematization and longitudinal studies are necessary. This study provides a robust theoretical framework that supports the implementation of touchscreen displays as an educational innovation strategy, integrating teaching, research, and community engagement. Ultimately, it highlights the importance of building inclusive, technology-mediated educational ecosystems oriented toward meaningful learning, with social relevance and institutional projection.

Keyword: educational innovation, educational technology, higher education, touchscreen displays, active learning, inclusive education

INTRODUCTION

The integration of interactive technologies in educational environments has revolutionized teaching-learning methodologies, promoting more active student participation and facilitating adaptation to various learning styles. Globally, touch screens have emerged as key tools to foster more dynamic and collaborative learning environments (Mimio, 2022; Wang & Reid, 2025). These technologies allow educators to design more personalized and inclusive experiences, tailored to the individual needs of learners (Zhang & Smith, 2025).

Studies have shown that the use of touch screens in the classroom increases student motivation and engagement. A recent meta-analysis showed that learning using touch screens has a significant effect on improving learning in young children, especially in terms of motor skills and sensory comprehension (Wang & Reid, 2025). In addition, it has been observed that touch screens promote more effective collaborative environments, encouraging group work and active learning (Sharp USA, 2022; Touchscreen Learning, 2023).

In the Ecuadorian context, the adoption of educational technologies has been driven by government and private initiatives that seek to close the digital divide and improve the quality of education. For example, in 2022, the Municipality of Guayaquil provided more than 200 educational establishments with interactive digital screens, benefiting approximately 130,000 students (Ecuador Comunicación, 2022). At the university level, research such as that of Candelario Villamar and Posligua Olmedo (2024) at the Technical University of Babahoyo concludes that these technologies promote more meaningful learning and effectively complement traditional teaching.

However, incorporating touch technologies also poses challenges. Among them are the need for teacher training, curricular adaptation, and investment in infrastructure (Coronel, 2021). The literature indicates that, although the tools are available, their impact depends to a large extent on the pedagogical use given to them (Zhang & Smith, 2025).

Within this framework, the Israel Technological University of Quito has developed a project to implement touch screens in its classroom environments, with the aim of innovating and improving teaching-learning processes. This literature review, following the SALSA approach (Booth et al., 2016), aims to identify, evaluate, synthesize, and analyze the existing scientific evidence on the impact of these technologies on teaching-learning processes. The aim is to provide a robust theoretical framework that supports future research and institutional decisions on technological integration in higher education.

LITERATURE REVIEW

The SALSA (Search, Appraisal, Synthesis, and Analysis) methodology has established itself as a rigorous and systematic approach to literature reviews in the social and educational sciences, since it allows not only to identify and gather relevant information, but also to critically evaluate the quality of the sources, synthesize the findings, and perform an in-depth analysis that brings new knowledge to the field (Booth, Sutton, & Papaioannou, 2016). In the context of the implementation of touch screens for the innovation of the teaching-learning process, the SALSA approach is especially appropriate because it facilitates a structured review that integrates both the diversity of international studies and local experiences in Ecuador, thus ensuring a comprehensive and grounded understanding of the impacts, benefits and challenges associated with this educational technology.

SEARCH AND INCLUSION CRITERIA

A systematic search was conducted in academic databases such as Scopus, Web of Science, ERIC and Google Scholar, using combinations of keywords in English and Spanish: "touchscreen in education", "interactive displays in classrooms", "touch screens in higher education", "interactive technologies in the classroom". Articles between 2018 and 2025, peer-reviewed and with an empirical or review approach, were prioritized.

QUALITY ASSESSMENT (APPRAISAL)

The selected studies were evaluated based on their methodological rigor, internal validity and relevance to the topic. Quantitative and qualitative research and meta-analyses were included that explored the impact of touch screens on teaching-learning, both in school and university contexts

SYNTHESIS OF FINDINGS

The findings were grouped into three thematic categories:
Impact on student learning and motivation:

Numerous studies indicate that the use of touch screens improves motivation, engagement, and information retention. A meta-analysis by Wang and Reid (2025) evidenced significant improvements in early learning thanks to the use of tactile technologies, highlighting their value for sustained attention and multisensory interaction.

Zhang and Smith (2025) found that these technologies promote active learning, improving conceptual understanding and facilitating the participation of students with different cognitive styles. In university contexts, Sharp USA (2022) points out that students interact more with content and engage in collaborative discussions when touch screens are used.

This evidence allows us to understand that the incorporation of touch screens should not be considered a simple modernization of the classroom, but a transformative intervention in the cognitive and motivational processes of students. The improvement in sustained attention and active participation, as Wang and Reid point out, is related to the multisensory and immersive nature of these technologies, which respond to the requirements of today's students, digital natives who process information visually, tactilely, and quickly. Likewise, Zhang and Smith's finding on the facilitation of active learning suggests that the pedagogical value of screens lies in their ability to adapt to different cognitive styles, offering differentiated paths for the construction of knowledge.

In the university context, as demonstrated by Sharp USA, these devices generate an environment conducive to critical discussion and the collaborative construction of knowledge, which is aligned with the competencies required by higher education in the twenty-first century. In short, these technologies not only enrich the classroom experience, but also redefine the role of the student as an active subject and builder of his or her learning.

Pedagogical function of touch screens in the classroom:

Mimio (2022) highlights that interactive screens allow differentiated teaching, facilitating seasonal work, project-based learning and formative assessment. In addition, these tools allow teachers to visualize ideas, brainstorm collaboratively, and present content in various formats (text, image, video).

Touchscreen Learning (2023) emphasizes that touchscreens are especially effective when they are integrated with active methodologies, such as cooperative learning and the flipped classroom. Its usefulness in hybrid and distance education environments has also been documented.

Evidence in Latin American and Ecuadorian contexts:

In Ecuador, the initiative implemented by the Directorate of Social Action and Education of Guayaquil in 2022, which provided 200 schools with digital screens, represented a significant step towards technological equity (Ecuador Comunicación, 2022). For their part, Candelario Villamar and Posligua Olmedo (2024), in a case study at the Technical University of Babahoyo, reported that the use of touch screens in the training of Basic Education teachers favored meaningful learning and student autonomy.

At Israel University of Technology, the recent implementation of these technologies represents a new field of exploration into how classroom dynamics and teaching practices are transformed in higher education. This study aims, therefore, to contribute to this understanding through the critical review of the existing literature.

The pedagogical function of touch screens is strengthened when their implementation responds to a conscious instructional design, focused on active methodologies and not on simple technological use. As Mimio indicates, these tools amplify the teacher's potential by offering multiple forms of content representation and interaction with the student. This becomes more relevant when linked to cooperative learning experiences or flipped classrooms, where technology is a means that enables methodological change, as Touchscreen Learning emphasizes. In Latin America, and particularly in Ecuador, these initiatives are still in the consolidation phase, but they are already showing positive results.

The case of Guayaquil demonstrates that investment in technology can contribute to educational equity if it is accompanied by training and access policies. For its part, the study at the Technical University of Babahoyo reinforces the idea that these tools impact not only the content learned, but also the way in which students relate to their own learning process. These cases show that touch screens, well implemented, can become catalysts for pedagogical innovation at different levels of the education system.

CRITICAL ANALYSIS

Despite the abundant international evidence on the benefits of touch screens, common limitations are identified. These include the lack of teacher training, resistance to methodological change, and the scarcity of longitudinal studies in university contexts (Booth et al., 2016). Likewise, in the Ecuadorian case, although there are emerging experiences, greater systematization and academic documentation are required to establish patterns of impact and sustainability.

Although the literature widely highlights the pedagogical benefits of the use of touch screens, as evidenced by multiple studies, it is essential to address their structural and contextual limitations with equal rigor. The absence of specialized teacher training continues to be a recurring obstacle, since the mere availability of technology does not guarantee its

meaningful use. As Booth et al. (2016) warn, real educational change requires reflexive and structured processes that accompany technological innovation with strategies of techno-pedagogical appropriation. In university environments, where a traditional teaching culture persists, resistance to methodological change hinders the effective integration of these tools. In addition, the lack of longitudinal studies in the field of higher education creates a gap in the understanding of the sustained effects of these technologies on learning. From the Ecuadorian perspective, the implementation of pilot experiences still lacks a rigorous systematization that allows scaling up good practices or formulating evidence-based institutional policies. In this sense, it is urgent to promote an educational research agenda that not only documents achievements, but also analyzes the critical factors of success and sustainability in the incorporation of interactive technologies in the classroom.

RESULTS

The results obtained in the literature review are presented below: Transformation of classroom environments through touch screens, an experience of educational innovation.

TRANSFORMATIONS RECORDED IN UNIVERSITY EXPERIENCES WITH TOUCH SCREENS: RESULTS FROM THE SCIENTIFIC LITERATURE

The findings obtained through the systematic review of literature show that the incorporation of touch screens in university classroom environments has generated substantial transformations in various higher education institutions internationally. The studies analyzed report positive impacts on three fundamental axes: methodological innovation, student performance, and teacher professional development.

In the methodological field, several universities that have implemented these technologies report a transition from traditional approaches to more active and interactive teaching models. Research such as that of Mimio (2022) and Touchscreen Learning (2023) documents how the use of interactive screens facilitates stational work, formative assessment, project-based learning, and other student-centered methodologies. These experiences reflect a profound resignification of the role of the teacher as a facilitator and the student as the protagonist of learning.

At the student level, studies such as those by Wang and Reid (2025) and Zhang and Smith (2025) show that touch screens improve motivation, active participation, conceptual understanding, and the development of higher cognitive skills. These technologies enable multisensory experiences that support information retention and sustained attention. In addition, the possibility of interacting directly with the content contributes to a better appropriation of knowledge, especially in students with visual and kinesthetic learning styles.

From the perspective of teachers, the evidence reviewed indicates that the implementation of touch screens promotes teacher professional development processes, especially when accompanied by techno-pedagogical training programs. The improvement in the design of interactive learning experiences and the strengthening of digital skills for more meaningful teaching are highlighted. However, it is recognized that these advances depend on sustained institutional commitment, adequate resources, and an environment that favors educational innovation.

Below are three tables that summarize the main results identified in the case studies and empirical reviews analyzed, of which Table 1 shows the methodological changes implemented by touch screens.

BOARD 1 METHODOLOGICAL CHANGES IDENTIFIED IN UNIVERSITIES WITH THE IMPLEMENTATION OF TOUCH SCREENS

Pedagogical category	**Before deployment**	**After implementation**
Teaching Strategies	Predominance of master classes	Active and participatory teaching
Resources used	Traditional whiteboard and presentations	Interactive and multimedia digital resources
Evaluation	Written exams	Dynamic formative assessments
Role of the teacher	Transmitter of knowledge	Facilitator and Experience Designer

Note. Taken from the literature review

Studies reviewed in international universities allow us to quantify in an estimative way the impact of the use of touch screens on key variables of student learning. In particular, substantial improvements are evidenced in motivation, participation, conceptual understanding and digital autonomy, which reaffirms the effectiveness of these tools when they are properly integrated into the pedagogical design. Table 2 summarizes the average improvement percentages

reported in various recent empirical studies, allowing us to observe patterns of transformation in the academic behavior of students after the incorporation of tactile technologies in the university classroom.

BOARD 2 STUDENT IMPACT REPORTED IN RECENT RESEARCH (INTERNATIONAL CASES)

Academic indicator	Average improvement (%) reported	Main source
Motivation in the classroom	+40%	Wang & Reid (2025)
Participation in collaborative activities	+37%	Sharp USA (2022)
Conceptual understanding	+31%	Zhang & Smith (2025)
Autonomous use of digital resources	+45%	Touchscreen Learning (2023)

Note. Cases taken from international investigations

The scientific literature also offers evidence on the perceptions and competencies developed by teachers who have integrated touch screens into their teaching practice. The results indicate a high valuation regarding its didactic usefulness, especially in aspects related to the design of active learning experiences, the use of digital resources and formative assessment. Table 3 presents a synthesis of studies that evaluated, through surveys and interviews, the level of proficiency and the perception of effectiveness of the use of touch screens by teachers in international university contexts.

BOARD 3 TEACHERS' PERCEPTION OF THE USE OF TOUCH SCREENS (INTERNATIONAL STUDIES)

Perceived Competence	High perception (%)	Main reference
Mastery of touch devices	68%	Mime (2022)
Interactive Activity Design	72%	ViewSonic (2024)
Integration of active methodologies	75%	Touchscreen Learning (2023)
Digital Learning Assessment	61%	Kharchenko et al. (2024)

Note. Based on the literature review, the generality of the teachers' perception was taken.

These results, extracted from various research applied in universities in America, Europe and Asia, show that the pedagogical use of touch screens allows the classroom ecosystem to be redesigned based on meaningful learning, digital equity and didactic innovation. Although institutional conditions vary, common patterns of success are identified: continuous teacher training, transformative academic leadership and technological sustainability policies. This evidence will serve as a reference basis for future implementations in Latin American contexts such as that of the Israel Technological University.

COMPARATIVE DISCUSSION: INTERNATIONAL EXPERIENCES AND PROJECTIONS IN THE CONTEXT OF ISRAEL TECHNOLOGICAL UNIVERSITY

The cases documented in universities on different continents show that the implementation of touch screens has promoted significant transformations in the quality of the educational process. As reported in studies such as those by Wang and Reid (2025), Mimio (2022), and Touchscreen Learning (2023), these technologies have enhanced student participation, active learning, and the development of digital skills in both students and teachers. However, these experiences cannot be transferred in a linear way to the Latin American or Ecuadorian context, where structural, pedagogical and technological conditions present particularities that must be considered.

In the case of Israel Technological University, the planning of the project to implement touch screens is based on an institutional strategic vision focused on educational innovation and the articulation of substantive functions. Unlike international cases where technological infrastructure is already part of the consolidated university ecosystem, at UISRAEL the process is in the phase of diagnosis, design and teacher awareness. This implies that, although there is a solid baseline in terms of theoretical foundations and institutional commitment, important challenges still need to be overcome, such as initial techno-pedagogical training, curricular adaptation and the generation of contextualized evidence.

A key difference identified in this comparison is that, while documented foreign universities have already made progress in measuring medium- and long-term impact, in UISRAEL the evaluation stage is still forward-looking. However, this situation also represents an opportunity: the analysis of international good practices can guide informed decisions, anticipate obstacles and strengthen the institutional intervention model based on proven scientific evidence.

Likewise, the technology transfer approach proposed by UISRAEL "which includes not only innovation in its own classrooms, but also the link with educational institutions with less access to technology" configures a model with a strong social sense, absent in several international studies that focus exclusively on the internal academic environment. This difference highlights a possible strength of the Ecuadorian project, aligning technological innovation with educational equity and institutional sustainability.

In short, the comparison between international experiences and the UISRAEL context allows us to identify points of convergence "such as the pedagogical potential of touch screens" and points of divergence "such as the conditions of implementation" that must be addressed with clear institutional policies, robust training processes and permanent evaluation aimed at continuous improvement. This comparative discussion constitutes a critical basis to accompany the transition towards a digital, inclusive and pedagogically transformative university culture.

CONCLUSIONS

Based on this article, the following conclusions are presented based on the contributions and projections of the integration of touch screens.

CONTRIBUTIONS AND PROJECTIONS OF THE INTEGRATION OF TOUCH SCREENS IN HIGHER EDUCATION

The systematic review carried out identified that the implementation of touch screens in university classroom environments, in various international contexts, has promoted substantial changes in the way in which the teaching-learning process is conceived and executed. These technological devices have shown a high potential to dynamize teaching methodologies, facilitate multisensory interaction, and promote active, collaborative and inclusive learning. In addition, they have strengthened the development of digital skills in both students and teachers, a key element in facing the challenges of education in the digital age.

Among the most relevant findings are: the increase in student motivation and participation, the improvement in the conceptual understanding of complex content, and the promotion of active methodologies such as the flipped classroom, 751odelo -based learning and formative assessment. From the perspective of teachers, the evidence analyzed shows that techno-pedagogical accompaniment and continuous training are necessary conditions for effective and sustainable implementation.

In the case of Israel Technological University, although the experience has not yet been implemented, institutional planning is solidly grounded in global trends in educational innovation. A comparison with the international cases reviewed makes it 751odelo to foresee high-impact opportunities, provided that critical aspects such as teacher training, curricular adequacy and longitudinal impact evaluation are rigorously addressed.

In this way, this study provides a robust theoretical and empirical framework that 751ode serve as a basis for strategic 751odelo f-making, the construction of institutional policies for digital transformation and the 751odelo f751 future applied research. The planned implementation of touch screens at UISRAEL represents an opportunity to consolidate a technologically mediated, student-centered 751odelo f higher education, committed to academic quality, and oriented to social equity.

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