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GenAI-driven storytelling on senior secondary students' Generative AI literacy and writing skills: A mixed-methods research

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The rapid development of Generative Artificial Intelligence (GenAI) is transforming education and requiring new forms of digital literacy. However, empirical research on the development of GenAI literacy in secondary education remains limited. This mixed-methods study investigated 76 students who were randomly assigned to control and experimental groups in the Hong Kong secondary school context. While the control group received traditional writing instruction, the experimental group engaged in a five-week GenAI-driven storytelling intervention. The study examined four dimensions of AI literacy, affective, behavioral, cognitive, and ethical, alongside key writing skills dimensions: word usage, narrative structure, creativity, and writing anxiety. Data were collected using validated questionnaires and a rubric-based writing assessment, administered before and after the intervention, as well as post-intervention interviews. Quantitative results showed that the experimental group reported reduced writing anxiety and achieved significant gains in AI literacy and writing performance. Thematic analysis confirmed these findings and highlighted greater motivation to use GenAI technologies, stronger confidence, and heightened ethical awareness. Overall, the study demonstrates the pedagogical value of integrating GenAI-driven storytelling into secondary education to foster AI literacy and enhance writing skills.

Keywords: AI literacy, digital storytelling, generative artificial intelligence (GenAI), narrative writing, creativity in writing, writing anxiety

1. Introduction

The integration of artificial intelligence (AI), particularly generative AI (GenAI) technologies, is significantly transforming the educational landscape. Since the launch of ChatGPT in late 2022, there has been an unprecedented surge of interest across the education sector in exploring how such technologies might reshape teaching and learning practices (Cacho, 2024). AI systems often emulate human cognitive functions—such as learning and problem-solving—by employing rule-based algorithms designed to process information, interpret inputs, and achieve specific objectives (Siemens et al., 2022). According to UNESCO (2023), GenAI refers to a subset of AI technologies that automatically generate content in response to prompts delivered through natural language-based conversational interfaces. More broadly, generative AI encompasses computational methods capable of producing novel and meaningful outputs—such as text, images, or audio—based on patterns learned from training data (Feuerriegel et al., 2023).

Traditional artificial intelligence (AI) and generative artificial intelligence (GenAI) exhibit substantial differences in both functionality and application. As outlined by Ng et al. (2025), six key dimensions distinguish GenAI from traditional AI: task execution, contextual understanding, response behavior, interactivity, data sources, and technical requirements. Traditional AI primarily relies on structured data derived from predefined datasets and historical records to generate conclusions (Ng et al., 2024). In contrast, GenAI is capable of generating human-like outputs across various modalities—including text, images, and videos. GenAI represents a rapidly expanding subfield of artificial intelligence that focuses on the development of models capable of generating new content—such as text, images, and music—with a level of originality that approximates human creativity. Beyond its generative capacity, GenAI empowers end users to create educational content independently (García-Peñalvo, 2023). Moreover, it enables the design of personalized learning experiences by adapting instructional difficulty and content in real time based on learner performance and behavioral data. GenAI can also support educators by generating instructional strategies and course materials informed by learners' progress and patterns of engagement (Huang, 2021).

Annapureddy *et al*. (2025) argue that the rapid advancement of Generative AI has rendered AI literacy increasingly essential. They highlight the need for specific competencies and knowledge to differentiate generative AI from other forms of AI and to understand how it produces creative outputs across domains such as writing, design, and scientific inquiry (Ray, 2023). Moreover, given that generative AI raises critical questions regarding authorship, ownership, and originality, ethical and legal literacy is equally important. As these technologies become more accessible to the general public, AI literacy must extend beyond technical experts to include broader societal engagement (Annapureddy et al., 2025). This view is echoed by Bozkurt (2024), who states that "its personality and essence will be shaped not only by the features it possesses but also by the capabilities and skills with which we use it." He further emphasizes that "the intentions and objectives of those who control it must also be taken into account." Within this

framework, GenAI literacy assumes particular importance, as it fundamentally influences the evolving nature of human–machine interaction.

Despite the increasing incorporation of GenAI tools into educational environments, current literature has predominantly concentrated on higher education, focusing on theoretical models, tool functionalities, and general ethical considerations (Annapureddy et al., 2025; Bozkurt, 2024). In contrast, there is a notable scarcity of empirical, classroom-based investigations that explore how GenAI literacy can be cultivated specifically among secondary school students. This study aims to examine the impact of a GenAI-driven storytelling workshop on the development of generative AI literacy and writing proficiency among secondary students. Specifically, it investigates whether the intervention can enhance students' GenAI literacy across four key domains: affective, behavioral, cognitive, and ethical. In addition, the study explores how students perceive these changes and how GenAI-assisted storytelling may influence their writing performance in terms of word usage, narrative structure, creativity, and writing anxiety.

The study aims to answer three research questions:

1. To what extent does GenAI-driven storytelling support the development of students' generative AI literacy across affective, behavioral, cognitive, and ethical dimensions?
2. How does GenAI-driven storytelling impact students' GenAI literacy in terms of affective, behavioral, cognitive, and ethical dimensions?
3. To what extent does GenAI-driven storytelling influence students' writing skills in terms of word usage, narrative structure, creativity, and writing anxiety?
4. How do students perceive the impact of GenAI-driven storytelling on their writing skills, particularly in terms of word usage, narrative structure, creativity, and writing anxiety?

2. Literature Review

2.1 Defining AI Literacy and Its Evolution

The term "AI literacy" refers to the understanding and ability to effectively engage with artificial intelligence technologies. It encompasses a broad set of competencies necessary for navigating an AI-driven world. Core components include conceptual knowledge of AI, operational skills in using AI tools, and the critical capacity to evaluate the implications of AI applications across diverse contexts (Ng et al., 2021). A growing body of literature suggests that AI literacy is an evolving and multifaceted construct. It extends beyond mere technical proficiency to include ethical considerations and social impacts, implying that individuals must be prepared to understand and respond to the broader consequences of AI in both community and everyday life (Biagini, 2025).

2.2 From AI Literacy to GenAI Literacy: Key GenAI Literacy Frameworks

Following the introduction of various AI literacy guidelines, the proliferation of generative AI tools has radically transformed daily life. GenAI presents distinctive and more complex characteristics compared to

traditional AI algorithms, which are not fully addressed in current AI literacy frameworks (Zhang & Magerko, 2025). The emergence of GenAI tools such as ChatGPT necessitates a specific set of competencies that extend beyond general AI knowledge, and it is fundamentally reshaping the educational landscape, presenting both significant opportunities and complex challenges (Annapureddy et al., 2025; Bozkurt, 2024). Zhang and Magerko (2025) offer a flexible, practice-oriented framework comprising twelve principles for fostering generative AI literacy, grounded in a comprehensive analysis of existing scholarship.

Likewise, Bozkurt's (2024) 3wAI framework introduces a metaphorically inspired, conceptually rich approach to building GenAI literacy. Rather than prescribing rigid competencies, the model is designed to be adaptive, contextually responsive, and scalable across diverse user groups. In parallel, Annapureddy, Fornaroli & Gatica-Perez (2025) have proposed a structured, competency-based framework that accounts for the complexity and dynamic evolution of GenAI technologies.

2.3 GenAI Applications in Education

As a sophisticated technology with significant immersive potential, generative AI (GenAI) presents both opportunities and challenges within educational contexts (Tlili et al., 2023). On the positive side, GenAI enhances student engagement through personalized feedback and interactive learning experiences. It adapts learning pathways in real time based on student performance, providing immediate support that fosters deeper understanding (Anderson et al., 2025). Lo (2023) demonstrates that ChatGPT can function as both a virtual tutor and instructional assistant, fulfilling a wide array of educational needs. Expanding on this perspective, tools such as ChatGPT and Claude have been identified as valuable assets in supporting personalized learning experiences. These technologies equip students and their families with strategies to navigate contemporary educational demands more effectively (Narciso, 2024).

Nevertheless, the limitations of GenAI must be acknowledged. These include its inability to fully interpret real-world contexts and its potential to produce inaccurate information (Chiu, 2023). Concerns have also been raised regarding the potential erosion of learners' critical thinking skills and the risk of over-reliance on AI systems. Additionally, educators have highlighted privacy-related issues, particularly the misuse of data and unauthorized access that may compromise the security of student information. The credibility of academic work has also been questioned due to GenAI's potential to facilitate plagiarism and diminish academic rigor (Pikhart & Al-Obaydi, 2025). Ethical implications are another recurring theme. In addition to calls for comprehensive ethical guidelines to govern AI usage, scholars have expressed concerns about algorithmic bias and the environmental impact of large-scale AI deployment (Pitts et al., 2025).

2.4 Conceptual Rationale for Digital Story Writing (DSW)

The adoption of GenAI-driven digital story writing (DSW) in this study was grounded in established constructionist and inquiry-based pedagogical traditions rather than being motivated solely by

technological novelty. DSW was selected because constructionist approaches emphasize learning through making meaningful digital artefacts using technology (Hughes et al., 2017; Laurillard et al., 2011). In DSW, students actively construct stories by integrating text, images, and other media, which allows them to reinterpret newly learned AI concepts rather than simply receiving information (Woo et al., 2013). This process aligns with inquiry-based learning, where reading and writing are used to explore information, reorganize knowledge, and deepen conceptual understanding through reflection and creation (McGinley & Tierney, 1988; Chu et al., 2021). In the context of AI learning, story writing requires students to first observe and understand AI concepts, then organize, classify, and apply them within a meaningful narrative, supporting deeper cognitive processing (Wong et al., 2020).

DSW was also chosen because it supports multimodal learning by allowing students to express ideas through multiple modes, including text, images, audio, and video. This multimodal approach helps make abstract concepts more accessible and supports learners with varying language proficiency levels (Boase, 2008; Smyrnaiou et al., 2020; Eisenlauer & Karatza, 2020). Prior research has shown that DSW provides a strong foundation for multimodal literacies by shifting learning from purely verbal modes to multimedia forms of expression (Ng et al., 2024). By engaging with different semiotic resources during story creation, students are able to connect prior knowledge with new concepts and construct meaning through the production of a finalized digital story (Boase, 2008).

3. Methodology

3.1 Research Context

This study was conducted at a Band 3 secondary school in Hong Kong and involved a total of 76 students from Form 4 and Form 5. The participants were divided into two groups: an experimental group (n = 38), which participated in a five-week, ten-hour GenAI-driven storytelling workshop, and a control group (n = 38), which continued with conventional English lessons without exposure to any AI tools.

This study was conducted in a government-funded secondary school in a public housing district serving socioeconomically disadvantaged students. The school had limited digital resources, while students exhibited low levels of digital and GenAI literacy. Many students lacked access to personal computers and had limited keyboarding skills, constraining their engagement in extended digital writing tasks. Institutionally, there was no school-wide AI policy, generative AI was not embedded in the curriculum, and teachers reported low confidence and limited pedagogical experience with AI tools.

3.2 GenAI Storytelling Course Design and Theoretical Framework

The intervention spanned five consecutive weeks, with two 60-minute sessions per week, conducted in the school's computer lab. Each session followed a structured instructional sequence grounded in the 5-step GenAI storytelling model, aligned with the study's research questions, and supported by relevant

pedagogical and AI literacy frameworks. The structure of the GenAI storytelling model is presented in Table 1.

The design of the intervention was guided primarily by Ng et al.'s (2024) AI Literacy Framework, which conceptualizes AI literacy across four key dimensions: affective, behavioral, cognitive, and ethical. Each workshop session was intentionally designed to target one or more of these dimensions through scaffolded GenAI storytelling tasks. See Table 1 for details.

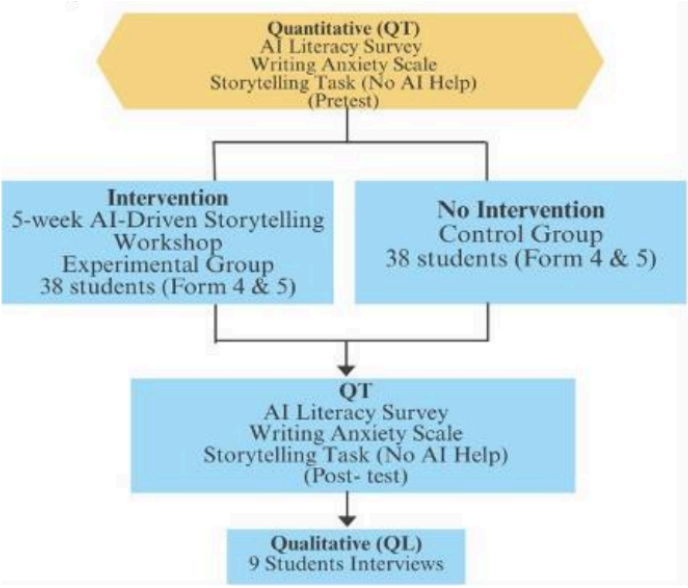

Figure 1: The overall research design.

The intervention was implemented as a pedagogically scaffolded process. Initial sessions introduced basic AI concepts and appropriate ways of interacting with generative tools. During the storytelling tasks, students were provided with instructor-designed prompt banks, along with guided prompt examples, individual and small-group support, and targeted assistance for lower-performing learners. The prompt banks supported idea generation, offered opportunities for brainstorming, and encouraged creative exploration during story production.

3.3 Research Design, Data Collection, and Sampling Method

The study employed a pretest-posttest quasi-experimental design (see Figure 1) and adopted a mixed-methods research approach. Quantitative data were collected using standardized questionnaires and rubric-based assessments of student writing, while qualitative data were obtained through semi-structured interviews. These instruments were administered to both the experimental and control groups immediately before and after the five-week intervention. Participants were assigned to either the experimental or control group through a process of simple random sampling.

Week	Focus	Key Activities	AI Literacy Outcomes	Writing Outcomes
1	What is AI? / AI vs GenAI	Introduction to AI concepts, classroom discussion, comparison of AI- vs human-generated stories	Affective, Ethical	Writing Anxiety (building trust in AI)
2	Text Generation / Prompt Crafting	5W1H brainstorming, prompt crafting, and outline building using Gen AI tools	Cognitive, Behavioral	Narrative Structure, Creativity, Word Usage
3	Digital Arts Creation (Visuals)	Create and revise visuals using Gen AI tools, and integrate visuals into storylines	Behavioral	Narrative Structure, Creativity
4	AI Music Composition	Generate and select AI music, align sound with narrative mood, and conduct ethical reflection	Affective, Ethical, Cognitive	Narrative Structure
5	Final Story Creation & Presentation	Story editing, peer review, highlight AI parts, record narration, and present	Ethical, Behavioral	Word Usage, Writing Anxiety

Table 1: 5-step GenAI storytelling model

3.3.1 Quantitative Data Instruments

Three validated instruments were used to collect data:

a) AI Literacy Questionnaire (Ng et al., 2024): This survey assessed students' AI literacy across four dimensions— affective, behavioral, cognitive, and ethical.

b) Writing Anxiety Scale (Cheng, 2004): To examine the emotional aspects of writing, this scale measured students' levels of anxiety related to writing tasks.

c) Creative Writing Assessment Rubric (Carey et al., 2022): A performance-based assessment was employed to evaluate students' writing samples on the dimensions of word usage,
narrative structure, and creativity.

3.3.2 Qualitative Data

To gain deeper insight into students' experiences, semi-structured interviews were conducted with selected students from the experimental group after the intervention. Interview questions explored their attitudes toward GenAI tools, perceived improvements in writing, emotional responses, and ethical considerations. Interviews lasted approximately 20–30 minutes and were audio-recorded for transcription and analysis. The interviews helped contextualize quantitative findings and shed light on how students engaged with GenAI in a real learning environment.

3.6 Data Analysis

To evaluate the effects of the GenAI-driven storytelling intervention and answer the research questions, both quantitative and qualitative data were analyzed using appropriate statistical and interpretive methods. Quantitative data obtained from the AI Literacy Questionnaire, Writing Anxiety Scale, and Creative Writing Assessment were analyzed using SPSS. Descriptive statistics, including means and standard deviations, were first calculated to summarize pre- and post-test scores for both experimental and control groups. To assess the equivalency of groups before the intervention, independent samples t-tests were conducted. Within-group changes from pre- to post-test were examined using paired samples t-tests. The pre-test comparisons indicated no statistically significant differences between the groups. ANCOVA was employed when comparing post-test scores to control for potential baseline variability and to increase the precision of the group comparisons. In addition, Cohen's d was calculated to measure the effect size of the intervention, providing insight into the significance of observed changes.

Thematic analysis, utilising the six-step framework developed by Braun and Clarke (2006), was used for qualitative analysis. Transcripts of interviews with students in the selected experimental group were openly coded to find recurring patterns. The codes were examined, categorized, and precisely defined into more general themes related to writing outputs, including word usage, narrative structure, creativity, and writing anxiety, as well as the affective, behavioral, cognitive, and ethical aspects of AI literacy.

4. Results and Findings

4.1 Background and Pre-Test Equivalence

A total of 76 students were divided equally into experimental and control groups. The experimental group included 18 Form 4 students (47.4%) and 20 Form 5 students (52.6%), ensuring a balanced

distribution across grade levels. Pre-test comparisons confirmed that the two groups were statistically equivalent across all GenAI literacy domains, including affective, behavioral, cognitive, and ethical dimensions, as well as in writing skills (word usage, narrative structure, creativity, and writing anxiety). This baseline equivalence supported the validity of using post-test differences to assess intervention effects.

RQ1: – To what extent does GenAI-driven storytelling support the development of students' generative AI literacy across affective, behavioral, cognitive, and ethical dimensions?

Post-test analyses indicated higher GenAI literacy scores across affective, behavioral, cognitive, and ethical dimensions in the experimental group following the intervention. Both Form 4 and Form 5 students increased their GenAI literacy scores after participation in the GenAI-driven storytelling workshop, as illustrated in Figure 2. In contrast, the control group did not demonstrate statistically significant changes in any GenAI literacy dimension between the pre-test and post-test stages (all $p > .05$).

Findings: Statistical results showed significant gains across all four GenAI literacy dimensions in the experimental group ($p < .001$). No statistically significant differences were observed between Form 4 and Form 5 students at either testing point ($p > .05$), and no corresponding gains were identified in the control group.

RQ2: How does Gen AI-driven storytelling impact students' Gen AI literacy in terms of affective, behavioral, cognitive, and ethical dimensions?

The thematic analysis revealed a set of sub-themes across the dimensions, capturing different aspects of students' engagement with GenAI-driven storytelling.

1. Affective Domain

- **Emotional shift.** Students described moving from initial hesitation toward more positive attitudes. "At the start, I was a bit skeptical… but I realized you can still have creativity" (S2).
- **Increased confidence.** Students associated AI-supported storytelling with a greater sense of control, emotional reassurance, and confidence during writing tasks. "I felt successful because I made a story… I felt proud of myself" (S1).
- **Enhanced motivation.** Students expressed curiosity and enjoyment when experimenting with different AI features. "I didn't know I can use my voice to give AI the rhythm while creating music… AI helped me make it" (S3).

2. Cognitive Domain

- **Idea development.** Students demonstrated cognitive awareness of AI as an idea-generation catalyst rather than an idea owner. "I had a story about a notebook... AI gave me different perspectives and how I could elaborate on different parts." (S2)
- **Integration of AI and personal input.** Students described actively merging their own ideas with AI-generated suggestions to enrich characters, settings, and plot elements. "I thought of alien

invasion… but AI helped me elaborate like aliens from another universe, with new characters and background." (S1)

- **Language awareness.** Increased awareness of vocabulary and sentence-level features was evident. "I wrote down 'reputed' and 'obtuse.' I didn't know these before, but AI helped me learn such words." (S1)

3. Behavioral Domain

- **Strategic integration of AI.** Students described using GenAI purposefully across different stages of writing. "First I will give the opening… then the problem… then the ending" (S3).
- **Extension of AI use beyond the classroom.** Students reported applying GenAI tools in other academic subjects and informal contexts. "I used it to help with astronomy class… and also in economics class" (S5).
- **Autonomous prompting.** Increased procedural awareness was evident as students described refining prompts and selectively improving AI outputs. "I give it an idea, then refine what it gives back" (S2).
- **Collaborative learning.** Some students described using GenAI in collaborative contexts. "We shared our main ideas, and AI helped us create the story" (S1).

4. Ethical Domain

- **Using AI as support.** Students emphasized that effective AI use required intentional personal input, positioning GenAI as a tool that supports rather than replaces their own thinking. "I did not let it make a story. I definitely made my own story, and the ideas it gave me, I changed." (S2)
- **Authorship awareness and transparency.** Students emphasized the importance of originality and honesty regarding AI involvement. "When you use AI, you should be honest about it… tell what part was written by AI, what part is written by you" (S9).
- **Evolving ethical understanding.** Students described a progression from guilt toward clearer ethical judgment. "At first, I thought using AI was kind of like cheating… but now I know if I give it my ideas, it helps me learn and improve" (S2).

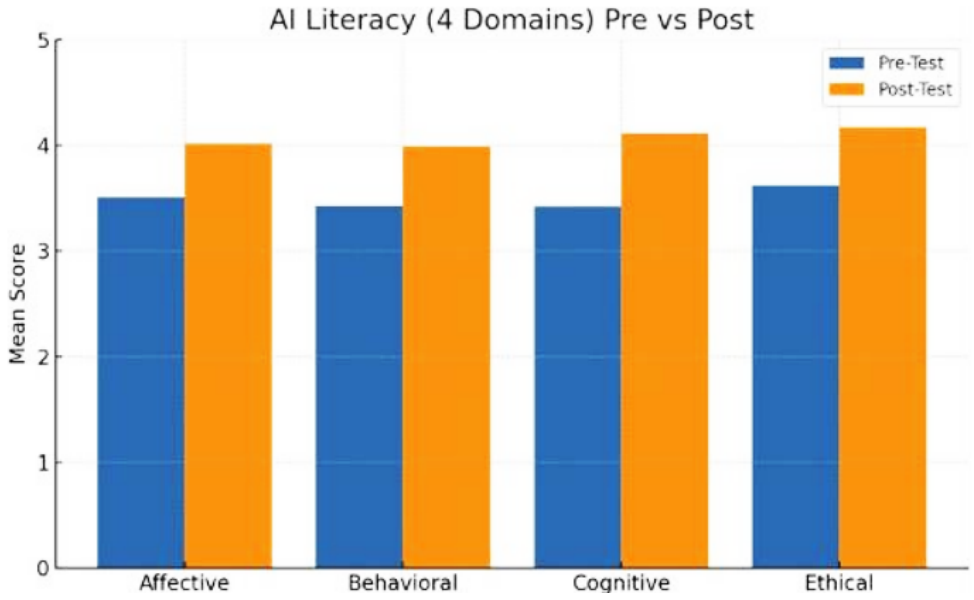

Figure 2: Experimental Group Comparison of Pre- and Post-Test Scores Across Four GenAI Literacy Domains across grade levels.

RQ3: To what extent does Gen AI-driven storytelling influence students' writing skills in terms of word usage, narrative structure, creativity, and writing anxiety?

Post-test results indicated higher writing scores for students in the experimental group following participation in the GenAI-driven storytelling workshop. The mean overall writing score increased from 3.34 to 8.71 out of 15. Improvements were observed across multiple writing dimensions, including word usage, narrative structure, and creativity, as presented in Figure 3. In contrast, the control group did not show statistically significant changes in overall writing performance or writing anxiety across any measured dimension between the pre-test and post-test stages.

Findings: Results showed significant gains across all assessed writing skill dimensions in the experimental group following the intervention, as shown in Figure 3. In addition, statistically significant reductions were observed across all three subdimensions of writing anxiety ($p < .001$), as illustrated in Figure 4. No corresponding improvements were observed in the control group.

RQ4: How Do Students Perceive the Impact of GenAI-driven Storytelling on Their Writing Skills?

The thematic analysis revealed sub-themes capturing students' perceptions of how GenAI-driven storytelling influenced their writing skills across word usage, creativity, narrative structure, and writing anxiety.

1. Word Usage
    - **Vocabulary expansion.** Students reported acquiring new and unfamiliar words through AI-generated suggestions. "It gave me good words that I didn't know… and I used them." (S3).
    - **Lexical appropriacy awareness.** Students demonstrated increased awareness of word choice. "The AI gave many versions, then I chose one that was more suitable" (S7).
    - **Motivation to experiment with words.** Students described greater willingness to try new and varied vocabulary, often framing language use as playful exploration supported by AI. "I tried to write more interesting words because AI gave me some cool options" (S8).
2. Creativity
    - **Idea expansion.** Students reported that AI-generated input supported the development of more imaginative and detailed storylines by introducing unexpected or novel ideas. "AI gave alien ideas, I used them with my own story" (S6).
    - **Blending human and AI imagination.** Students described combining personal ideas with AI-generated suggestions. "The jungle and characters were mine… but I asked AI to help with the setting" (S5).
    - **Playful and experimental attitude.** Students framed AI-supported storytelling as an enjoyable and exploratory process, often treating it as a creative game. "It felt like a game… using AI to create something strange" (S1).

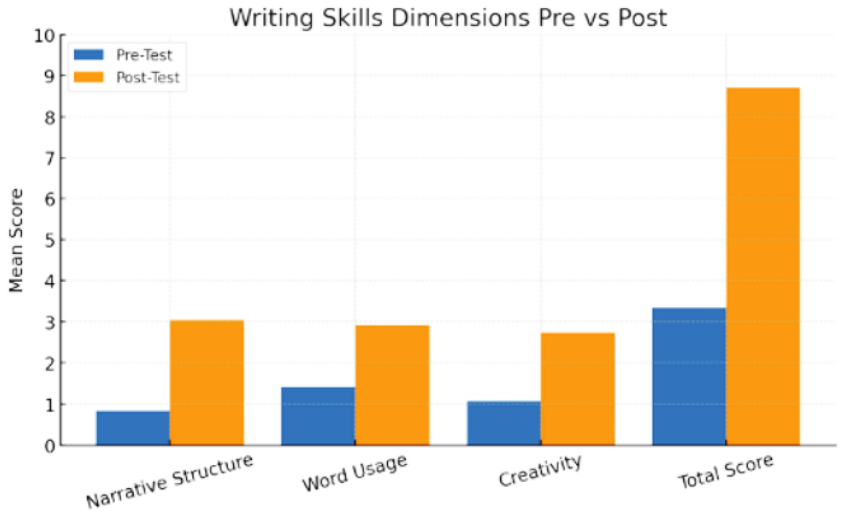

Figure 3: Experimental Group Comparison of Pre- and Post-Test Scores Across Three Storytelling Skills Domains

3. Narrative Structure

- **Narrative structure awareness and scaffolding.** Students demonstrated improved understanding of core narrative elements and used GenAI to organise story components more effectively. "I had only some parts… AI helped me organize them better" (S7).
- **Increased coherence and flow.** Students reported improved logical sequencing of ideas, smoother transitions, and greater overall coherence. "The AI helped make it more connected… it flowed better than my first draft" (S6).

4. Writing Anxiety

- **Reduction of writing-related stress.** Students reported feeling less stressed and more supported, describing AI as a source of reassurance that made writing more approachable. "I feel less stressed because AI gives me a start" (S8).
- **Increased confidence to take linguistic risks.** Students described greater willingness to experiment with language and ideas. "Before I think my writing is weak… now I feel more brave" (S7).
- **Transformed anxiety.** Some students continued to express concerns about overuse, dependence, or authorship, indicating that anxiety was not entirely eliminated but reshaped. "Sometimes I still feel worried… like, is this really my idea?" (S3).

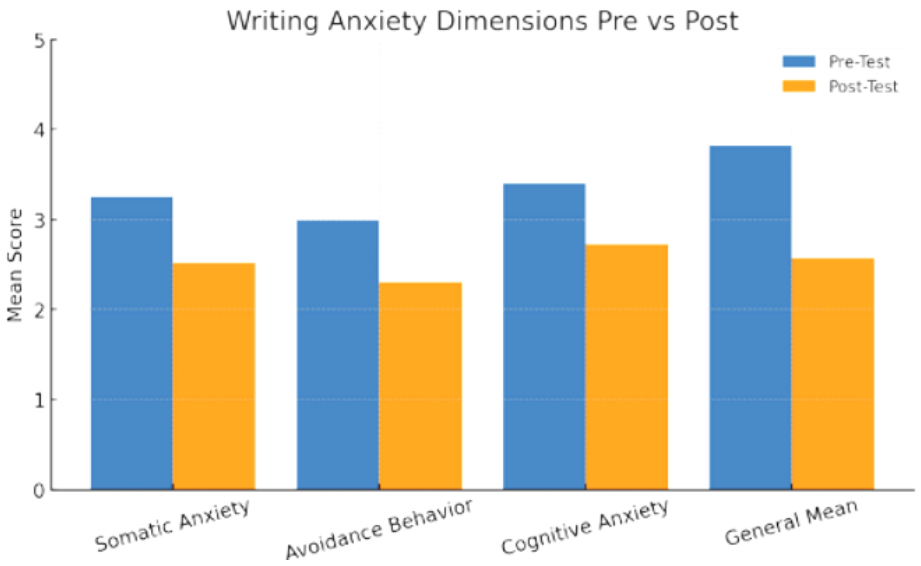

Figure 4: Pre- and Post-Test Scores of Writing Anxiety Subdimensions in the Experimental Group

5. Discussion

The findings indicate that the GenAI-driven storytelling workshop enhanced students' writing skills and AI literacy in a Band 3 secondary school context characterised by limited digital infrastructure and low initial AI literacy. Beyond overall gains, the qualitative findings help explain how these developments unfolded across GenAI literacy dimensions. Affective changes suggest that GenAI-driven storytelling reduced initial resistance to AI use and supported emotional engagement, creating conditions in which students felt more confident and motivated to participate in AI-supported writing. Cognitive engagement indicates a shift from viewing AI as an answer-providing tool toward recognising it as a generative resource that requires human judgment, particularly in idea development, language use, and narrative construction. Behavioral patterns further suggest increasing learner agency, as students moved toward more strategic, autonomous, and transferable uses of GenAI across writing stages and learning contexts. Ethical reflections point to an emerging understanding of authorship and responsibility, indicating that students did not adopt GenAI uncritically but actively negotiated its role in relation to originality and personal contribution. Collectively, these patterns suggest that GenAI literacy developed as a reflective and interconnected process rather than as isolated affective, cognitive, behavioral, or ethical skills.

Parallel to these literacy-related developments, students' perceptions of their writing skills suggest that GenAI-driven storytelling reshaped the writing experience in focused yet interconnected ways. Students described engaging with language in a more exploratory and intentional manner, experimenting with vocabulary choices while remaining attentive to meaning and appropriacy. The writing process also became more generative, as GenAI support enabled students to extend, adapt, and elaborate ideas without displacing their original creative intentions. At the level of text organisation, GenAI was perceived as a scaffold that supported clearer structuring of drafts, helping students manage gaps, strengthen sequencing, and improve overall coherence. Although writing-related stress was reduced and

confidence increased, students continued to reflect on issues of authorship and reliance, indicating that emotional reassurance coexisted with growing critical awareness rather than unexamined dependence.

The results both align with and further existing research. For instance, Bozkurt and Sharma (2024) contend that ethical AI integration in education requires explainability, transparency, and trust. The increased ethical awareness observed in this study—particularly students' understanding of authorship, attribution, and the responsible use of AI—echoes Bozkurt's emphasis on trustworthy and interpretable AI practices. The cognitive and behavioral improvements observed are also in line with the findings of Annapureddy et al. (2025). A notable reduction in writing anxiety further highlights GenAI's role not only as a cognitive aid but also as an affective support mechanism, echoing findings by Hawanti and Zubaydulloevna (2023) regarding AI's potential to foster learner confidence and engagement.

Importantly, these findings reinforce the notion that GenAI literacy constitutes a recursive and reflective process rather than a linear progression of discrete skills, aligning with the hybrid literacy paradigm articulated by Bozkurt (2024). The emergence of ethical awareness, for example, signals a developing conceptualization of AI not merely as a tool, but as a collaborative agent whose role must be continually examined and negotiated. This conceptual deepening suggests that pedagogically guided GenAI use can support students' evolving understanding of agency, responsibility, and authorship in AI-mediated writing contexts. Such insights further substantiate the inclusion of affective and cognitive dimensions in future GenAI literacy models, thereby validating the framework advanced by Ng et al. (2024).

As a practical and empirical contribution, the findings show that GenAI can be integrated into everyday classroom practice by embedding it within structured writing tasks rather than using it as a stand-alone tool for teachers. Guiding students through idea generation, drafting, revision, and reflection allows GenAI to support writing development and AI literacy in a focused and manageable way. Importantly, this approach demonstrates that meaningful GenAI integration does not require advanced technical infrastructure, but rather clear pedagogical goals, scaffolded activities, and opportunities for reflection, making it particularly relevant for resource-constrained secondary school contexts.

6. Conclusion

This study examined the impact of a GenAI-driven storytelling workshop on secondary school students' writing skills and generative AI literacy in a Hong Kong secondary school context. Using a mixed-methods approach, the study explored changes in students' writing performance, including word usage, narrative structure, creativity, and writing anxiety, and engagement with GenAI across affective, behavioral, cognitive, and ethical dimensions. The findings indicate that GenAI-driven storytelling can support students' writing development while also strengthening their understanding and responsible use of generative AI tools. Students showed clearer awareness of narrative structure, richer word use, increased creativity, and reduced writing anxiety. At the same time, they developed greater confidence, motivation, and ethical awareness when interacting with GenAI technologies.

Overall, this study points to the potential for developing key AI literacy competencies within resource-constrained educational contexts when supported by structured pedagogical interventions. Students can engage productively with GenAI when learning activities emphasize creativity, reflection, and guided use rather than technical complexity. The results should be interpreted in light of several limitations, including the short intervention period and the use of a single school context, which may limit generalizability. These findings highlight the value of integrating GenAI-supported story writing into English language education and point to the need for further classroom-based research in diverse secondary school settings.

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