Digital Storytelling for the Prevention of Mathematical Anxiety in Primary Education: A Comparative Analysis of AI Platforms

Svitlana Skvortsova[1], Tetiana Symonenko[2], Kira Hnezdilova[3] and Ruslana Romanyshyn[4]
[1]*Department of Mathematics and Methods of its Teaching, The State Institution "South Ukrainian National Pedagogical University named after K. Ushynsky", Staroportofrankovska Str. 26, 65029 Odesa, Ukraine*
[2]*Department of Teaching Methods, Stylistics and Culture of the Ukrainian Language, Bohdan Khmelnytsky National University of Cherkasy, Shevchenko Boulevard 81, 18031 Cherkasy, Ukraine*
[3]*Department of Primary and Special Education, Bohdan Khmelnytsky National University of Cherkasy, Shevchenko Boulevard 81, 18031 Cherkasy, Ukraine*
[4]*Department of Primary Education and Educational Innovations, Vasyl Stefanyk Carpathian National University, Schevchenko Str. 57, 76014 Ivano-Frankivsk, Ukraine*
skvo08@i.ua, tetianasymonenko4@gmail.com, kiragnez@gmail.com, ruslana.romanyshyn@cnu.edu.ua

Keywords: Digital Storytelling, Math Anxiety, Artificial Intelligence, Primary Education, Generative AI Platforms, Storytelling Therapy, Neurocognitive Mechanisms.

Abstract: Mathematical anxiety affects approximately 20-30% of primary school students, negatively influencing academic achievement and fostering persistent avoidance of mathematical activities. This study presents a systematic comparative analysis of three generative AI platforms (Gemini Story Book, Grok, and NotebookLM) used to create illustrated mathematical fairy tales as an innovative preventive approach for children aged 6-10. Twelve original mathematical fairy tales were created on each platform (total sample n=36 narratives), covering key topics of the primary mathematics curriculum. Two independent experts with experience in primary mathematics education and educational technologies conducted a systematic evaluation of the generated content according to a developed rubric with four criteria: mathematical accuracy, pedagogical relevance, narrative coherence, and visual quality (scale of 1-3 points). A total of 36 original narratives (n = 36), with twelve tales generated per platform, addressed key topics of the primary mathematics curriculum. The results demonstrate statistically significant differences between platforms: Gemini Story Book achieved the highest scores in all categories (mathematical accuracy M=2.71, SD=0.464; pedagogical relevance M=2.79, SD=0.415), while Grok revealed critical issues with the accuracy of automatic narration (M=1.42, SD=0.504), and Notebook LM demonstrated a systematic drift in mathematical content (M=2.17, SD=0.565). Based on empirical findings, a five-step scientifically grounded workflow was developed that combines AI efficiency with pedagogical quality control. The results are relevant for the development of educational technologies, the prevention of math anxiety, and the integration of generative artificial intelligence into primary education.

1 INTRODUCTION

Mathematical anxiety constitutes one of the most significant challenges in contemporary primary education, affecting cognitive performance, emotional well-being, and long-term educational trajectories of millions of children. Empirical research indicates that approximately 20-30% of children develop clinically significant levels of mathematics anxiety by the fourth grade of primary school [1].

This phenomenon is characterized by intense feelings of tension, apprehension, and fear arising in situations that require numerical manipulation, mathematical calculations, or problem solving. Such emotional responses contribute to a self-reinforcing cycle of distress, cognitive interference, and behavioural avoidance.

Traditional bibliotherapy has emerged as a promising pedagogical approach for preventing math anxiety in younger schoolchildren. The theoretical work of Bettelheim [2] and the empirical pedagogical research of Furner [3] demonstrate that fairy tales create psychologically safe spaces for interacting with complex content through the mechanism of identification with fairy tale characters.

However, traditional approaches to fairy tale therapy face practical limitations: the labour-intensive nature of creating high-quality illustrated narratives, the need for artistic skills for visualisation, limited opportunities for personalisation to meet individual student needs, and insufficient appeal to Alpha generation children who have grown up in an environment of intense digital stimulation.

Systematic reviews by Gómez-Martín et al. [4] provide empirical evidence of the advantages of digital storytelling (DST) over traditional narratives. In a systematic review of 43 empirical studies, Nasir et al. [5] identified types of positive outcomes of DST: affective (motivation, engagement), cognitive (understanding of concepts), conceptual (depth of learning), academic (test results), technological (digital skills), linguistic (language competence), ontological (worldview), and social (collaboration). Gómez-Martín et al. [4] in a PRISMA review of 154 studies determined that digital storytelling has a statistically significant impact on the development of digital competencies, computational thinking, and oral expression in primary and secondary school, while traditional storytelling prevails in the development of socio-emotional skills and deep reflection.

The emergence of generative artificial intelligence in the period 2022-2025 has created an unprecedented technological breakthrough in educational content production [10]. Platforms based on large language models and diffusion image generation systems, capable of autonomously creating coherent narratives, professional illustrations, and synthesising natural speech, offer a dramatic increase in efficiency for educators in developing customised educational materials.

However, the application of these technologies to the specific domain of mathematics education and anxiety prevention remains largely unexplored, with critical open questions regarding the mathematical accuracy of AI-generated content, the pedagogical appropriateness of narratives, the technical reliability of platforms, and the practical ease of use for educators without specialised technical skills.

Despite growing academic and practical interest in AI-generated educational content, at the time of this study, there is no empirical work that systematically compares different AI platforms for creating mathematical narratives with the specific goal of preventing math anxiety in primary school children. This study fills this critical gap by implementing three interrelated objectives: first, conducting a systematic comparative evaluation of three representative AI platforms (Gemini Story Book, Grok, Notebook LM) based on multiple criteria of mathematical accuracy, pedagogical relevance, narrative coherence, and technical reliability; second, developing a scientifically grounded, empirically tested workflow for practicing educators that maximises the synergy between AI efficiency and pedagogical quality control; third, theoretical analysis and empirical operationalisation of the mechanisms through which digital mathematical narratives can contribute to the prevention of math anxiety based on the integration of neurocognitive research, developmental theory, and the principles of fairy tale therapy.

2 FAIRY-TALETHERAPY AS A MEANS OF OVERCOMING MATH ANXIETY

Mathematical anxiety functions as a secondary cognitive task that competes for limited working memory resources with the primary mathematical task [6]. Lyons & Beilock [7] found increased activation of the right amygdala in children aged 7-9 years when anticipating mathematical tasks in a neuroimaging study, indicating the development of an automatic conditioned fear response to mathematical stimuli early in school. When the anxiety system is activated, intrusive negative thoughts and physiological stress responses take up a significant portion of working memory capacity, leaving fewer cognitive resources for retaining intermediate calculation results, retrieving arithmetic facts from long-term memory, and executing problem-solving strategies. This explains the paradoxical empirical finding that math anxiety has the strongest negative effect on students with high baseline working memory capacity, as they have more resources that can be consumed by anxious thoughts [8].

Children with high math anxiety demonstrate a systematic tendency to avoid math activities both in class and at home, which reduces their opportunities for practice, prevents the automation of basic arithmetic facts, and blocks the accumulation of conceptual understanding.

Fairy tales create what Bettelheim [2] conceptualised as ‘therapeutic distance’ – an optimal psychological distance that allows children to process emotionally charged themes and personal challenges through identification with fairy tale characters without directly threatening their self-concept or fear of negative evaluation. When a relatable fairy tale protagonist encounters a mathematical problem, experiences initial confusion, makes mistakes in the process of solving it, and ultimately succeeds through perseverance and the use of effective strategies, the child internalises this sequence as a viable model for their own behaviour through vicarious learning, without the risk of real failure or social condemnation that would accompany similar mistakes in the context of classroom work or homework.

The narrative structure of fairy tales provides an organisational framework for mathematical information, transforming isolated mathematical facts and abstract operations into an integrated sequence of events with cause-and-effect relationships, which corresponds to the natural tendency of the human brain to process and memorise information in the form of stories (narrative processing bias). This creates distributed neural networks with multiple paths for extracting information: a mathematical concept is encoded not only as an abstract symbolic fact, but also as a character's action (episodic memory), as a visual image (imaginative memory), as an emotional experience (affective memory), and as part of a broader causal sequence (semantic memory). When one channel of access to information is blocked by anxiety, other channels remain functional, ensuring robustness of retrieval.

Based on the integration of theoretical sources and pedagogical practice, six key requirements for mathematical fairy tales for effective anxiety prevention have been identified. First, mathematical accuracy and conceptual clarity: all numerical operations, arithmetic facts, and mathematical terminology must be absolutely correct without simplifications or distortions that could form misconceptions. Second, normalisation of difficulties and productive modelling of errors: characters demonstrate that encountering mathematical difficulties is a normal experience, make mistakes but respond constructively through analysis, correction and retrial. Third, multiple representations: mathematical concepts are presented through character actions, visual images, verbal descriptions, and emotional experiences. Fourth, demonstration of multiple strategies: fairy tales show more than one way to solve problems. Fifth, emotional validation and positive resolution: fear and confusion are recognised as legitimate feelings, and stories end successfully through effort. Sixth, cultural relevance and inclusivity: representation of character diversity without stereotypes.

Children of Generation Alpha (born after 2010), who currently constitute the main demographic group of primary school pupils, demonstrate a specific cognitive and behavioural profile formed through continuous interaction with digital environments from an early age [9]. Studies confirm that the integration of technology into education significantly influences students' knowledge, attitudes, and engagement with learning content [11]. Key characteristics include clip thinking – the fragmented perception of information in short segments with frequent shifts of attention rather than sustained linear narratives; visual orientation, reflected in a preference for images and video content over text; expectations of interactivity and immediate feedback, resulting from extensive use of touch-screen devices and adaptive interfaces; and a gamer mentality characterized by a focus on progressive levels of difficulty, achievement and reward systems, and the belief that success can be attained through effort and practice rather than fixed abilities [9].

Gómez-Martín et al. [4] found in a systematic review that digital storytelling effectively meets these characteristics through multimodality (simultaneous presentation of textual, visual, and auditory information), dynamic presentation (animation and video instead of static images), personalisation options (adaptation of content to individual interests and level of complexity) and interactive elements (the ability to choose and influence the development of the plot). However, the critical balance lies in preserving the psychological depth and symbolic ambiguity of traditional fairy tales in digital adaptation: excessive interactivity, visual overload, or game mechanics can reduce the space for imaginative visualisation, symbolic interpretation, and reflective processing, which are critical to the therapeutic and developmental functions of fairy tales.

3 METHODOLOGY

The study used exploratory design-based research with expert evaluation of generated content as the primary data collection method. This positions the work as an expert-based design evaluation study – a technological comparative study of the quality of AI platforms for educational purposes. This position is methodologically correct for the initial phase of development and validation of a technological solution, which precedes large-scale randomised controlled studies of the effectiveness of the intervention. Twelve original mathematical fairy tales have been developed, systematically covering the key topics of the primary mathematics curriculum for children aged 6-10: the concept of numbers and counting; arithmetic operations of addition and subtraction; geometric shapes and spatial relationships; concepts of measurement; problem-solving strategies. Each fairy tale was designed to model productive struggle, normalise errors, and demonstrate multiple strategies in accordance with quality criteria.

Each of the twelve stories was implemented on three selected AI platforms, creating a total sample of thirty-six narrative units for comparative analysis. Gemini Story Book (Google Labs, powered by Gemini 2.0 Flash, free of charge at the time of testing) was used to generate complete illustrated books with integrated voice narration through detailed text prompts. The process involved iterative refinement of prompts with explicit specification of complete narrative arcs, specific examples of numerical operations in the context of character actions, characterisation through growth trajectories, desired emotional tone, and visual style. Grok-2, available via the X platform with a Premium+ subscription, approximately $16/month at the time of testing) was used to convert generated images into video format with automatic voice narration generation based on user text scripts. Notebook LM was used to synthesise multimedia content with an emphasis on audio explanations and narratives. For each platform, generation parameters, processing time, success rates, and output quality characteristics were systematically documented.

Two independent experts with experience in teaching mathematics in primary school and knowledge of educational technologies conducted a systematic evaluation of all thirty-six generated fairy tales according to a specially developed rubric. The rubric included four criteria, each rated on a four-point scale from 0 to 3: mathematical accuracy (correctness of numerical operations, accuracy of mathematical terminology, adequacy of visual representations of quantitative relationships); pedagogical relevance (suitability of complexity for age group, effectiveness of integration of mathematical concepts into the narrative, potential for reducing anxiety through psychological safety, cultural sensitivity); narrative coherence (logical plot development, consistency of character traits, cause-and-effect relationships, overall engagement); visual quality (aesthetic appeal of illustrations, consistency of artistic style, correspondence of images to text content, age appropriateness of visual content).

Inter-expert agreement was assessed using Cohen's kappa coefficient. Platforms were compared using the non-parametric Kruskal-Wallis H test. A pairwise comparison of all platforms was performed for each criterion (Dunn's post-hoc test with Bonferroni correction). All calculations were performed using IBM SPSS Statistics 27 software.

4 RESULTS

A systematic evaluation of twelve maths storybooks revealed significant differences in platform performance. Gemini Story Book achieved the highest overall quality scores, with average ratings of 2.7 out of 3 for mathematical accuracy, 2.8 for pedagogical relevance, 2.4 for narrative quality, and 2.6 for visual appeal. The platform demonstrated particular strength in maintaining a consistent artistic style across multi-page stories and successfully integrating mathematical concepts into the natural narrative flow when provided with well-crafted prompts. The integrated workflow offered by Gemini Story Book proved particularly valuable for educators. A single platform handling text generation, illustration, and voiceover eliminated the technical complexity of coordinating multiple tools. Generation time averaged 5 to 15 minutes for a fully illustrated story (including editing, if necessary), representing significant efficiency gains compared to manual creation, which requires hours of writing and illustration work. Text-to-speech narration, while not matching professional human narration, achieved sufficient quality for classroom use with clear pronunciation and moderate emotional expressiveness.

At the time of testing – July 2025 – Grok's video conversion introduced critical limitations that undermined its usefulness for educational content. Most significantly, the platform's text-to-speech system was unable to accurately reproduce the provided narration scripts. Instead of reading the specified text verbatim, the system engaged in paraphrasing, omissions, and random insertion of content not present in the scripts. For maths education, which requires precision in terminology, this unreliability proved disqualifying. In addition, the length of the videos is quite short, necessitating the splicing of individual scenes.

Notebook LM demonstrated capabilities for generating narrative frameworks and multimedia offerings, but showed significant weaknesses in execution. Generated stories often deviated from specified mathematical learning goals, with mathematical content becoming peripheral rather than central to the narratives. The visualisations lacked the vividness and artistic coherence of Gemini Story Book illustrations, appearing more generic and less engaging for the target age group. In addition, narrative coherence proved problematic, with the logic of the story sometimes becoming unclear across segments, and elements of the story structure not being reliably supported.

Inter-expert agreement was calculated according to all platform evaluation criteria (Table 1).

Table 1: Cohen's kappa coefficient results.

Criterion	Cohen's kappa coefficient
Mathematical precision	0,724, $p < 0.001$
Pedagogical relevance	0,785, $p < 0.001$
Quality of narrative	0,744, $p < 0.001$
Visual appeal	0,761, $p < 0.001$

Cohen's kappa coefficient of overall inter-expert agreement was $\kappa=0.76$ ($p < 0.001$), which corresponds to substantial agreement among experts. This confirms the reliability of the assessment and the validity of the study. Table 2 presents descriptive statistics by criteria.

Table 2: Descriptive statistics of platform quality indicators.

Platform & Indicators	Statistical Data (M, SD)
Gemini Story Book	
Mathematical precision	2.71, 0.464
Pedagogical relevance	2.79, 0.415
Quality of narrative	2.42, 0.504
Visual appeal	2.63, 0.495
Grok	
Mathematical precision	1.63, 0.495
Pedagogical relevance	1.42, 0.504
Quality of narrative	1.42, 0.504
Visual appeal	1.50, 0.511
Notebook LM	
Mathematical precision	2.17, 0.565
Pedagogical relevance	2.13, 0.338
Quality of narrative	2.13, 0.338
Visual appeal	2.33, 0.565

The results of the calculations (Table 2) show that Gemini Story Book is the undisputed leader in creating educational content. The platform demonstrated high performance across all parameters. In contrast, the Notebook LM platform showed stable average results, positioning it as a reliable but less creative tool. The Grok platform proved to be the least adapted to the tasks at hand, receiving the lowest scores.

Analysis of the results according to the 'pedagogical relevance' evaluation criterion shows that Gemini Story Book ($M=2.79$) has the highest level of compliance with educational goals. These results confirm the platform's ability to correctly integrate educational elements into the plot. The lowest score for this criterion was recorded by the Grok platform ($M=1.42$). According to the criterion of 'mathematical accuracy,' Gemini Story Book demonstrated the best ability to operate with mathematical concepts within the fairy tale ($M=2.71$), while Notebook LM scored moderately ($M=2.17$). When it comes to evaluation criteria such as 'narrative quality' and 'visual appeal,' all platforms showed some variability. The Kruskal–Wallis H test was used to evaluate the differences between the three platforms simultaneously. Hypotheses were formulated and tested at a significance level of $p \le 0.05$. H_0: According to expert assessments, the platforms (Gemini Story Book, Grok, Notebook LM) do not differ in terms of criteria (mathematical accuracy, pedagogical relevance, narrative quality, visual appeal). H_1: According to experts, the platforms differ in terms of criteria (mathematical accuracy, pedagogical relevance, narrative quality, visual appeal). The results of testing the hypotheses for each criterion are presented in Table 3.

Table 3: Kruskal-wallis test results of platform quality indicators.

Criterion	Test Stat., Asymp. Sig.
Mathematical precision	31.755, $p < 0.001$
Pedagogical relevance	40.673, $p < 0.001$
Quality of narrative	33.531, $p < 0.001$
Visual appeal	36.526, $p < 0.001$

Thus, the results of the Kruskal-Wallis Test confirmed the statistical significance of differences in all criteria (mathematical accuracy; pedagogical relevance; narrative coherence; visual quality). Since the Kruskal-Wallis Test does not indicate the direction of changes, but only their presence, a pairwise comparison (Dunn's post-hoc test with Bonferroni correction) of the platforms was performed for all criteria. The results of the calculations revealed statistically significant differences in mathematical accuracy between Grok and Notebook LM ($p = 0.001$), as well as between Grok and Gemini Story Book ($p < 0.001$). At the same time, no statistically significant difference was found between Notebook LM and Gemini Story Book ($p = 0.119$), which rather indicates that Grok's results differ significantly from those of the other two platforms.

Analysis of the results according to the criterion of ‘pedagogical relevance’ revealed statistically significant differences between all the platforms studied. The results of pairwise comparisons (Dunn's post-hoc test with Bonferroni correction) indicate a significant difference between Grok and Gemini Story Book ($p < 0.001$), as well as between Grok and Notebook LM ($p = 0.003$). It is important to note that there is also a statistically significant difference between Notebook LM and Gemini Story Book in terms of pedagogical relevance ($p = 0.007$). This indicates that each platform has a unique profile of pedagogical effectiveness.

Analysis of the results of calculations based on the criteria of ‘narrative quality’ and ‘visual appeal’ showed a trend similar to the results of mathematical accuracy: Grok differs statistically significantly from both Notebook LM ($p < 0.001$) and Gemini Story Book ($p < 0.001$). However, no statistically significant difference was found between Notebook LM and Gemini Story Book ($p = 0.313$, $p = 0.015$).

Gemini Story Book demonstrated the highest level of component integration through a single workflow that combines text generation, illustration creation, and voice narration synthesis within a single platform, dramatically lowering technical barriers for educators. High-quality visual content with a consistent artistic style throughout the book creates an aesthetically appealing product. Mathematical accuracy with proper prompt engineering ensures pedagogical reliability. The success rate of generation without critical errors is 95%.

Grok has identified a fundamental problem for maths education: automated text-to-speech systems do not reproduce the text scripts provided verbatim, instead paraphrasing, omitting or adding content based on their own language models. The success rate is only 80%. Limited control over the synchronisation of visual and audio elements creates additional cognitive dissonance.

Notebook LM demonstrates a systematic tendency for content to drift away from specified mathematical learning objectives, with mathematical concepts becoming peripheral rather than central to the narrative. Lower visual quality compared to Gemini reduces appeal. The unpredictability of the narrative structure requires careful review and often multiple regenerations. The success rate is 88%.

5 DISCUSSION

The statistically significant advantage of Gemini Story Book across all evaluation criteria can be explained by the architectural integration of components into a single workflow, which minimises technical barriers and cognitive load for educators without specialised technical skills. The critical inaccuracy of Grok's automatic narration reflects the fundamental problem of delegating semantically critical content to automated systems without verification and quality control mechanisms [10]. For mathematics education, where the accuracy of mathematical language is absolutely critical for the formation of correct conceptual models, such unreliability is a disqualifying characteristic. The systematic drift of mathematical content in Notebook LM points to the limitations of general AI platforms trained on a broad corpus of text for specialised educational purposes, where it is necessary to maintain a focus on specific learning objectives.

Based on empirical findings, a five-stage scientifically based workflow for educators has been developed. Stage 1 (pedagogical planning) includes identifying specific mathematical learning objectives aligned with the curriculum, designing a fairy tale premise that naturally incorporates the target concepts, and specifying the desired pedagogical elements. Stage 2 (AI generation) involves formulating a detailed prompt for Gemini Story Book with explicit specifications for the narrative arc, mathematical examples, character personalities, and visual style, followed by iterative modification as necessary. Stage 3 (export and archiving) involves downloading PDFs for printing, saving audio files, and extracting images. Stage 4 (optional video conversion) recommends a manual approach rather than automation to ensure mathematical accuracy. Stage 5 (pedagogical integration) involves embedding the story into a lesson with discussion questions, extension activities (drawing, dramatisation, creating your own stories) and monitoring student responses.

A critical methodological limitation of the study is the lack of empirical validation with actual primary school students. This expert-based design evaluation study assesses the theoretical potential for anxiety prevention through expert evaluation of content quality, rather than proven effectiveness in real educational settings. The small sample size (n=12 stories per platform) limits statistical power; future studies should expand the corpus to at least 30 narratives per platform to achieve adequate power for generalisation. The involvement of only two expert evaluators, while yielding substantial inter-rater agreement (κ=0.76), represents a structural limitation: an expanded panel of 4-6 experts from diverse cultural and pedagogical backgrounds would increase the robustness and generalisability of content quality assessments. All platform evaluations are explicitly time-bounded to July 2025 and were conducted using specific model versions: Gemini Story Book (Gemini 2.0 Flash), Grok (Grok-2), and Notebook LM (Gemini 1.5 Pro). Given the rapid pace of AI development, platform capabilities may change substantially within months; the comparative conclusions should therefore be interpreted as valid for the tested versions and time period rather than as permanent assessments of the platforms.

The critical next step in the research programme should include randomised controlled trials with students to establish the causal effect of digital maths stories on maths anxiety levels and learning outcomes.

6 CONCLUSIONS

The study finds that Gemini Story Book is the most effective of the tested AI platforms for creating mathematical stories for anxiety prevention, achieving the highest scores across all quality criteria. Automated video generation via Grok is unsuitable for maths education due to critical issues with the accuracy of automatic narration, which paraphrases or omits specific numerical values. Notebook LM can serve as an auxiliary tool for initial brainstorming and idea generation, but not for final content production due to systematic drift from mathematical goals. The developed five-step scientifically grounded workflow provides a practical balance between AI efficiency and pedagogical quality control, making the creation of personalised mathematical fairy tales practically feasible for individual educators without specialised technical skills or artistic abilities. Digital math fairy tales operationalise anxiety prevention through five interrelated mechanisms: emotional reattribution through identification, psychological safety through narrative distance, multiple representations that create distributed neural networks, positive associations through classical conditioning, and buffering intergenerational transmission of anxiety, confirming theoretical predictions of the integration of neurocognitive research, developmental theory, and bibliotherapy principles. The convergence of traditional narrative pedagogy rooted in fairy-tales with contemporary generative artificial intelligence technologies offers new opportunities to transform mathematics education through personalised and emotionally supportive storytelling at a scale previously unattainable in pre-digital contexts. Within this framework, technology functions as a means of augmenting rather than replacing pedagogical expertise. A sustainable model of integration positions educators as designers of narrative and instructional objectives, AI systems as tools facilitating content generation and technical implementation, and students as active constructors of mathematical understanding through emotionally meaningful narratives in psychologically safe learning environments.

REFERENCES

[1] S. S. Wu, M. Barth, H. Amin, V. Malcarne, and V. Menon, "Math anxiety in second and third graders and its relation to mathematics achievement," Frontiers in Psychology, vol. 3, p. 162, 2012, [Online]. Available: https://doi.org/10.3389/fpsyg.2012.00162.

[2] B. Bettelheim, The Uses of Enchantment: The Meaning and Importance of Fairy Tales, New York: Vintage, 2010.

[3] J. M. Furner, "Using fairy tales and children's literature in the math classroom: Helping all students become Einstein's in a STEM world," Journal of Advanced Education Research, vol. 2, no. 2, pp. 103-112, 2017, [Online]. Available: https://dx.doi.org/10.22606/jaer.2017.22006.

[4] M. Gómez-Martín, J. M. Prieto-Andreu, and L. Álvarez-Kurogi, "Storytelling vs. Digital Storytelling in Primary and Secondary Education: Systematic Review," Ocnos, vol. 25, no. 1, 2026, [Online]. Available: https://doi.org/10.18239/ocnos_2026.25.1.574.

[5] W. M. F. W. M. Nasir, L. Halim, and N. M. Arsad, "Digital Storytelling Learning Outcomes and Critical Factors: A Scoping Review," International Journal of Learning, Teaching and Educational Research, vol. 23, no. 5, pp. 323-344, 2024, [Online]. Available: https://doi.org/10.26803/ijlter.23.5.17.

[6] M. H. Ashcraft, "Math anxiety: Personal, educational, and cognitive consequences," Current Directions in Psychological Science, vol. 11, no. 5, pp. 181-185, 2002.

[7] I. M. Lyons and S. L. Beilock, "Mathematics anxiety: Separating the math from the anxiety," Cerebral Cortex, vol. 22, no. 2, pp. 2102-2110, 2012, [Online]. Available: https://doi.org/10.1093/cercor/bhr289.

[8] G. Ramirez, H. Chang, E. A. Maloney, S. C. Levine, and S. L. Beilock, “On the relationship between math anxiety and math achievement in early elementary school: The role of problem solving strategies,” Journal of Experimental Child Psychology, vol. 141, pp. 83-100, 2016, [Online]. Available: https://doi.org/10.1016/j.jecp.2015.07.014.

[9] M. McCrindle and A. Fell, “Understanding Generation Alpha,” McCrindle Research, Feb. 2020, [Online]. Available: https://generationalpha.com/wp-content/uploads/2020/02/Understanding-Generation-Alpha-McCrindle.pdf.

[10] G. Jumaev, D. Shukurov, K. Khudoyqulov and X. Kurbanov, "AI in Education: Revolutionizing Learning and Personalized Instruction," Proceedings of International Conference on Applied Innovation in IT, vol. 13, issue 5, pp. 401–410, 2025, [Online]. Available: https://doi.org/10.25673/122875.

[11] B. D. Buendia, N. M. D. Borbon, M. P. A. Lumbera, L. Manimtim, I. S. Pasahol, J. V. Abel and J. U. Sargento, "Impact of Technology Integration on Students' Knowledge, Attitudes, and Practices (KAP) Towards the Sustainable Development Goals (SDGs): A Structural Equation Modeling (SEM) Approach," Proceedings of International Conference on Applied Innovation in IT, vol. 13, issue 5, pp. 547–558, 2025, [Online]. Available: https://doi.org/10.25673/123079.