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Digital games and emotional competences: a study using sensidex at school

Jogos digitais e competência emocional: um estudo com usando o sensidex na escola

Juegos digitales y competencias emocionales: un estudio con sensidex en la escuela

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Abstract: Emotional competences are a set of knowledge, skills, and attitudes that are fundamental to understanding, expressing, and adequately regulating emotions. This study investigates the use of the digital game Sensidex in an intervention to mobilize emotional competences at school. The objective was to evaluate the impact of the intervention with the game on the mobilization and promotion of emotional competences. The pre-experimental research involved 447 students aged 6 to 13, from 9 schools of Brazil. The methodology included pre-test

and post-test, observations, and content analysis. The results indicate significant improvements in the identification and understanding of emotions, in addition to the strengthening of emotional regulation and moral behavior. A high level of engagement among the participants and a positive perception of the game were observed. The results of this study reinforce that digital games can be integrated into the curriculum and used in interventions for the development of emotional competence in the school context.
Palabras claves: Technology education; Emotional development; Cognition; Curriculum.

Resumo: As competências emocionais constituem um conjunto de conhecimentos, habilidades e atitudes fundamentais para compreender, expressar e regular adequadamente as emoções. Este estudo investiga o uso do jogo digital Sensidex em uma intervenção para mobilizar competências emocionais na escola. O objetivo foi avaliar o impacto da intervenção com o jogo na mobilização e promoção das competências emocionais. A pesquisa pré-experimental envolveu 447 estudantes, com idades entre 6 e 13 anos, de 9 escolas do Brasil. A metodologia incluiu pré-teste e pós-teste, observações e análise de conteúdo. Os resultados indicam melhorias significativas na identificação e compreensão das emoções, além do fortalecimento da regulação emocional e do comportamento moral. Observou-se um alto nível de engajamento entre os participantes e uma percepção positiva do jogo. Os resultados deste estudo reforçam que os jogos digitais podem ser integrados ao currículo e utilizados em intervenções para o desenvolvimento da competência emocional no contexto escolar.
Palavras-chave: Educação tecnológica; Desenvolvimento emocional; Cognição; Currículo.

Resumen: Las competencias emocionales son un conjunto de conocimientos, habilidades y actitudes fundamentales para comprender, expresar y regular adecuadamente las emociones. Este estudio investiga el uso del juego digital Sensidex en una intervención para movilizar competencias emocionales en la escuela. El objetivo fue evaluar el impacto de la intervención con el juego en la movilización y promoción de las competencias emocionales. La investigación preexperimental involucró a 447 estudiantes de 6 a 13 años, de 9 escuelas de Brasil. La metodología incluyó pretest y postest, observaciones y análisis de contenido. Los resultados indican mejoras significativas en la identificación y comprensión de las emociones, además del fortalecimiento de la regulación emocional y del comportamiento moral. Se observó un alto nivel de compromiso entre los participantes y una percepción positiva del juego. Los resultados de este estudio refuerzan que los juegos digitales pueden integrarse al currículo y utilizarse en intervenciones para el desarrollo de la competencia emocional en el contexto escolar.
Palabras claves: Educación tecnológica; Desarrollo emocional; Cognición; Currículo.

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1. INTRODUCTION

Emotional competences are a set of knowledge, skills, and attitudes that are fundamental to understanding, expressing, and properly regulating emotions (Alzina; Escoda, 2007). These competences involve emotional awareness, emotional regulation, and empathy. They are strongly related to interpersonal relationships.

Emotional awareness refers to the ability to identify and understand one's own emotions, as well as to recognize the emotions of others through facial expressions, situational cues, and culturally shared vocabulary (Saarni, 2000; Buckley & Saarni, 2006; Garner, 2010). This competence is essential for personal and social development, as it

allows the individual to better understand their emotional states and react more appropriately to different situations (Mikolajczak et al., 2015).

According to Huang et al. (2025), recent evidence show that with age, understanding the emotions of others becomes less dependent on perceptual cues, such as facial expressions, and more dependent on conceptual knowledge about each emotion.

Perceiving and understanding the emotions of others involves both the cognitive ability to capture and interpret emotions and empathy, which consists of sharing and responding appropriately to the emotional experiences of others (Alzina & Escoda, 2007). Empathy, therefore, is an essential element of interpersonal relationships, favoring more effective and harmonious social interactions (Hare & Parent, 2022).

Emotion regulation, in turn, is a process that involves monitoring, evaluating, and modifying emotions according to the needs of the context (Hare & Parent, 2022; Villani, 2018). This regulation can be extrinsic or intrinsic and includes strategies that help manage the intensity of emotions and maintain emotional balance (Gross, 2024; Mikolajczak et al., 2015). In addition, emotional regulation is directly related to subjective well-being and resilience in the face of adverse situations (Saarni, 2000).

The interplay between emotion regulation and emotional competence is crucial, as the ability to manage emotions positively impacts social adaptation and emotional stability (Garner, 2010; Hare & Parent, 2022). When regulation is dysfunctional, it can compromise emotional performance and impair social interaction. Thus, the adoption of adaptive strategies in emotional regulation is essential for balanced emotional development.

Due to their scope and importance, emotional competences influence mental health and well-being (Mikolajczak et al., 2015), learning and academic success (Franco et al., 2017), social relationships (Denham, 2023; Franco et al., 2017), and job performance (Camras & Halberstadt, 2017).

Several studies reinforce that emotions favor the development of cognitive processes important for learning, such as language (Beck et al., 2012), the ability to understand reading and mathematics (Yang & Wang, 2023), and the predisposition to learn (Zhengxian et al., 2024; Denham et al., 2013). Thus, working on childhood emotional competences can be decisive both for the child's general development and for their learning and interaction in the school context.

Emotional competences are directly related to interpersonal interactions, such as conflict resolution and emotional regulation, contributing to the development of healthy relationships in the school context. In this sense, Kalomenconkovas et al. (2025) highlight that empathy — both cognitive and affective — improves communication and promotes the strengthening of relational intelligence. Increased emotional competence can occur naturally throughout life, but it can also benefit from specific conditions, activities, and interventions (Brasseur et al, 2013). When intentionally integrated into the curriculum, different pedagogical strategies and resources can be combined. However, in this study, we focus on the use of digital games to improve emotional skills. In this sense, the adoption of intentional pedagogical actions that integrate socio-emotional competences into the curriculum is essential (Meira & Silva, 2025).

In the Brazilian context, children's socio-emotional development is strongly influenced by cultural patterns that value close interpersonal relationships, affective expressiveness, and family-centered socialization (Dessen & Torres, 2019, Moreira et al., 2012). Empirical studies with Brazilian children indicate that the understanding and

expression of emotions are shaped by both cultural practices and socioeconomic conditions, with differences observed in the way children recognize and interpret emotional cues in different contexts (Karstad et al., 2016). These findings highlight that emotional competences in Brazil are not developed in isolation, but arise from daily interactions within families, peer groups, and schools, reinforcing the need for culturally sensitive educational interventions.

In recent years, socio-emotional development has gained increasing prominence in Brazilian educational policy and practice, especially with the inclusion of socio-emotional competences as a central dimension of comprehensive education in the National Common Curriculum Base. This framework emphasizes emotional awareness, empathy, and self-regulation as essential competences to be developed throughout basic education (Brasil, 2018). Within this scenario, school-based interventions that use interactive and meaningful resources — such as digital games — represent a promising strategy to promote emotional competences in ways that are aligned with both the developmental needs and cultural realities of Brazilian children, especially in contexts marked by social diversity and inequality.

Therefore, this article presents a digital game developed to mobilize emotional competences and integrate them into the school curriculum. The aim of the study is to evaluate the contributions of the use of the Sensidex digital game in the school context to mobilize children's emotional competences and learning.

Thus, the main research questions of this study are as follows:

a) How does the intervention with the Sensidex digital game contribute to the mobilization and promotion of emotional competences in children?
b) What are the impacts of using the Sensidex game on students' ability to identify, understand, and regulate emotions?
c) What are the students' perceptions of their learning and emotional development after playing Sensidex?

1.2. Interventions with digital games and mobilization of emotional competences

Digital games are characterized by being an interactive and dynamic experience based on rules, challenges and objectives, promoting immersion and engagement (Juul, 2003; Salen & Zimmerman, 2012). Within this universe, educational digital games stand out, combining gameplay with pedagogical content to improve learning (Flowers, 2021; Squire, 2011). Among these games, "serious games" are designed for specific purposes, such as education, training, and behavioral change (Michel, 2013).

Research indicates that digital games can be effective in developing emotional competences (Greipl et al., 2023; Meira & Silva, 2025; Reynard & Dias, 2022; Villani et al., 2018). Literature reviews highlight that these games are powerful tools for improving emotion regulation and empathy, especially in interventions aimed at managing anxiety and anger (Villani et al., 2018), and cooperation, self-control, and conflict resolution, which are key to social interaction and academic success (Meira & Silva, 2025). Additionally, digital games promote the recognition and understanding of emotions, as well as strengthen empathy and leadership skills (Greipl et al., 2023).

There is evidence from several studies that reveal the effectiveness of using digital games to develop educational skills in children (Liu et al., 2019). The games bring engaging and motivational elements that aid in teaching and learning, helping children develop a set of skills, including emotional competences. Mikolajczak et al. (2015)

demonstrated that adolescents who participated in game-based interventions showed improvements in children's development and social-emotional well-being, reinforcing their relevance.

Shum et al. (2019) presented evidence that game-based digital methods support the understanding of essential concepts and competences, such as emotional competence, problem-solving, communication, and empathy. This growing interest in using digital games to enhance emotional competences reinforces the potential of games for their mobilization and promotion.

Some games have been developed specifically for emotional education, such as Emotion Detectives (Koivula et al., 2017), which helps children identify emotions and encourage prosocial behaviors, and The Park of Emotions (Papoutsi et al., 2024), which relies on structured models of emotional intelligence to improve these competences in children aged 9 to 12. For adolescents, games such as emoTIC (De La Barrera et al., 2021) have demonstrated positive impacts on self-esteem, emotional balance, and behavior, indicating the influence of these games on building healthy social relationships.

Additionally, digital games can contribute to emotional regulation and the development of resilience, allowing players to bounce back from negative experiences and satisfy their psychological needs even in the face of challenges (Hefner et al., 2019). This process strengthens emotional well-being by improving frustration tolerance and coping skills.

In this way, digital games emerge as innovative alternatives for emotional education and therapy, offering an interactive and playful approach to the development of emotional competences in different age groups and contexts.

3. METHODOLOGY

This pilot study is applied in nature and characterized as a pre-experimental investigation, in which a single group of participants underwent an intervention with a digital game and completed assessments before and after the experience (pre-test and post-test) (Cohen et al., 2018).

To gain a more comprehensive understanding of the effects of the intervention, the study adopted a mixed-methods approach with convergent design, integrating quantitative and qualitative data collected during the same phase of the research process (Creswell & Creswell, 2023). Quantitative data were derived from the pre-test and post-test results of the adapted emotional competence scale, allowing us to examine changes over time. The qualitative data consisted of systematic observation records produced throughout the intervention sessions and an open question applied in the post-test, which captured the children's perceptions of their learning experiences. The quantitative and qualitative datasets were analyzed separately and subsequently integrated during the interpretation phase, allowing triangulation between measured outcomes, observed behaviors, and participants' self-reported learning, thus strengthening the interpretation of the results within the confines of a pre-experimental pilot design.

3.1. Participants

The sample was composed of convenience, based on institutional access to the participating schools and the feasibility of fully implementing the intervention protocol, which characterizes a non-probabilistic design. Initially, there were 554 students. However, data from 447 participants were analyzed, after excluding those who did not

participate in all the sessions provided for in the intervention protocol, did not answer all the instruments or identified problems in the answers, such as the repetition of the same alternative in all questions.

Participants had a mean age of 9.08 years (standard deviation of 1.21), with a minimum age of 6 years and a maximum of 13 years. The students came from 9 different schools in three states of Brazil (Santa Catarina, São Paulo and Alagoas). Table 1 shows the distribution of children by class.

Table 1
Distribution of participants by grade

Degree	n	% of total
1	18	4.0%
2	28	6.3%
3	179	40.0%
4	91	20.4%
5	110	24.6%
6	21	4.7%

Source: authors' elaboration.

The largest number of participants are students from municipal public schools in the southern region (n=223). The number of participants from the southern region stands out, corresponding to 90.8%. Although the sample is regionally concentrated, the participants came from three Brazilian regions (South, Southeast and Northeast), covering different educational and socio-institutional contexts. This territorial heterogeneity introduces contextual variation.

3.2. Ethical Considerations and Protection of Participants

This study was conducted in accordance with established ethical standards for research involving human participants and was reviewed and approved by the Research Ethics Committee of the institution (CAAE 63042822.5.0000.0121). Written informed consent was obtained from parents or legal guardians, and children aged 6 to 13 gave age-appropriate consent.

The consent process was specifically designed to be accessible to children: an illustrated assent form was used, which was read aloud collectively with each class, and time was set aside for questions, clarifications, and the expression of curiosity before participation. This procedure ensured that the children understood the objectives, activities, and voluntary nature of the study. Participants were told that they could refuse or withdraw from the survey at any time without any penalty.

Given the involvement of emotionally sensitive content, special care has been taken to minimize potential risks, such as discomfort during gameplay or emotional distress triggered by specific scenarios. All activities took place in the school environment, with the continuous presence of teachers and researchers in the classroom to offer support, mediation and emotional safety when necessary.

The confidentiality of the data and the anonymity of the participants were strictly protected through de-identification procedures and restricted, password-protected access to the research files.

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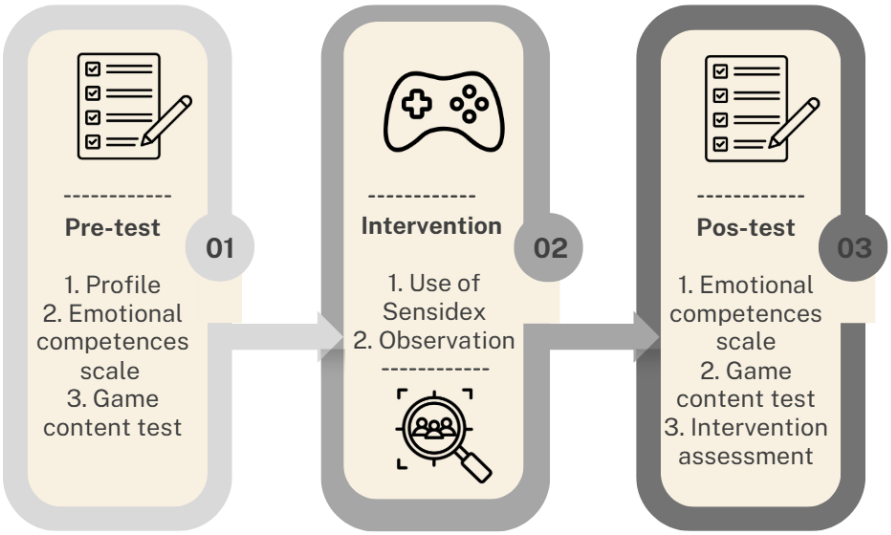
While no direct risks were identified, potential indirect risks related to emotional distress or unintentional disclosure of information were anticipated and mitigated through careful monitoring and respectful pedagogical mediation.

3.3. Collection instruments and procedures

Data collection occurred in 24 different classes, following a systematized intervention protocol that included the three steps illustrated in figure 1:

1. Pre-test application: applied before the intervention to assess the students' prior knowledge.
2. Carry out the intervention: use the Sensidex game for 2 to 4 lessons, make observations and records.
3. Post-test application: performed after the intervention to check for possible changes in performance.

Figure 1
Stages of data collection



Source: authors' elaboration.

The pre- and post-test questionnaires were printed and applied in the classroom. The questionnaires consisted of two parts: an emotional competences scale and a game content test. The pre-test was different because it included questions about the participants' profiles, while the post-test had 5 objective questions and 1 open-ended question to evaluate the game, focusing on perceptions about learning.

The intervention took place over three or four days, with two hours of class dedicated to each session. In the first session, the proposal was explained, the consent form was presented and the students completed the pre-test; in the second and third sessions, they played Sensidex and, in the fourth session, they completed the post-test. The interval between the application of the pre-test and post-test questionnaires was, on average, eight days.

The first instrument, called pre-test, consisted of 3 parts. The first referred to profile questions to identify participants. The second presented a self-referential adapted scale from Yang, Quadir and Chen (2019) to measure the perception of emotional

competence. The adaptation consisted of translating and rewriting the statements to fit the context of the study, excluding one item, and adopting a frequency-based response scale instead of a Likert-type agreement scale. Thus, the emotional competence scale used presented 8 affirmation items, such as "It's easy for me to understand how I feel" and "I find the words to explain how I feel", in addition to 5 answer options about frequency always, often, sometimes, rarely and never). The calculation of the score on the scale considered that the alternatives corresponded to 0 to 4 points, with 0 never and 4 always. The maximum score is 32 points.

The last part was a test on the content and situations covered in the Sensidex game. Organized into 3 challenges, the first presented 5 questions addressing situations so that the respondent could choose the emotion felt among 3 alternatives of different emotions. The second challenge described 5 situations and asked the respondent what he/she would do, presenting 2 answer options. The last challenge showed 6 expressions of the characters in the game to correlate emotion. The score considered the correct answers, assigning 1 point to each one. The maximum score is 16 points.

Given the exploratory nature of the research and the absence of a previously validated version for this population and context, content validity procedures were carried out before data collection. Both the adapted emotional competence scale and the game content test were subjected to an expert judging process involving three professionals with experience in basic education and academic qualifications, at least at the master's level. This evaluation was carried out through qualitative interviews, during which the jurors carefully read the instruments and evaluated the clarity, relevance and adequacy of the items in relation to the objectives of the study and the level of development of the target population. Based on the feedback, minor adjustments were made to the wording to improve comprehension and alignment with the school context.

The internal consistency of the adapted emotional competence scale, consisting of eight items, was examined using Cronbach's alpha ($\alpha = 0.570$) and McDonald's omega ($\omega = 0.580$). Although these coefficients indicate modest reliability, they are considered acceptable for an exploratory, pilot-level study with a small number of items and a young sample. These results, therefore, should be interpreted with caution and highlight the need for future studies to perform more robust psychometric analyses, including construct validity tests and scale refinement, or to employ standardized and fully validated instruments to assess emotional competences in children.

During the interventions using Sensidex, the researchers who conducted and monitored the lessons made observations and recorded them in an online field diary shared with the project team. The records included descriptions of observed behaviors, such as conversations, celebrations, questions asked, and movements in space.

3.4 Sensidex digital game

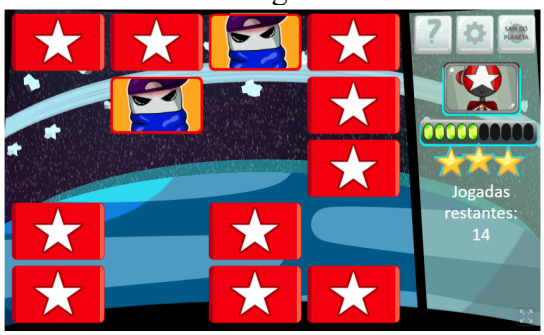
The digital game Sensidex proposes a space narrative aboard a ship on its way to planet Earth, considered the ultimate challenge. The narrative involves the disappearance of emotions, which turned the planet of the intergalactic patrol gray. Thus, the player is invited to be part of the patrol and, along the way, collect emotions on different planets.

At the beginning, the player chooses a character to start their journey, which includes traveling through six planets. Each planet has a mini-game, and the player must earn at least one star to get a thrill. Three different mechanics are combined, that is, each

one appears on two planets and covers different contents. The mechanics of the mini-games are described below:

1. The mini-game "What emotion is this?", as illustrated in figure 2, explores the mechanics of a memory game, so the player needs to relate the facial expressions of the characters to the emotions.

Figure 2
Screenshot from the game "What's this emotion?"



Source: Screenshot of the Sensidex game (authors' elaboration).

2. In the "What Do I Feel?" mini-game, you need to drag the appropriate emotional expression into a situation presented in a situation, as shown in figure 3. For example: I met a friend I hadn't seen in a long time. The options for facial expression are anger, fear, and joy.

Figure 3
Screenshot from the game "What Do I Feel?"

Source: Screenshot of the Sensidex game (authors' elaboration).

3. In the mini-game "What would you do?" —Figure 4—, you must choose between two attitude/behavior options when faced in situations presented by the game. For example: I got a low grade on my report card. The options are show or hide.

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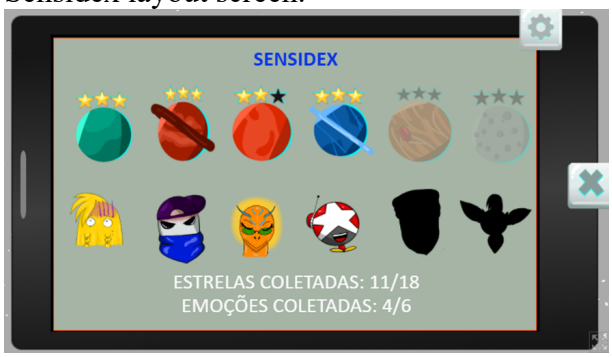
Figure 4
Screenshot from the game "What Would You Do?"

Source: Screenshot of the Sensidex game (authors' elaboration).

Throughout the journey and the collection of emotions, the game records the player's achievements and the emotions collected on the Sensidex device, which gives access to the final challenge, Planet Earth, as shown in figure 5.

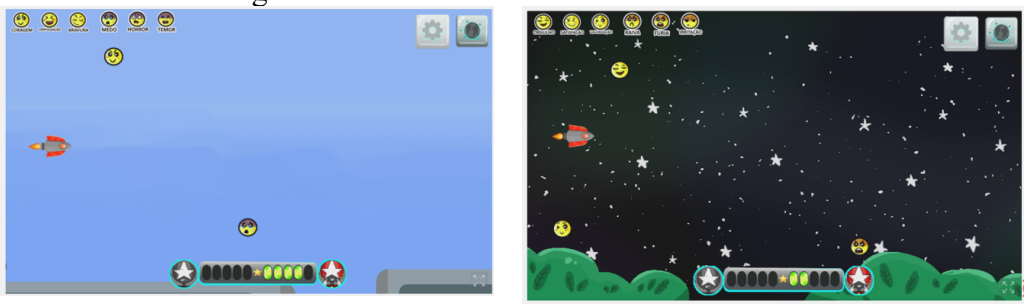
Figure 5
Sensidex layout screen.



Source: Screenshot of the Sensidex game (authors' elaboration).

When you arrive on Planet Earth, you have access to six new minigames, which have the same mechanics and present everyday situations for the player, such as: "Diego got lost in the city". In this case, the player needs to collect the emotions related to the situation and avoid the opposing emotions. In this case, you must collect the negative emotions (fear, horror, and fear) and avoid the positive emotions (courage, excitement, and courage) that attack the ship, as illustrated in figure 6. When you complete this mini-game, you receive positive feedback: "That's it! Diego can feel fear, dread or horror."

Figure 6
Planet Earth mini-game screens



Source: Screenshot of the Sensidex game (authors' elaboration).

Overall, the positive and negative feedback presented in the game provides players with information about the emotions addressed, helping them to better understand the feelings and their implications in each situation presented. Feedback varies from game to game, whether it's highlighting which situations we feel these emotions in, for example, "I have fun when I play with my friends!", or demonstrating synonyms and associated feelings, such as, "That's right! It can also be: disappointment, disappointment." or even reinforcing behaviors such as: "Very good! You show yourself to be a reliable person!". The game also features negative feedback, such as, "Oh no! Even if it makes you happy at the time, this compliment wasn't for you." or even "Oops! This may be selfishness. Try to share things!".

3.5 Data analysis

To analyze the effects of the intervention with the Sensidex digital game (independent variable), the number of correct answers in the pre-test and post-test was considered, resulting in a total score (dependent variable). Data analysis was performed using descriptive and inferential statistics, using the Jamovi software version 2.2.5. First, the normality of the data was verified using the Shapiro-Wilk test. Then, the non-parametric Wilcoxon test was applied to compare the performance of the participants before and after the intervention, allowing an evaluation of the effectiveness of the game in mobilizing emotional competences. To compare the performance of students from different school years, the Kruskal-Wallis test was used.

The records of the observations made during the interventions were treated based on content analysis (Bardin, 2011), proceeding with a floating reading, definition of analysis categories that corresponded to the observed behaviors, and coding to identify the frequency of occurrence.

The answers to the open question about the participants' perception of their learning as a result of the intervention were also submitted to content analysis. Using NVivo software, responses were initially read, categories and subcategories were recorded, and then coding was performed to record frequencies.

4. RESULTS

The results are based on the observations and records made by the researchers during the interventions, on the comparison of performance in the pre-test and post-test, on the evaluation of the game and on the perception of learning that the students recorded in the post-test.

The observation records were organized and analyzed based on three categories that emerged: gameplay, engagement, and learning. The table 2 lists the top behaviors observed and recorded by category. The behaviors recorded in 70% of the interventions were considered relevant — that is, given that the interventions occurred in 24 different classes, a behavior was considered relevant if it was identified in at least 17 of them.

Table 2
Categories and behaviors observed.

Category	Observed behavior
Gameplay	1. They understood the game and knew what to do 2. They paid attention to the feedback and read 3. They expressed a preference for the narrative and the characters
Engagement	4. They participated in the game activity and did not do any other activities. 5. They showed a desire to finish the game 6. They talked about the game during the interventions
Learning	7. They would ask questions or comments related to emotions 8. They showed interest in the content and situations addressed in the game, interacting with the mediators and colleagues about them.

Source: authors' elaboration.

About the gameplay, after a brief explanation of how the interaction with the game would happen, the students showed autonomy when using the buttons, understanding the instructions and providing game feedback. Interactions with the mediators (researchers and teachers) occurred when participants encountered content related to unfamiliar emotions or during situations in the game where they disagreed about what the correct course of action should be. The characters related to the extraterrestrial narrative aroused the interest of players. Comments about character preferences could be observed and they were involved in the choice of character. Some children even attributed powers to the characters.

The engagement was evident when the classes reserved for intervention ended and it was necessary to interrupt the game. Many asked for more time to finish the game in this class. In addition, even when they finished the game, they showed interest in playing again. Some wanted to "fail everything" to see the feedback the game gave.

The analysis of the contributions of the game to the mobilization of emotional competences was based on the application of two instruments. The scale adapted for self-referential assessment of students' perceived competences, and a game content test.

Considering that the data did not follow a normal distribution according to the Shapiro–Wilk test ($p < 0.05$) and that the assumption of randomness was not met, the Wilcoxon rank test by sign was used to examine differences between pre- and post-test performance. Table 3 shows that the results indicated statistically significant differences for both the Emotional Competence Scale (1.3 points) and the game content test (1.4 points), suggesting improved performance after using the Sensidex game. The magnitude of the change was small to moderate for the Emotional Competence Scale ($r_{rb} = −0.274$) and large for the game content score ($r_{rb} = −0.638$).

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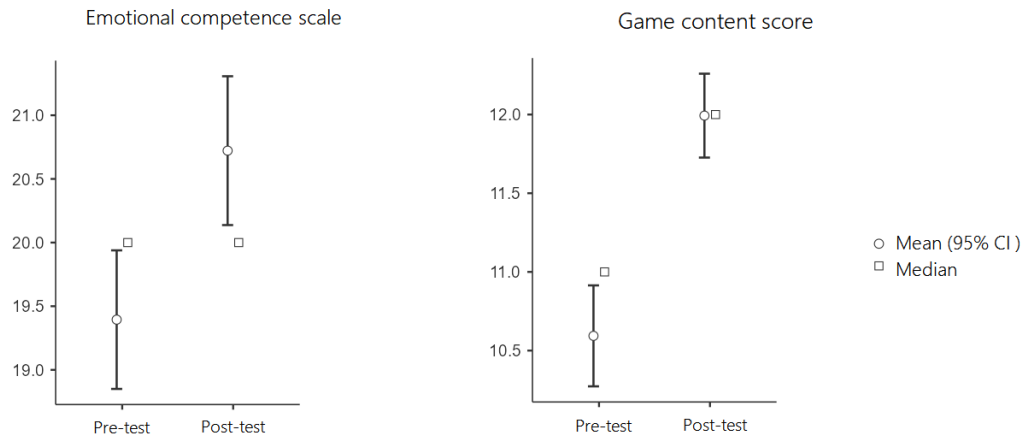
Table 3
Mean, median, standard deviation, Wilcoxon test, p-value, and effect sizes of the pre-tests and post-tests.

Measurements	N	Mean	Median	SD	Wilcoxon W	p	Effect sizes*
Emotional Competence Scale (Pre-Test) Score	446	19.4	20.0	5.86	27132	<0.001	0.274
Emotional Competence Scale (Post-Test) Score		20.7	20.0	6.30			
Game Content Score (Pre-Test)	433	10.6	11	3.41	12491	<0.001	0.638
Game Content Score (Post-Test)		12.0	12	2.83			

Notes. * Effect size was calculated using rank-biserial correlation (r_{rb}) for the Wilcoxon signed rank test. Values of |r_{rb}| ≈ 0.10 indicates a small effect, ≈ 0.30 a median effect, and ≥ 0.50 a large effect.
Source: authors' elaboration.

To complement the results presented, the graphs in figure 7 show the mean and median with 95% confidence intervals for the pre- and post-test scores on the emotional competence scale and the game content test. This visualization supports the comparison of performance changes between evaluation moments and improves the interpretability of the results.

Figure 7
Graphs of pre- and post-test scores on the emotional competence scale and the game content test



Source: authors' elaboration using the jamovi software.

Considering the classes in which the game was applied, the performance analysis was carried out by class to identify which could achieve better results.

The results in table 4 reveal a better average performance on the emotional competence scale in the 1st and 6th grade classes, which are equivalent to the groups with the lowest number of participants. Among the 2nd and 5th grade classes, which include

the age group between 8 and 9 years old, for which the game was developed, the best performance is observed in the 3rd grade.

Regarding the content test covered in the game, a better average performance was also observed in the 1st and 6th grade classes, as shown in table 4. Among the 2nd and 5th grade classes, the 4th grade had the best average performance.

Table 4
Mean, median, and standard deviation of performance in the difference between the post-test and the pre-test.

Pre- and post-test difference	Grey	N	Mean	Median	SD
Emotional Competence Scale	1	18	5.89	6.00	10.37
	2	28	0.25	1.50	7.10
	3	179	1.60	1.00	5.91
	4	91	1.36	2.00	6.26
	5	110	0.02	0.00	3.87
	6	21	2.29	2.00	5.20
Game Content Testing	1	18	3.67	3.00	3.94
	2	28	0.32	1.00	3.55
	3	179	1.81	2.00	2.52
	4	91	2.11	3.00	6.32
	5	110	0.64	1.00	2.32
	6	21	2.52	2.00	2.73

Source: authors' elaboration.

The analysis of the difference between the groups, equivalent to the classes, was performed using the Kruskal-Wallis test, indicating a comparison between more than two paired groups whose values do not observe the normal distribution. The result revealed that the difference between the performance in the post-test and in the pre-test in the emotional competence scale is statistically significant (p=0.004), as well as in the content test (<0.001). An additional analysis compared performance between school grades. The post-hoc examination indicated significant differences in Game Content Test scores between grades, and post-hoc comparisons revealed statistically significant differences between Grades 1 and 5, Grades 4 and 5, and Grades 5 and 6 ($p < 0.05$).

Participants' perception of the game was measured by inserting five objective questions in the post-test and one open-ended question about learning. The score assigned to the response scale ranged from 4 to 1. Considering that the averages obtained were all above 3, there is an agreement regarding the questions, as shown in table 5.

Table 5
Average, median, and standard deviation in relation to the perception of learning from the game.

Questions	Mean	Median	Standard deviation
1. Did you learn more about emotions?	3.36	4	0.84
2. Have you experienced new emotions?	3.08	3	1.06
3. Did you understand that emotions are related to the situations we experience?	3.23	3	0.87
4. Do you understand that emotions influence our behavior?	3.25	3	0.90
5. Did you better understand the importance of emotions?	3.21	3	0.93

Source: authors' elaboration.

The question with the highest agreement referred to knowing more about emotions (3.36), followed by the understanding that emotions influence behavior (3.25) and are related to experienced situations (3.23).

In addition, the post-test included an open-ended question about what the students learned from participating in the intervention with the Sensidex digital game. The answer to the question was spontaneous, and of the total number of instruments analyzed, 265 contained answers (59.3%).

In table 6 is presented content analysis and coding revealed 4 main categories, including "Other," which coded game-related responses, and records of not having learned from it. Among the categories related to emotional competences, Emotional Awareness stands out with 60.65% of all the coding recorded. Next, we have the category of Social Relationship, with 15.53%, in which moral behavior was expressive and emotional regulation, with 13.72%.

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Table 6
Frequency and percentage of coding by categories and subcategories of the open-ended question.

Category	Subcategory	Frequent.	%	Examples
Emotional awareness	Identification of emotions	118	42.60	"I learned several things, such as that I feel calm when I have peace, this is an emotion"; "I learned new emotions"
	Expression of emotions	16	5.78	"I learned to express my feelings"; "Emotions help us express ourselves"
	Recognition of the emotions of others	8	2.89	"I learned to identify the emotions of others"; "This game helps you understand people's emotions"
Emotion regulation	Recognizing the importance of emotions	26	9.39	"I learned that emotions are important"
	Control over emotions	27	9.75	"I learned to control my emotions"; "We need to control our emotions"
	Impact of emotions on behavior	11	3.97	"Emotions influence our actions"
Social relationship	Moral behavior	35	12.64	"I learned that telling the truth is the best option"; "You have to be honest, share things and not take things that are not yours"
	Teamwork and cooperation	8	2.89	"I learned to work in pairs and be honest"; "Working as a team"
	About the game	17	6.14	"I found the game fun"; "I really liked the game"
Other	Difficulty or not learned	11	3.97	"I don't remember"
Total encodings		277	100	

Source: authors' elaboration.

The three subcategories with the highest number of codes were the identification of emotions (n=118), moral behavior (n=12.64) and control over emotions (n=9.75).

4. DISCUSSION

The results obtained reinforce that the Sensidex game can mobilize emotional competences. Observations made throughout the interventions highlighted the children's interest and motivation. The game managed to capture their attention through an engaging and immersive narrative. These observed aspects are important to reinforce the contributions of play, as Ong et al. (2019) highlight that game-based learning can improve outcomes in several domains, including behavior change and acquisition of social competences, due to the ability to engage games and increased intrinsic motivation. In addition, educational studies emphasize that emotions play a central role in cognitive processes such as attention, memory, and motivation, and can facilitate or hinder learning depending on their quality and intensity (Li et al., 2020; Gkintoni et al., 2023).

The emotional learning strategies used in Sensidex have made the concepts of emotional competences easy for children to understand by exploring play and storytelling. This evidence was also noted by Craig et al. (2016), who found the effectiveness of digital games in increasing children's knowledge and understanding of social competences, leading to significant improvements in children's behavior.

The results reinforce the evidence from other studies, such as Papoutsi et al. (2024), which consolidate principles of games for children aimed at facilitating the development of emotional regulation and highlight the importance of emotional development in children and the potential of games as tools to improve emotional regulation.

The data on emotional recognition presented in the research in Tables 4 and 5 are corroborated by Panizo-Lledot et al. (2022) on emotional identification, where students were able to identify emotions correctly. In some situations, students had difficulty clearly distinguishing between some facial expressions and their emotions. For example, they found it easy to discriminate between happiness and other emotions, but more difficult to distinguish between anger and sadness based on facial expressions.

Regarding the gameplay and learning aspects of Sensidex, it is important to note that engaging players (children) is necessary, but not sufficient, for a game to be a successful learning tool. The game also needs to communicate its ideas and approach the content to achieve its educational goals. At the same time, it explores opportunities to work out complex ideas in a fun and entertaining way.

The perception of the participating students about their own learning, in relation to emotions, reveals that the game contributed more strongly to mobilize emotional awareness, especially with regard to the identification of new emotions and learning more about them. Saarni (1990) emphasizes the importance of emotional awareness so that children can improve their interpersonal relationships and regulate their behaviors based on various emotional experiences.

It is recognized that emotional awareness is an important competence that makes up emotional competences, since the ability to identify emotions, in oneself and in others, as well as the appropriate expression of these emotions, directly interfere with emotional regulation and social interactions (Saarni, 1990; Pons et al., 2004). These aspects are decisive for the well-being of children at school and, consequently, for their learning, since this state of consciousness allows children to better perceive how they deal with their emotions, presenting adaptive responses to situations experienced in such a diverse environment (Franco et al., 2017).

Several studies indicate that, by directly interfering with the regulation of behavior and social relationships, emotional awareness is directly linked to students' academic performance (Zhengxian et al., 2024; Denham et al., 2013). Two studies developed by Rocha (2016) and Franco et al. (2017) with elementary school children demonstrated that emotional understanding, mediated by social competences, improved children's academic performance in different areas of knowledge.

Regarding the participants' perception of the game's contributions, there was consensus that the game made it possible to learn more about emotions. The students demonstrated a significant improvement in their emotional awareness, as the results indicated an increase in the students' knowledge of emotions.

These results corroborate other studies that have used digital games to improve emotional competences. Greipl et al. (2023) noted in a scoping review that looked at

thirty-three studies that addressed digital games and emotions. Among the results, it is worth noting that the identification of emotions is one of the most developed competences of the intervention with digital games.

This stood out in the students' perception of their learning related to moral behavior. The situations addressed in the game related to the emotions felt, especially involving other characters, made it possible to link emotional competences to moral behavior. From this perspective, the work of Hilliard et al. (2018), which addressed empathy comprehensively when analyzing the digital game Quidary, highlighted its ability to promote ethical and moral thinking. In this context, a connection is established between moral disposition and emotional competence. Saarni (2000) emphasizes that moral disposition and developmental trajectory are intrinsically linked to emotional competence, since this trajectory is deeply influenced by cultural practices. The moral disposition reflects a way of acting in each context, especially in the social sphere, where the relationship with others is central. In this dynamic, the way we recognize, express, and manage emotions has a direct impact on social interactions.

During the interventions in the school, carried out in groups, many interactions with researchers, teachers and colleagues. The interactions occurred mainly in relation to content related to new emotions unknown to the children or even in game situations in which the children disagreed about what would be right to do. Thus, it is emphasized that the use of digital games in the school context benefits from pedagogical mediation and reinforces the importance of adult mediation in problematizing children's choices during the use of digital games, as well as the impact that this mediation may or may not have on children's reflection on these practices (Franco et al. 2017).

The exchanges between the children occurred spontaneously during the intervention, whether about the content of the game, strategies to overcome the challenge or even comments about the relationship between emotions in real situations. According to Silva et al. (2025), the elements of games (challenges, rewards, and feedback) in pedagogical activities encourage students to engage more deeply with the content, increasing their motivation and persistence. In this sense, the use of the Sensidex game encouraged discussions, questions about emotions and exchanges between children, teachers and researchers.

The results of the content test reinforce that digital games integrated into the curriculum can contribute to school learning. Along with the children's perceptions and observations recorded, contributions are highlighted, especially related to the learning of conceptual contents, which included, for example, the naming of emotions. From this perspective, digital games, when properly integrated into the curriculum, create alternatives for the development of competencies, adding educational media and incentives to reflection. (Ramos et al., 2025).

While the results indicate positive effects of the Sensidex intervention on children's emotional awareness, regulation, and moral behavior, some potential confounding factors should be considered when interpreting these findings. A central aspect concerns the variability in pedagogical mediation during the intervention. Interactions with teachers and researchers were frequent, especially when children faced unfamiliar emotions or disagreed about the appropriate courses of action in the game scenarios. From a sociocultural perspective, this mediation plays a crucial role in learning processes and in the development of emotional competences (Saarni, 2000; Denham, 2023).

In the Brazilian educational context, where affective expressiveness, dialogue, and relational engagement are culturally valued, adult mediation and peer interaction may have intensified discussions about emotions and moral choices, potentially amplifying learning outcomes beyond the effects of game mechanics alone. Studies highlight that emotional competences are shaped through social interaction and guided reflection, especially in school settings (Franco et al., 2017; Denham et al., 2013). Therefore, the observed improvements cannot be attributed exclusively to the Sensidex game, but rather to the combined effects of gameplay, pedagogical mediation, peer-to-peer exchanges, and culturally situated modes of emotional socialization, which together may have acted as confounding variables influencing the outcomes.

As for the performance of the classes, the first year of elementary school had the best performance, even though it was not the most appropriate group for the Sensidex game. However, children in this age group had more mediation from adults and the intervention occurred in smaller groups. Thus, the best performance may be more associated with conditions and mediation than with the experience with the Sensidex game.

Among the conditions for carrying out the intervention, it is important to note that the children must be literate, as the application of the instruments and the use of the game required reading by the children. Despite this, digital games can be used in various age groups, offering not only game-related elements, but also educational content (Pinheiro & Lima, 2020). However, it is important to observe the necessary conditions, which reinforces that the use of digital games in schools needs to be anchored in planning and pedagogical intentionality Gkintoni et al, 2023; Silva et al., 2025).

Considering the size of the participating groups, organized according to the classes, and the observed performance, the results converge to suggest that the intervention with the Sensidex game in the school context is more appropriate for the 3rd and 4th grade classes. Children in this age group have an ideal stage of socio-emotional development for the mobilization and improvement of the emotional competences worked on in games (Silva & Lemos, 2024). Studies by Canettieri et al. (2021) and Carmo (2023) indicate that, around this age, students develop a greater ability to identify, name, and regulate emotions, fundamental competences for social interaction and conflict resolution.

In terms of cognitive and literacy competences, children in the 3rd and 4th grades have a better understanding of texts and rules, allowing for a more autonomous interaction with games (Silva & Lemos, 2024). According to Huang, Pollak and Xi (2025), digital games that work on emotional competences are more effective when participants develop reading and interpretation competences, which occur naturally at this stage of schooling. It is worth noting that this aspect allows children to understand more complex challenges and make decisions in the game without the constant need for mediation.

Another relevant point is the increase in motor and cognitive autonomy in this age group (Pena et al. 2020). According to studies presented by Villani et al. (2018), digital games that require decision-making and strategies for emotional regulation are best explored by children who have already reached a certain level of independence. Interventions with the Sensidex game in the school context can therefore benefit from this autonomy by promoting more dynamic and player-centered learning experiences, favoring both engagement and the development of social and emotional competences.

Thus, studies in intervention-based emotional gaming programs such as EmoTIC demonstrate that the use of digital games at appropriate ages can promote significant gains in self-esteem, emotional regulation, and the development of interpersonal skills (De La Barrera et al., 2021). Thus, the combination of emotional maturity, cognitive skills and increased autonomy makes the use of Sensidex especially suitable for 3rd and 4th grade students, offering a safe and effective environment for the comprehensive development of emotional competences.

5. CONCLUSION

The results of this study reinforce that digital games can be integrated into the curriculum and used in interventions for the development of emotional competences in the school context. Sensidex has demonstrated a positive impact on mobilizing emotional awareness, emotion regulation, and promoting prosocial behaviors. In addition, a high level of engagement and a positive evaluation of the game by the children was observed.

The main contribution of this study is the validation of Sensidex as an innovative pedagogical resource for emotional education. The findings corroborate previous research that highlights the potential of serious gaming to promote emotional well-being and improve social interaction. The analysis revealed that students in the 3rd and 4th grades benefited the most, suggesting that this age group may be the most suitable for interventions involving digital gambling.

Although this study aims to contribute to the understanding of how digital games can mobilize emotional competences in school contexts, its scope and statements are necessarily limited by specific contextual and methodological conditions. The research was carried out with a convenience sample taken from nine Brazilian schools, predominantly located in the southern region of the country, which limits the representativeness of the findings at the national level. In addition, variations related to demographic factors such as gender, socioeconomic background, and cultural diversity were not explored in depth, restricting a more detailed analysis of how different student profiles can experience and benefit from the intervention. Thus, the results should be interpreted as contextually situated and exploratory, and not as generalizable evidence of efficacy.

In addition, the study focuses on short-term outcomes after a brief intervention, which may be influenced by factors such as participants' awareness of being observed (Hawthorne effect) or the novelty associated with the use of a digital game in the classroom. While the results support the potential of Sensidex as a pedagogical resource, they do not justify widespread claims about the integration of digital games into school curricula in diverse educational systems or cultural contexts. Instead, the study seeks to offer empirical insights that can guide future investigations, including surveys with more representative samples, probabilistic sampling strategies, longitudinal designs, and analyses that take into account contextual variables such as teacher training, mediation practices, and implementation conditions.

Future research can explore the impact of longer interventions, compare experimental groups and controls, and assess the role of pedagogical mediation in game effectiveness. In addition, investigations with different age groups can contribute to the improvement of Sensidex and its applicability in different educational contexts.

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