# Digital storytelling to develop critical thinking

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## Abstract

This research sought to confirm the hypothesis that the use of digital storytelling develops critical thinking among secondary school students. The study used a quasi-experimental design and a quantitative approach that was complemented with qualitative data to deepen the understanding of the variable being analyzed. This combination of methodological techniques generated a comprehensive and robust understanding of the research results. The design of the study was informed by constructivist, socio-cultural and critical pedagogy theories that underline the potential of storytelling to promote higher order cognitive processes in students. A written test and semi-structured interview were conducted with a population of 110 students, with both instruments validated by experts. The findings showed a significant development in critical thinking after participation in the digital storytelling program. In the post-test, 46.34% of the students reached a "good" level of critical thinking while 19.51% achieved an "excellent" level. This study evidences that the didactic resource of digital storytelling fosters the development of higher order cognitive skills like analyzing, questioning and decision-making that have a positive impact on the development of critical thinking.

**Keywords:**

Learning, stories, interpretation, self-monitoring, pedagogical practice.

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# Storytelling digital para desarrollar el pensamiento crítico


## Resumen

La investigación tuvo como objetivo determinar que el uso del storytelling digital desarrolla el pensamiento crítico en estudiantes de educación secundaria. Presenta un diseño cuasiexperimental y un enfoque cuantitativo, complementado con datos cualitativos para profundizar en la comprensión de la variable de análisis; esta combinación permitió obtener una comprensión holística y robusta de los resultados. Se fundamenta en las teorías constructivistas, socioculturales y de pedagogía crítica, las cuales subrayan el potencial del storytelling para promover procesos cognitivos de orden superior en los estudiantes. Se aplicó una prueba escrita y una entrevista semiestructurada, ambos instrumentos validados por expertos, a una población de 110 estudiantes. Los hallazgos evidenciaron un desarrollo significativo en el pensamiento crítico; en el post-test, el 46,34% de los estudiantes alcanzaron un nivel bueno, mientras que el 19,51% se ubicaron en el nivel excelente. Este resultado demostró que el storytelling digital, como recurso didáctico, fomenta el desarrollo de habilidades cognitivas de orden superior, como analizar, cuestionar y tomar decisiones; habilidades que impactan positivamente en el desarrollo del pensamiento crítico.



***Palabras clave:***

Aprendizaje, historias, interpretación, autocontrol, práctica pedagógica.


# Storytelling digital para desenvolver o pensamento crítico


## Resumo

A pesquisa teve como objetivo determinar que o uso do storytelling digital desenvolve o pensamento crítico em estudantes do ensino secundário. Apresenta um desenho quase-experimental e uma abordagem quantitativa, complementada com dados qualitativos para aprofundar a compreensão da variável de análise; essa combinação permitiu obter uma compreensão holística e robusta dos resultados. Fundamenta-se nas teorias construtivistas, socioculturais e de pedagogia crítica, que destacam o potencial do storytelling para promover processos cognitivos de ordem superior nos estudantes. Foi aplicada uma prova escrita e uma entrevista semiestruturada, ambos os instrumentos validados por especialistas, a uma população de 110 estudantes. Os resultados evidenciaram um desenvolvimento significativo no pensamento crítico; no pós-teste, 46,34% dos estudantes alcançaram um nível bom, enquanto 19,51% se situaram no nível excelente. Esse resultado demonstrou que o storytelling digital, como recurso didático, fomenta o desenvolvimento de habilidades cognitivas de ordem superior, como analisar, questionar e tomar decisões; habilidades que impactam positivamente no desenvolvimento do pensamento crítico.



***Palavras-Chave**:*

Aprendizagem, histórias, interpretação, autocontrole, prática pedagógica.

## Introduction

Critical thinking has become a fundamental competence in the contemporary landscape. It is a relevant skill because it gives students the ability to analyze, question and make informed decisions in an increasingly complex world. The United Nations Educational, Scientific and Cultural Organization (UNESCO, 2021) emphasizes the need for education systems to integrate these cognitive skills into their curricula, recognizing them as essential for learning in the 21st century. This perspective is supported by researchers including Paulsen and Dankert-Kolsto (2022) and Andreucci-Annunziata et al. (2023) who argue that critical thinking should be the central axis of the educational process, acting as a fundamental tool for discovering truth and preparing students for future challenges.

This need is aligned with Sustainable Development Goal 4 (SDG 4) contained in the 2030 Agenda, which seeks to ensure inclusive, equitable and quality education through promoting lifelong learning opportunities (United Nations [UN], 2015). Target 4.4 of this goal emphasizes the importance of substantially increasing the number of young people and adults who are equipped with relevant competencies so that they can access employment, decent work and entrepreneurship, including technical and vocational skills. The development of critical thinking in students is presented as a key component for achieving this goal, given that it helps adolescents and young people respond to the challenges they will face in the world of work in the 21st century. Vrabec et al. (2023) stresses that critical thinking is even more relevant today due to the growing level of misinformation and the proliferation of digital sources.

A number of international studies point to an educational crisis that has caused setbacks in student learning, particularly in terms of critical thinking skills. Thulla et al. (2022) report that more than 70% of children in Sierra Leone have difficulty reading and comprehending texts, while Angrist (2022) states that in African countries such as Kenya, Tanzania and Uganda, more than 50% of third graders cannot read a simple sentence. The World Bank

(2021) estimates that Latin America and the Caribbean could experience the largest increase in the learning poverty indicator, a projected rise from 51% to 62.5% in the proportion of children who face major difficulties with reading and understanding a simple text.

Peru is no exception and faces challenges in the development of fundamental skills such as critical thinking. This educational crisis is reflected in the results of national standardized tests. According to a report from the La Libertad Regional Education Management [GRELL] (2023) on academic performance in this region, just 6% of students in the fourth grade of primary school achieved a satisfactory reading level while just 1% of secondary school students in the second year reached a satisfactory level in reading comprehension and mathematics.

Faced with an educational crisis characterized by low levels of reading comprehension and critical thinking, there is an urgent need to implement innovative teaching strategies. Effective digital storytelling emerges as a promising alternative, given that it combines traditional storytelling elements with the potential of digital technologies (Robin, 2008). This communication technique uses storytelling to convey messages, engage the audience and generate emotional connections (Smith, 2021).

Previous studies have demonstrated the positive effects of digital storytelling on strengthening higher-order cognitive abilities. Levine (2022) revealed how digital narratives can act as a vehicle of cognitive empowerment for young people in socioeconomically challenging environments in South Africa, facilitating the development of their metacognitive and reflective skills. Pilligua-Holguín and Hermann-Acosta (2022) identified the effectiveness of storytelling to encourage reading among students at a public school in Manta, Ecuador. Setyowati (2023) corroborated these findings in the Asian context, highlighting that the integration of historical visual narratives in a digital format can significantly enhance the analytical and evaluative skills of secondary school students.

In Peru, research in this area has followed a convergent trajectory with distinct methodological nuances. Romani and Macedo (2021) used a quantitative approach to demonstrate how storytelling developed critical thinking among vocational students. Del Risco (2023) extended this research to the field of visual storytelling, evidencing how narrative photography can be an effective medium for supporting secondary students to develop communicative competences and critical thinking.

Auccapure and France (2023) generated empirical evidence regarding the effectiveness of structured critical thinking programs through the use of quasi-experimental designs that reinforce the internal validity of their findings. Espinola (2023) conducted a quasi-experimental study to determine if the use of literary conversations activated critical thinking. The combined results of these studies validate the effectiveness of digital storytelling in the Peruvian context while also providing a robust methodological framework for future research in the fields of critical pedagogy and educational innovation.

The present study aimed to determine how the use of digital storytelling develops critical thinking among secondary school students in the city of Guadalupe, Peru. This research is based on constructivist, sociocultural and critical pedagogy theories that emphasize the potential of storytelling to promote higher order cognitive processes, enhance reflection skills and empower students (Piaget et al., 1929; Vygotsky, 1934; Freire, 1970). It is also important to note the work carried out by Villarini (2001) and Tamayo et al. (2015) that affirms the three dimensions of critical thinking: thinking, reflection and self-regulation.

## Method

This study employed a quantitative method that was enriched with qualitative elements, an approach that is suitable for testing theories and hypotheses (Sampieri et al., 2014). A quasi-experimental design was chosen that included the application of pre- and post-tests. For Creswell (2014), quasi-experimental designs are very useful for assessing causal relationships. Their reliability increases when applied to real-world contexts. The population

for the study consisted of 110 secondary students in their fourth year of high school. Using non-probabilistic sampling, a total of 80 participants were selected aged between 15 and 16 years. These students were then divided into control and experimental groups. Informed consent was obtained from the parents of all participants before the study commenced and the necessary authorization was also obtained from the participating school.

Two instruments were used for data collection. These included a written test with 10 open-ended questions to assess the three dimensions of critical thinking: thinking, reflection and self-regulation (Villarini, 2001). The design of this test was based on Priestley's Critical Thinking Questionnaire (2013), which has been used in previous studies. Before its application, the instrument was subjected to a validation process with experts. Three Education Ph.Ds. certified the coherence and relevance of the instrument for measuring the dimensions of thinking, reflection and self-regulation. The second instrument was a semi-structured interview that was designed to delve deeper into learners' perceptions and experiences in relation to the development of their critical thinking. The questions for the interview were also validated by experts who assessed their clarity, relevance and logical sequence.

## Results

The results of the study evidence that the experimental group that participated in the digital storytelling program made substantial progress with the development of their critical thinking skills compared to the control group.

**Table 1**

**Critical thinking achievement levels – Control and experimental groups consisting of secondary school students – Guadalupe, 2024**

| | CONTROL GROUP | | INTERVENTION GROUP | |
|---|---|---|---|---|
| LEVEL | PRE - TEST | POST-TEST | PRE - TEST | POST-TEST |
| EXCELLENT | 0.00% | 2.56% | 0.00% | 19.51% |

| | | | | |
|---|---|---|---|---|
| GOOD | 0.00% | 7.69% | 0.00% | 46.34% |
| AVERAGE | 84.62% | 84.62% | 84.62% | 34.15% |
| POOR | 15.38% | 5.13% | 4.88% | 0.00% |

Note: Data taken from the written critical thinking test.

The analysis of this data strongly evidences the positive and significant effect of the digital program storytelling on the development of students' critical thinking.

It was notable that levels of critical thinking remained relatively stable in the control group, with the majority of students at the average level (84.62%) and only a small proportion attaining a good level (7.69%).

In contrast, the experimental group that participated in the digital storytelling intervention achieved a substantial transformation in this skill. In the post-test, almost half of the participants (46.34%) reached a good level of critical thinking while 19.51% reached the excellent level. This contrasts sharply with the pre-test, in which 84.62% of the learners scored at the average level. The notable difference in results between the control group and the experimental group underlines the effectiveness of digital storytelling as a pedagogical tool that fosters the reflective skills essential for the development of critical thinking.

**Table 2**

*Level of critical thinking in the control and experimental groups – broken down by dimensions. Guadalupe, 2024*

| | CONTROL GROUP | | | | | | EXPERIMENTAL GROUP | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LEVEL | D1 | | D2 | | D3 | | D1 | | D2 | | D3 | |
| | PRE. | POST. | PRE. | POST. | PRE. | POST. | PRE. | POST. | PRE. | POST. | PRE. | POST. |
| EXCELLENT | 0.0% | 2.5% | 0.0% | 5.1% | 0.0% | 2.5% | 0.0% | 34.1% | 0.0% | 19.5% | 0.0% | 17.0% |
| GOOD | 0.0% | 41.0% | 0.0% | 23.0% | 0.0% | 35.9% | 0.0% | 56.1% | 0.0% | 46.3% | 0.0% | 53.6% |
| AVERAGE | 97.4% | 53.8% | 97.4% | 71.7% | 97.4% | 61.5% | 100.0% | 9.7% | 100.0% | 34.1% | 97.4% | 29.2% |
| PPOOR | 2.5% | 2.5% | 2.5% | 0.0% | 2.5% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 2.5% | 0.0% |

*Note: Data taken from the written critical thinking test.*

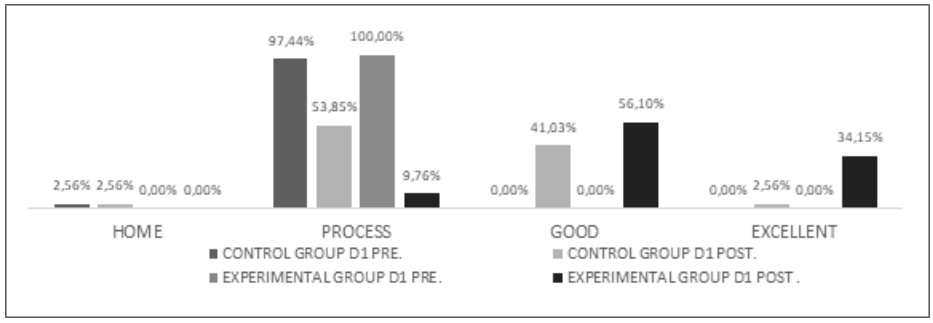
The analysis of the data presented in Table 2 shows the positive and significant impact of the digital storytelling program on the three key dimensions of critical thinking: thinking, reflection and self-regulation. For the thinking dimension, the majority of students in the control group remained at the process level (53.85% in the post-test). On the contrary, students in the experimental group that participated in the digital storytelling intervention showed remarkable progress with the development of their thinking skills. In the post-test, 56.10% of these participants reached a good level and 34.15% achieved an excellent level. These findings strongly support the hypothesis that digital storytelling contributes to the development of high-level cognitive skills, such as the ability to process information, generate concept maps and engage in analysis and synthesis of information.

In terms of the dimension of reflection within the skill of critical thinking, the results evidence that the digital storytelling program had a significant impact. The majority of students in the control group remained at the process level (71.79% in the post-test) while those in the experimental group achieved a radical transformation of their reflection skills. In the post-test, 46.34% of participants in the experimental group achieved a good level of reflection and 19.51% reached an excellent level. This indicates that the digital storytelling program had an impact on the development of students' reflective capacity, enabling them to engage in mental processes for effective decision-making and problem-solving.

The experimental group evidenced a substantial improvement in the dimension of self-regulation following their participation in the digital storytelling program. While the majority of the control group remained at the process level (61.54% in the post-test), 53.66% of students in the experimental group reached a good level and 17.07% achieved the excellent level. These results show that the digital storytelling program developed reflective skills among the students that allowed them to monitor and control their own learning process.

**Figure 1**

*Level of achievement - control and experimental groups - Thinking dimension*

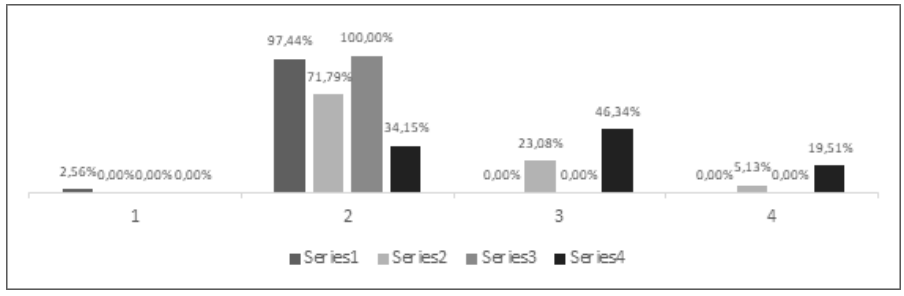



Note: Data taken from Table 2

For the thinking dimension, more than half of the students in the experimental group (56.10%) reached a good level and more than a third (34.15%) were at the excellent level. This indicates that the use of digital storytelling promoted the development of high-level cognitive skills, including the ability to process information, generate concept maps and carry out analysis and synthesis of information.

**Figure 2**

*Level of achievement - control and experimental groups - Reflection dimension*

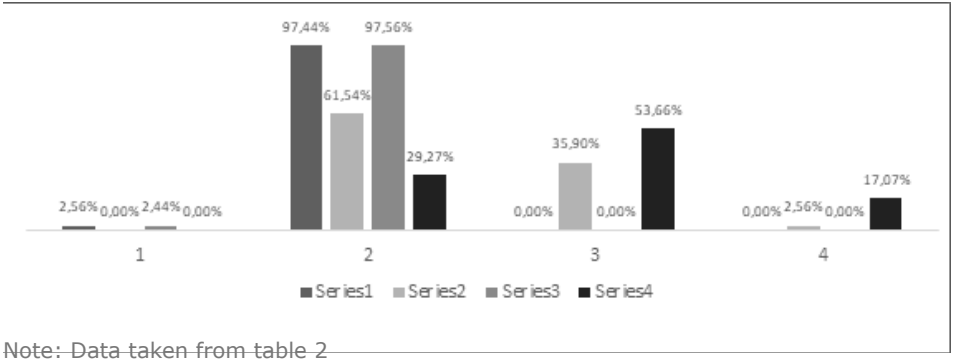



Note: Data taken from Table 2

In terms of the reflective dimension, 46.34% of the participants in the experimental group achieved a good level and 19.51% an excellent level in the post-test. These results suggest that digital storytelling develops students' reflective capacity, supporting them to engage in effective decision-making and problem-solving.

**Figure 3**

*Level of achievement - control and experimental groups - Self-reflection dimension*




Note: Data taken from table 2

Finally, 53.66% of the students in the experimental group reached the good level and 17.07% were at the excellent level for the self-regulation dimension following the intervention. These findings indicate that the digital storytelling program developed self-regulation skills among students that allowed them to enable them to monitor and control their own learning process.

## Hypothesis testing

Given that the two samples are related (pre-test and post-test), the most appropriate non-parametric tool is the Wilcoxon test, as shown in the following table:

**Table 3**

*Wilcoxon test results*

| Ranges | | | | |
|---|---|---|---|---|
| | | N | Average range | Sum of ranges |
| PREPOST INTERVENTION PREPOST CONTROL | Negative ranges | 5[a] | 14.50 | 72.50 |
| | Positive ranges | 64[b] | 36.60 | 2342.50 |
| | Ties | 11[c] | | |
| | Total | 80 | | |

a. PREPOST EXPERIMENTAL GROUP < PREPOST CONTROL GROUP

b. PREPOST EXPERIMENTAL GROUP > PREPOST CONTROL GROUP

c. PREPOST EXPERIMENTAL GROUP = PREPOST CONTROL GROUP

| Test statistics | |
|---|---|
| | INTERVERPREPOST - GESTIONPREPOST |
| Z | -6.797[b] |
| Asymp. signif. (bilateral) | <.001 |
| a. Wilcoxon signed-rank test | |
| b. Based on negative ranges. | |

*Note: Data taken from the SPS for hypothesis testing*

Analysis of the results using the Wilcoxon test yielded a Z-statistic value of -6.797 with an asymptotic significance (bilateral) of less than 0.001. This indicates the existence of a statistically significant difference between the scores obtained by the experimental group and the control group in the post-test. The range analysis showed that the positive ranges (64 cases) were significantly higher than the negative ranges (5 cases), which suggests that the group exposed to the digital storytelling program performed better in critical thinking skills compared to the control group.

Based on these findings, it can be concluded that the use of digital storytelling contributed to the development of critical thinking skills among the participating secondary school students. The results allow us to reject a null hypothesis and accept the alternative hypothesis put forward in the study. This research provides solid empirical data that evidences the effectiveness of digital storytelling as a didactic teaching tool to promote the development of critical thinking in an educational context. These findings have important implications for the improvement of teaching and learning processes in secondary education.

## Testing specific hypotheses

**Hypothesis 1:** Digital storytelling develops thinking skills among secondary school students in Guadalupe.

No statistically significant difference was found between the pre-test and post-test scores for the thinking dimension ($t(38) = 1.24$, $p = 0.222$) among members of the control group. However, there was a significant and positive difference between the two

measures among students in the experimental group (t (40) = 8.63, p < 0.001) with a large effect size (Cohen's d = 1.35). This indicates that the digital storytelling program had a significant effect on the development of the thinking dimension among students.

**Hypothesis 2:** Digital storytelling develops reflection skills among secondary school students in Guadalupe.

When analyzing the reflection dimension, there were no statistically significant differences between the pre-test and post-test results in the control group (t (38) = 1.86, p = 0.070). However, a positive and significant difference was found between the two measurements in the experimental group (t (40) = 6.54, p < 0.001) with a large effect size (Cohen's d = 1.02). These results suggest that the digital storytelling program effectively contributed to the development of reflective skills among students.

**Hypothesis 3:** Digital storytelling develops self-regulation skills among secondary school students in Guadalupe.

For the dimension of self-regulation, no statistically significant differences were found between the pre-test and post-test in the control group (t (38) = 1.39, p = 0.172). In contrast, a positive and significant difference was found between the two measurements in the experimental group (t (40) = 5.92, p < 0.001) with a large effect size (Cohen's d = 0.92). These results indicate that the digital storytelling program developed self-regulation skills among students.

The findings of the statistical observation, using a Student's t-test for related samples, lead us to accept the three hypotheses put forward. Statistically significant and large effect size differences were found between the pre-test and post-test results for the experimental group in the critical thinking dimensions of thinking, reflection and self-regulation.

From a methodological perspective, it was decided to complement the study's quantitative data by incorporating an ethnographic tool. This contributed to a more comprehensive

understanding of the impact of the digital storytelling program on the development of students' critical thinking skills.

Below is a table summarizing the semi-structured interview questions and notable responses from students in the experimental group:

**Table 4**

*Summary of key interview questions and answers designed to evaluate perceptions of the Digital Storytelling program.*

| Questions | Notable student responses |
|---|---|
| What did you learn from the storytelling program? | Understanding values in a positive way.<br>It awakened my critical thinking.<br>It taught me good lessons and how to think better.<br>It helped me improve my reading comprehension and thinking.<br>How to interpret reality in a different way. |
| How has storytelling impacted your ability to critically understand and interpret texts? | It helped me to be more critical and analyze texts better.<br>Each story has a lesson. It helped me identify values and anti-values.<br>How to interpret reality in a different way, with more reflection and intelligence. |
| What aspects of the storytelling program have you enjoyed in these 10 sessions? | It's a good way to learn and reflect.<br>The stories are interesting and fun.<br>The reflection after each story.<br>The unfamiliar images and words enrich the experience. |
| What do you think are the benefits of making decisions using critical thinking? | The reflection and acting wisely.<br>You make good decisions based on correct thinking.<br>Being more independent and knowing how to make decisions in a fair and effective manner. |
| Why would you recommend the storytelling program? | It helps you reflect and think effectively and accurately.<br>Because it's fun and makes you understand things in a correct way.<br>Because it helps develop our skills and practice our critical thinking. |

Note: Summary of answers to questions in the semi-structured interview designed to evaluate participants' perceptions of the Digital Storytelling program.

The analysis of the data collected through the semi-structured interviews with the experimental group provides valuable qualitative insights that enrich the study's quantitative findings.

In terms of the thinking dimension, students' responses reflected a substantial improvement in their ability to verify and critically evaluate the information they receive, especially on social media. Several participants highlighted that they now pay more attention to the source, authorship, date and consistency of information before giving it credibility. They also stated that they have developed a more reflective and questioning attitude towards the content they consume, seeking to contrast information with other reliable sources. This evidence supports the quantitative results that showed significant progress in the experimental group's level of critical thinking.

In relation to the dimension of reflection, the interviews revealed that students strengthened their ability to analyze different points of view on a topic before reaching a conclusion. Many of them report that they now try to keep an open mind, carefully listening and considering the perspectives shared be their peers and then contrasting these with their own experiences and prior knowledge. Some of the students even mentioned that they have changed their minds about certain topics after reflecting on new information or stronger arguments. These qualitative findings support the quantitative results that showed significant progress in the reflective skills of students in the experimental group.

Finally, the interview questions focused on the dimension of self-regulation showed that students have developed increased awareness and control over their own learning processes. Several participants indicated that they are now more careful when checking the validity and coherence of their own arguments before expressing them, using reliable sources and critically evaluating their ideas. They also mentioned that they use a variety of creative strategies, such as group activities, concept maps and even relaxation techniques to effectively address and solve problems. This qualitative data is aligned with the quantitative results that evidence the positive and significant impact of the digital storyte-

lling program on the development of students' self-regulation skills.

Overall, the analysis of the semi-structured interviews provides results that complement the study's quantitative findings, contributing to a deeper understanding of the processes involved in the development of critical thinking skills through digital storytelling. The students' testimonies evidence a transformation in their thinking, reflection and self-regulation skills. This qualitative supports the statistical results described above. The author considered it relevant to explore the perceptions and experiences of participants through a semi-structured interview in order to achieve a better interpretation of the study's results.

In terms of the learning acquired by students as a result of their participation in the storytelling program, their responses to the interview questions evidenced that they now understand values in a more positive way, have awakened their critical thinking and improved their thought processes. Several participants state that the program had an impact on their reading comprehension ability, allowing them to interpret reality in a different way. Regarding the impact of storytelling on their critical reading comprehension and interpretation skills, the students noted that the program taught them to be more critical and analytical when reading different texts. They indicated that each of the digital narratives taught them a specific lesson, helping them become aware of their values and anti-values. They also stated that the program provided them with tools to interpret reality with increased levels of reflection and intelligence.

In regard to the highlights of the digital storytelling program, the students mentioned that it was a good way to learn and reflect because the stories were fun and interesting. They particularly valued the reflection spaces after each story was finished, as well as the use of images and unfamiliar words that enriched their learning experience. In terms of the benefits of making decisions based on critical thinking, participants emphasized that these skills allow them to reflect and act more accurately, make decisions using "correct" thinking and be more independent in judging situations both fairly and effectively.

Taken together, the analysis of the semi-structured interviews provides a qualitative perspective that is complementary to the quantitative results, allowing for a deeper understanding of the processes involved in the development of critical thinking as a result of the digital storytelling program. The students' testimonies reflect a transformation in their thinking, reflection and self-regulation skills, with these interviews generating qualitative data that supports the statistical findings presented above.

## Discussion

The results of this research are highly significant and confirm the effectiveness of digital storytelling as a pedagogical strategy that fosters the development of critical thinking in secondary school students. These findings align with and complement previously documented empirical evidence from a range of educational contexts. The analysis of the data shows that while the control group maintained similar levels of critical thinking between the pre-test and post-test, the experimental group that participated in the digital storytelling program experienced a substantial improvement in the three critical thinking dimensions that were assessed by the study: thinking, reflection and self-regulation.

The experimental group made significant progress in the thinking dimension, with almost half of the students (48.9%) reaching a good level and more than a fifth (21.9%) achieving an excellent level in the post-test. These results support the premise that digital storytelling strengthens higher-order intellectual skills, including the ability to process information, generate concept maps and carry out analysis and synthesis of data. This is in line with the storytelling principles proposed by Villarini (2001), who proposes that thinking involves implementing cognitive processes of combination, representation and operations. These aspects were strengthened through the digital storytelling strategy implemented as part of this research.

The findings were equally remarkable for the reflection dimension. While in the control group most of the students remained at the poor and average levels, substantial progress was observed in the experimental group, with 36.6% of students reaching

a good level of achievement and 12.2% an excellent level. This data corroborates the hypothesis that digital storytelling fosters the development of students' reflective capacities, allowing them to activate mental processes that facilitate effective decision-making and problem-solving. This result is supported by the work of Villarini (2001), who states that reflection is the manifestation of a student's free will and activates mental processes and resources to achieve objectives and goals.

The experimental group made significant progress in the self-regulation dimension, with 36.7% of the students achieving the good level and 14.5% at the excellent level. These results show that digital storytelling strengthens students' ability to monitor and control their own learning. This in turn leads them to activate mental processes that contribute to their freedom of thought and help develop their critical thinking. This is in accordance with Tamayo et al. (2015), who proposes that self-regulation is essential so that students can make the best decisions and take appropriate action.

The findings of this study are particularly relevant in the current context of a global education crisis and setbacks in student learning, particularly in terms of critical thinking skills (World Bank, 2021; UNESCO, 2021). The results of this research support the implementation of innovative strategies like digital storytelling to address this problem and contribute to the formation of citizens who have the ability to analyze, reflect and make informed decisions.

The results obtained in this research are closely related to findings reported in several previous international and national studies. Levine (2022) and Setyowati (2023) confirm the potential of storytelling to foster critical thinking in students, a position that is supported by the work of del Risco (2023), Auccapure and Francia (2023) and Ruiz (2023). These authors identified the positive effects of storytelling strategies on the development of critical thinking skills. These studies don't just validate the effectiveness of digital storytelling in the Peruvian context, but also provide a robust methodological framework for future research in the fields of critical pedagogy and educational innovation.

The results of these previous studies support the findings of the present research, which evidences that didactic strategies incorporating problem solving, analysis and decision making, such as project-based learning, can be as effective as digital storytelling in promoting critical thinking among students.

The results of this research corroborate theories that support the use of storytelling in education. From a constructivist perspective, storytelling is presented as a strategy that allows students to actively build their own knowledge. This is in line with the work of Piaget (1936), who conceived thinking as an internalized action that modifies the object of knowledge through interactions between the individual and their environment.

Vygotsky's (1934) sociocultural theory emphasizes the fundamental role of language and social interaction in the cognitive development of individuals. Vygotsky argued that learning emerges at a social level and is then internalized at an individual level. In accordance with this theory, storytelling is a tool that enhances these social mediation processes by encouraging communication, dialogue and the exchange of ideas among students. As evidenced by Pilligua-Holguín and Hermann-Acosta (2022), the use of storytelling as a pedagogical strategy favors the development of complex cognitive skills in learners, given that this technique is aligned with the principles of sociocultural theory.

Freire's (1970) critical pedagogy considers storytelling to be a valuable ally that promotes student empowerment. Freire conceived education as a political act aimed at liberation and social transformation. In this sense, storytelling emerges as an innovative means of encouraging critical analysis of social realities, questioning the status quo and raising awareness about urgent issues. As noted by Levine (2022), the use of digital storytelling with young people in vulnerable situations allows them to share their experiences, gain confidence and develop a critical view of their surroundings. This aligns storytelling with the Freirean premise that dialogue and reflection is important in education because it empowers learners to question oppressive structures in society.

The results of this study fully support this approach, evidencing that the digital storytelling program significantly contributed to the development of thinking, reflection and self-regulation skills among participating students. This suggests that storytelling, far from being a mere entertainment tool, can be used as a powerful pedagogical resource that develops higher order cognitive processes, as proposed by Andreucci-Annunziata et al. (2023) and Vrabec et al. (2023). By questioning assumptions, analyzing different perspectives and making informed decisions, students exercise and strengthen skills that are essential for comprehensive development and facilitate their active participation in society.

It should be noted that the findings of this research are based on a solid methodological approach that combines a quasi-experimental design with the incorporation of ethnographic techniques. This mixed methods approach means that the study's results are more solid and rigorous because the phenomenon is considered from multiple perspectives.

Creswell (2014) notes that the quasi-experimental design is a valuable tool when seeking to establish causal relationships and determine the impact of an intervention in a real-world context. By comparing the results from the experimental group that participated in the digital storytelling program with the pre and post-test scores of the control group, the researcher reliably confirmed the positive and significant effect of this pedagogical strategy on the development of students' critical thinking skills. The incorporation of qualitative techniques in the methodological design enriched understanding of the phenomenon by collecting data regarding the perspectives and experiences of the study's participants. Through observation of the learning process, semi-structured interviews and analysis of students' perceptions, the researcher obtained a comprehensive view of the impact of digital storytelling on the development of complex cognitive skills. According to Hammersley (2018), this approach provides ecological validity to the results by analyzing them in the natural context in which they were developed.

Through the rigorous validation and application of the instruments used, this combination of methodological approaches

ensured robustness and reliability for the results reported in this research. This is of particular importance as it allows us to transcend the mere description of the effects of digital storytelling and gain an in-depth understanding of the underlying processes that explain its effectiveness in strengthening students' critical thinking. To conclude the discussion, it is important to highlight the incorporation of qualitative tools in the research, which increased understanding of the impact of the digital storytelling program on the development of students' critical thinking. The semi-structured interview allowed the researcher to delve deeper into the perceptions and experiences of participants in the experimental group, providing valuable information that complemented the results obtained through the written pre and post-tests. Hernández Sampieri et al. (2014) observe that the incorporation of qualitative techniques, such as semi-structured interviews, enables in-depth exploration of educational phenomena, allowing researchers to access the representations and meanings that students construct related to the learning process.

## Conclusions

The digital storytelling program significantly developed the critical thinking of secondary school students in Guadalupe. This conclusion is supported by the statistical evidence obtained through the Wilcoxon test, which revealed a p value very close to zero (negative Z value and highly significant - $p < 0.001$). The results of the study support constructivist, sociocultural and critical pedagogy theories that highlight the potential of storytelling to promote higher order cognitive processes, encourage reflection and promote student empowerment.

In this study, digital storytelling significantly developed students' thinking skills, given that they demonstrated substantial progress. More than half (56.10%) reached a good level of achievement and more than a third (34.15%) achieved an excellent score for this dimension following their participation in the program. A significant and positive difference was found between the two measures ($t(40) = 8.63$, $p < 0.001$) in the experimental group with a large effect size (Cohen's $d = 1.35$). These findings

indicate that the use of digital storytelling contributes to the development of cognitive thinking skills among students, which include processing information, generating concept maps and carrying out analysis and synthesis of information.

Digital storytelling also contributes to the development of reflection skills among participants. Initially, 100% reached the average level. Following their participation in the digital storytelling program, 46.34% of students in the experimental group reached a good level and 19.51% achieved an excellent level in terms of their reflection skills. This result was supported by a positive and significant difference between the two measures ($t(40) = 6.54$, $p < 0.001$) with a large effect size (Cohen's $d = 1.02$). These results evidence that digital storytelling developed students' reflective capacity, enabling them to activate mental processes for effective decision-making and problem-solving.

The study also found that digital storytelling contributes to the development of self-regulation among participants, with 56.66% of the experimental group achieving a good level and 17.07% an excellent level. A significant difference was found ($t(40) = 5.92$, $p < 0.001$) with a large effect size (Cohen's $d = 0.92$). These results indicate that the use of digital storytelling contributed to the development of students' ability to monitor and control their own learning process. This is essential for relevant decision-making and the development of critical thinking skills.

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