

SENSORY MARKETING AND DIGITAL TECHNOLOGY* I INNOVATIONS IN THE LEARNING EXPERIENCE

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ABSTRACT

This article presents a literature review on the application of sensory marketing in the educational field, focusing on digital learning environments. The research analyzes how visual, auditory, and interactive stimuli influence student engagement and enhance the learning experience on digital platforms. Furthermore, it investigates the role of digital technology as a mediator of these stimuli and discusses the opportunities and limitations of this approach. The results indicate that integrating sensory elements into digital educational environments can foster motivation, content retention, and personalized learning—provided that ethical issues and the inclusion of diverse student profiles are carefully considered.

Keywords: Sensory marketing; Digital technologies; Learning experience.



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1 INTRODUCTION

Contemporary education has been marked by profound transformations driven by digitalization and the integration of new technologies in the teaching-learning process. The incorporation of digital tools in face-to-face classrooms, hybrid environments, and fully virtual platforms has redefined the roles of students and teachers, shifting the focus from traditional teaching to learner-centered and experience-based learning. In this context, strategies originating from the field of marketing have gained ground in interdisciplinary research—especially sensory marketing, which seeks to understand how stimuli applied to the human senses can influence behavior, perception, and decision-making (SCHMITT, 1999).

Sensory marketing, traditionally associated with consumption and customer experience, proposes that the integration of visual, auditory, tactile, olfactory, and gustatory stimuli can significantly impact individuals' attention, memory, and emotions. When transposed into the educational field, this concept shows potential to transform the way students engage with knowledge, offering opportunities for deeper engagement and meaningful learning. In digital learning environments, resources such as strategic color schemes, animations, sounds, interactive effects, and gamification can be intentionally used to spark interest, stimulate curiosity, and reinforce information retention.

The adoption of digital technologies as mediators of these sensory stimuli also enables personalized learning, allowing each student to receive content tailored to their preferences, cognitive styles, and learning pace. Recent studies indicate that platforms combining sensory stimuli with interactive resources increase motivation and promote a more engaging learning experience, helping to reduce dropout rates and improve academic performance (KAPP, 2012; MAYRING, 2014). Furthermore, these tools foster collaborative learning, as digital elements can facilitate synchronous and asynchronous interactions, forum discussions, group projects, and instant feedback—enhancing the role of technology as both a social and pedagogical mediator.

Despite its potential, the application of sensory marketing in digital education still faces significant challenges. Issues related to accessibility, cultural diversity, and inclusion must be carefully addressed to ensure that sensory stimuli do not become barriers for certain student profiles. Additionally, there are ethical implications

concerning the influence on learners' emotions and behavior, requiring that teachers and developers of digital platforms adopt conscious and transparent practices.

In light of this scenario, the present article proposes a literature review on the integration of sensory marketing with digital technologies applied to education, seeking to understand how sensory stimuli can be strategically used to enhance the learning experience. The study analyzes scientific evidence on visual, auditory, and interactive resources, discusses the opportunities and limitations of this approach, and points out directions for future research. The relevance of this work lies in its contribution to pedagogical innovation, helping digital learning environments become not only efficient in content delivery but also engaging, personalized, and responsive to the needs of increasingly connected and demanding students.

Moreover, the integration of sensory marketing and digital technologies allows a rethinking of the learning experience, making it more interactive and immersive. Schmitt (1999) asserts that well-designed sensory stimuli can generate memorable experiences and positively influence individual behavior—a concept which, when applied to education, suggests greater engagement and content retention. Mayer (2009) complements this view by emphasizing that multimodal learning—combining images, sounds, and interactivity—enhances understanding and knowledge retention. In this sense, digital educational environments that incorporate such strategies offer opportunities for personalization, active participation, and learner autonomy, aligning with the demands of an increasingly connected and critical audience (Selwyn, 2016).

Sensory marketing applied to digital education also enables a differentiated approach to address the needs of students with distinct learning styles. As Livingstone (2012) highlights, the diversity of learning profiles and contexts requires that technological resources be designed to promote accessibility and inclusion. In this regard, the strategic use of visual, auditory, and interactive stimuli allows each student to explore content in an adaptive manner, increasing engagement and reducing barriers that may limit effective learning.

2 MOTIVATION

The motivation for developing this study arises from the growing need for educational methodologies that go beyond the traditional transmission of content.

Research indicates that student engagement is directly related to the experience lived during the learning process and is influenced by elements that awaken attention, curiosity, and emotion (Selwyn, 2016). In digital environments, these experiences become even more relevant, as learning depends not only on access to information but also on the way content is presented and interacted with.

Sensory marketing emerges as a promising resource in this context. Schmitt (1999) argues that sensory stimuli such as colors, sounds, scents, and textures are capable of generating emotions and memorability, influencing individual behavior. When applied to digital education, this concept allows visual, auditory, and interactive resources to be strategically designed to reinforce attention, stimulate curiosity, and facilitate information retention, thereby promoting more meaningful learning.

In addition, digital technology enables the personalization of teaching by adapting content and activities to each student's pace and preferences. Mayer (2009) emphasizes that multimodal strategies combining images, sounds, and interactivity enhance comprehension and information retention, improving the learning experience. In this sense, the application of sensory marketing in digital platforms offers opportunities to develop more engaging, motivating, and learner-centered educational experiences.

Another relevant aspect is inclusion and diversity. Livingstone (2012) highlights the importance of designing digital environments that consider different student profiles, promoting accessibility and preventing sensory stimuli from becoming learning barriers. Thus, the integration of sensory marketing and digital technologies not only increases engagement but also contributes to a more inclusive, collaborative, and adaptive education that meets learners' individual needs.

Therefore, this study is justified by the need to investigate how sensory stimuli can be strategically applied in digital environments to enhance the learning experience. The research seeks to provide theoretical support for pedagogical innovation, contributing to the creation of more interactive, personalized, and engaging digital learning environments that meet the expectations of increasingly connected and demanding students.

Beyond the need for engagement and personalization, the motivation to explore the use of sensory marketing in digital environments is also related to the diversity of learner profiles and different ways of processing information. Mayer (2009) points out

that each individual processes information differently and that multimodal strategies combining visual, auditory, and interactive elements can enhance understanding and knowledge retention. In this context, Selwyn (2016) emphasizes that, in an expanding digital education landscape, it is essential to consider not only access to technology but also how it is used to provide meaningful experiences. Thus, integrating carefully designed sensory stimuli into the pedagogical design of digital platforms not only increases engagement but also contributes to more inclusive, personalized, and meaningful learning aligned with students' real needs.

3 OBJECTIVES

The main objective of this study is to analyze how sensory marketing can be applied in digital educational environments in order to enhance the students' learning experience.

To achieve this purpose, the following specific objectives were established:

- Identify the main sensory stimuli explored in digital educational platforms;
- Evaluate the impacts of sensory marketing on student engagement and retention;
- Investigate the ethical and pedagogical boundaries associated with the use of sensory strategies in education;
- Suggest future possibilities for integrating digital technologies and sensory stimuli into innovative educational practices.

These objectives aim to contribute to advancing knowledge about the application of sensory marketing strategies in digital education, providing theoretical and practical insights for developing learning environments that are more engaging, motivating, and inclusive.

4 THEORETICAL FRAMEWORK

Sensory marketing emerged as a strategy initially aimed at consumption and consumer behavior, defined as the planned use of human senses to create experiences that evoke emotions and influence attitudes (SCHMITT, 1999). From this

conception, scholars began to observe that the application of sensory stimuli could go beyond the commercial field, reaching areas such as health, communication, and, more recently, education. In the context of digital learning, this approach has stood out as an innovative resource to enhance engagement, stimulate motivation, and promote knowledge retention.

Recent research reinforces the importance of visual stimuli in technology-mediated education. Lehane, Scully, and O’Leary (2023), for example, demonstrated that the inclusion of images and animations in digital assessments influences student behavior, making activities cognitively more attractive and less tiring. This indicates that the aesthetic experience can serve as a mediator of motivation, helping students perceive learning more positively. The emphasis on visual aspects is also related to the ability to capture attention in virtual environments, where distraction is a recurring challenge.

Another widely studied resource is gamification, defined as the application of game-like elements in non-game contexts. Khaleel et al. (2019) found in a study with programming students that using challenges, rewards, and rankings significantly increased engagement compared to traditional teaching. Similarly, Ishaq and Alvi (2023), in a literature review, confirmed that personalized gamification helps raise levels of motivation, participation, and cognitive performance. These results reinforce the potential of sensory stimuli—especially visual and interactive ones—in promoting digital environments that are more dynamic and responsive to student needs.

In addition to motivation, the literature also points to benefits for student well-being. Lai et al. (2015) identified that using positive visual elements in synchronous platforms reduced digital fatigue and generated a sense of lightness during interactions. This finding is particularly relevant given that cognitive overload and visual fatigue are recurrent problems in remote learning environments, especially when screen exposure time is prolonged. Thus, well-designed sensory strategies can contribute not only to learning but also to students’ emotional and physical well-being.

However, understanding technology merely as an instrumental tool is a limited view. Vieira Pinto (2005, v. 2, p. 220) argues that “technology is the form of manifestation of human creative capacity applied to the transformation of the world.” This means that when analyzing the use of technology in education, it is essential to consider its historical, social, and political nature. The application of sensory marketing

in digital platforms cannot be reduced to the mere pursuit of efficiency or productivity—it must be understood as a culturally situated practice that directly impacts the ways of teaching and learning.

This perspective is reinforced by Paulo Freire, who warns that technology is not neutral. For the author, every human creation must be subject to ethical and pedagogical principles. As he states: “Technology, like any other human creation, must be subject to ethics. What makes it good or bad is the direction we give it” (FREIRE, 1996, p. 103). Therefore, the adoption of sensory stimuli in digital educational environments must be guided by pedagogical intentionality and the pursuit of humanization. This implies designing strategies that promote inclusion, citizenship, and critical participation—rather than reinforcing mechanisms of consumption or attention control.

Despite the observed advances, the literature also draws attention to the challenges involved. Neves Rito (2024), in a review on gamification in higher education, highlighted that the lack of adequate technological infrastructure and insufficient teacher training can compromise the outcomes of digital sensory practices. In contexts marked by inequality, limited access to devices, high-speed internet, and updated platforms can reinforce exclusion rather than promote opportunities. Furthermore, adopting sensory strategies without proper pedagogical preparation may result in superficial experiences, where aesthetics outweigh effective learning.

Another recurring concern involves the ethical dimension. UNESCO (2023) points out that the use of digital sensory resources must adhere to principles of accessibility and inclusion, ensuring that students with visual, auditory, or cognitive disabilities are not disadvantaged. Moreover, there is a risk of manipulating learners’ attention and emotions, which requires caution so that engagement strategies do not become conditioning tools. In this sense, thinking about sensory marketing applied to education means balancing innovation with responsibility, ensuring that digital experiences are created to foster meaningful learning while respecting diversity and students’ rights.

Therefore, the theoretical framework reveals that sensory marketing, when articulated with digital technologies, holds transformative potential for education—but also carries limitations and challenges that cannot be overlooked. While it stimulates engagement, motivation, and well-being, it simultaneously demands critical reflection

on accessibility, teacher training, and ethics in the use of digital resources. Together, these aspects provide the foundation for understanding how sensory stimuli can be applied innovatively and responsibly in digital educational environments, aligning with the purpose of this study.

Another aspect worth highlighting is the relationship between sensory stimuli and cognitive processes studied by neuroscience. Research indicates that the human brain responds differently when information is presented through multiple sensory channels, facilitating long-term memory retention (MAYER, 2009). This perspective reinforces the importance of integrating sounds, images, and interactivity in digital environments—since the more varied the modes of presentation, the greater the chances of consolidating meaningful learning. Furthermore, studies suggest that well-designed sensory stimuli help reduce cognitive overload, balancing the mental effort required from the learner with the clarity and organization of content (SWELLER; AYRES; KALYUGA, 2011).

Practical examples of these principles can be found in educational platforms that use augmented reality (AR) and virtual reality (VR). Research shows that immersive environments allow abstract concepts to be explored more concretely, sparking curiosity and stimulating active learning (BILLINGHURST; DÜNSE, 2012). In science education, for example, virtual laboratory simulations enable students to experiment with phenomena without the risks and costs associated with in-person practice. In language learning, immersion in interactive scenarios assists in more natural language acquisition. These examples demonstrate that applying sensory stimuli can significantly expand pedagogical possibilities, going beyond the mere transposition of traditional models to online environments.

In this field, the use of soundscapes and ambient music has also gained attention as a learning resource. Anderson (2020) found that soft sounds, such as instrumental music, can improve concentration and reduce anxiety during complex cognitive tasks. However, the same research warns that excessive auditory stimuli may cause distraction, particularly in tasks requiring high logical reasoning. This reinforces the importance of careful pedagogical planning, in which each sensory stimulus is designed in accordance with learning objectives and student profiles.

Finally, it is important to emphasize that the theoretical framework points to a global trend toward integrating sensory marketing and digital education, while also

revealing the need for further studies investigating the long-term effects of these practices. On the one hand, the literature indicates gains in motivation, engagement, and content retention; on the other, there remain gaps in assessing effectiveness across diverse contexts—especially in developing countries, where inequalities in access to technology persist (SELWYN, 2016). This gap underscores the relevance of studies like the present one, which seek to critically analyze both the potential and the limitations of pedagogical innovations mediated by sensory stimuli in the digital era.

5 METHODOLOGY

This study is characterized as a narrative literature review, as it seeks to systematize and discuss scientific productions addressing the use of sensory stimuli in digital learning environments. According to Rother (2007), the narrative review method is appropriate when the goal is to gather, organize, and interpret results from different studies—without claiming exhaustiveness—but with the intention of identifying trends, gaps, and perspectives on a given topic. This methodological choice is justified by the exploratory nature of the study, which aims to understand how visual, auditory, and interactive resources have been used in digital educational contexts and what impacts have been reported in the literature.

For data collection, articles, books, dissertations, theses, and technical reports published between 2010 and 2024 were consulted from databases such as Google Scholar, SciELO, CAPES Journals Portal, and ERIC (Education Resources Information Center). This time frame was selected to encompass the most recent developments related to sensory marketing, learning neuroscience, and digital methodologies applied to education. In addition, institutional documents—such as UNESCO reports—were also considered, addressing guidelines on accessibility, technological innovation, and ethical use of digital resources in education.

The descriptors used for the search included combinations in Portuguese and English, such as: “sensory marketing,” “digital education,” “gamification,” “online learning,” “neuroscience of education,” and “digital learning engagement.” These terms were combined using the Boolean operators “AND” and “OR” to broaden and refine search results. The initial selection yielded approximately 120 publications, from which around 45 were chosen for full reading, based on relevance, methodological clarity,

and direct pertinence to the topic.

The process of analyzing the selected texts was guided by thematic content analysis (Bardin, 2016), which enables the identification of recurring categories and meaning patterns within documents. After several readings, the following categories of analysis were established:

- (i) visual resources and stimuli in educational design;
- (ii) gamification and motivation;
- (iii) cognitive and emotional impacts of sensory marketing;
- (iv) ethical challenges and limitations in the use of digital sensory resources.

This categorization allowed the organization of findings and the establishment of connections with the study's objectives.

It is important to note that, as a narrative review, this study did not follow systematic review protocols such as PRISMA, but rather prioritized critical and interpretative discussion. This methodological choice allowed greater flexibility in incorporating diverse theoretical perspectives, thereby broadening the understanding of the investigated phenomenon.

Finally, care was taken to ensure the reliability of sources, prioritizing works from peer-reviewed journals and publications of recognized academic relevance. This approach aims to guarantee scientific rigor, even within the interpretive nature of a narrative review. Thus, the adopted methodology provides a comprehensive, critical, and well-founded view of the possibilities and limitations of sensory marketing applied to digital education.

6 DATA ANALYSIS AND DISCUSSION

The literature review revealed that sensory marketing has been progressively incorporated into digital educational practices, particularly in gamified platforms, virtual learning environments (VLEs), and augmented reality-based resources. These mechanisms not only increase the attractiveness of pedagogical proposals but also offer new possibilities for engagement, motivation, and content retention. However, their adoption requires critical reflection regarding ethical limits, the inclusion of diverse student profiles, and the availability of adequate infrastructure.

Regarding visual stimuli, the literature shows that colors, contrasts, and

interface design play a decisive role in usability and the quality of the learning experience. Graphic resources, when used intentionally, help organize information, reduce cognitive overload, and increase student interest. Lehane, Scully, and O’Leary (2023) demonstrated that the presence of images and animations in digital assessments can alter how students respond to cognitive tasks, making them more accessible and stimulating. This finding reinforces the idea that visual components, beyond embellishing the platform, have a pedagogical function by facilitating content assimilation. Conversely, excessive use of graphic elements can cause distractions, impairing concentration and objectivity in the educational process—thus requiring balance on the part of instructional designers.

Another relevant aspect found in the studies was auditory stimulation. Feedback sounds, background music, and multimedia resources have been explored in educational games and digital materials as mechanisms of positive reinforcement. Khaleel et al. (2019) emphasized that students exposed to gamified environments, where auditory stimuli were integrated into activities, showed higher engagement levels and greater ease in memorizing concepts. This data confirms the relevance of the auditory dimension in learning, as sounds can indicate progress, signal errors in a non-punitive manner, and create immersive atmospheres. However, not all students respond uniformly to this type of stimulus. In some cases, constant sounds may become distracting or even exclusionary—particularly for individuals with hearing impairments or sensory sensitivity. Therefore, the literature highlights the need to offer personalization mechanisms, allowing students to adjust volume, frequency, or even deactivate these resources when necessary.

Interactivity constitutes one of the most valued dimensions in digital education. Gamification—understood as the application of game elements in learning environments—has shown great potential to increase student motivation. Ishaq and Alvi (2023) point out that gamification fosters deeper engagement when elements are adapted to each student’s profile, taking into account their interests, challenges, and learning style. Such personalization is essential to avoid superficiality, where playful elements become mere adornments without real pedagogical impact. Complementarily, Khaleel et al. (2019) observed that programming courses using gamified components exhibited higher participation and completion rates than traditionally structured courses. These findings indicate that interactivity, when

combined with sensory stimuli, creates more dynamic and participatory environments that promote not only motivation but also content retention and skills development.

Moreover, the literature emphasized the importance of digital ambience, understood as the set of factors shaping the student's experience in virtual environments. Positive visual elements—such as friendly icons, balanced colors, and customizable learning spaces—can significantly reduce digital fatigue. Lai et al. (2015) demonstrated that the inclusion of light visual stimuli in synchronous platforms not only reduced student exhaustion but also increased their sense of comfort and well-being during online study sessions. This finding is especially relevant in a context where digital overload has become one of the main challenges of technology-mediated education. Thus, digital ambience should not be viewed merely as an aesthetic component but as an integral part of pedagogical strategy, promoting persistence and motivation in virtual settings.

Despite the reported benefits, challenges related to sensory marketing in digital learning environments remain significant. The lack of adequate technological infrastructure is one of the main obstacles, particularly in public institutions and regions with limited access to high-quality internet. Neves Rito (2024), in a review on gamification in higher education, highlighted that insufficient teacher training to work with sensory digital resources directly compromises expected results, leading to frustration among both instructors and students. This finding underscores that the success of sensory strategies depends not only on technology itself but also on the structural and educational conditions enabling their implementation.

Another critical issue identified involves ethical and inclusive concerns. UNESCO (2023) stresses that the use of digital resources in education must consider student diversity, ensuring accessibility for people with disabilities and avoiding practices that excessively manipulate user attention. Due to its potential to influence behavior, sensory marketing must be handled carefully so as not to become a tool of control but rather one of empowerment. Furthermore, there is a risk of cognitive overload when multiple stimuli are applied simultaneously, which can hinder rather than enhance learning.

In summary, the analysis confirms that sensory marketing, when combined with digital technologies, provides meaningful contributions to pedagogical innovation and to strengthening the learner's experience in virtual environments. However, such

contributions only become fully effective when accompanied by pedagogical planning, adequate infrastructure, teacher training, and clear ethical guidelines. As Paulo Freire (1996) and Vieira Pinto (2005) remind us, education must serve the purposes of humanization and social transformation—which means that technological and sensory resources must always be guided by principles of inclusion, critical awareness, and responsibility.

7 CONCLUSION

The application of sensory marketing in digital educational environments holds great potential to transform the learning experience, making it more attractive, interactive, and personalized. The literature review demonstrated that visual, auditory, and interactive stimuli can significantly increase student engagement, as well as enhance content retention and motivation. These results reinforce the importance of integrating sensory strategies into pedagogical design in order to move beyond teaching practices centered solely on content transmission and toward approaches that value the learner's overall experience.

However, the findings also indicate that understanding technology merely as a technical resource is insufficient. As Vieira Pinto (2005) points out, technology should be recognized as an expression of human creativity, imbued with social, political, and cultural dimensions. In the same vein, Freire (1996) emphasizes that technology is not neutral—it must always be subjected to ethics and humanization. Thus, the incorporation of sensory marketing strategies into digital education should not be driven merely by the pursuit of immediate engagement but must instead be grounded in clear pedagogical intentionality aimed at the learner's critical and emancipatory development.

The benefits identified throughout the review—such as reducing digital fatigue through positive visual elements (LAI et al., 2015) and increasing motivation through personalized gamification (ISHAQ; ALVI, 2023)—demonstrate significant progress in this field. Nevertheless, the literature also highlights challenges that cannot be ignored. The lack of adequate technological infrastructure and the absence of teacher training (NEVES RITO, 2024) limit the effectiveness of digital sensory practices, reinforcing the need for institutional policies that promote continuous professional development and

investment in resources. Furthermore, the potential manipulation of student attention and the risk of cognitive overload indicate that such practices must be carefully planned to avoid excesses that may undermine learning.

Another point deserving attention concerns inclusion. UNESCO (2023) reports emphasize the importance of considering diverse student profiles, ensuring accessibility for individuals with disabilities and respect for cultural diversity. Therefore, the integration of sensory marketing into digital education can only be deemed successful when it promotes equity and contributes to reducing inequalities—rather than amplifying them.

Consequently, this study concludes that sensory marketing applied to digital education represents an innovative and promising strategy that must be implemented according to well-defined ethical, pedagogical, and social principles. For future research, it is recommended that empirical studies be conducted to analyze the impact of different types of sensory stimuli across diverse student groups, deepening the understanding of which strategies are most effective in varying contexts. It is also suggested that educational administrators develop institutional practices encouraging the conscious use of technology, aligning digital innovation with humanization in the teaching-learning process.

In summary, while sensory marketing in digital education opens new pedagogical possibilities, it simultaneously challenges educators, administrators, and researchers to rethink the role of technology in human development. When approached critically, ethically, and inclusively, it can become an essential tool for transforming learning into a more meaningful, motivating, and emancipatory experience.

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