

ENHANCING DIGITAL LITERACY AND CHARACTER DEVELOPMENT THROUGH AI-INTEGRATED MICROLEARNING

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Abstract: This qualitative case study investigates how AI-integrated microlearning enhances digital literacy and character development among undergraduate students in a basic writing class. Four participants engaged in a four-session module centred on reimagining the legend of Suro and Boyo in Surabaya through narrative writing. Students used AI tools such as Padlet, PaperRater, ChatGPT and QuillBot for drafting, revising, and reflecting on their work. Data were collected through self-assessment checklists, writing artefacts, observation notes, and reflective responses. Digital literacy was assessed across five UNESCO domains: functional skills, information evaluation, content creation, ethical AI use, and reflective engagement. Findings revealed strong proficiency in functional and creative skills, consistent reflective use of AI, and moderate success in ethical AI application. Character development was measured using a rubric across five traits—empathy, responsibility, respect/humility, honesty/integrity, and perseverance. Student narratives and reflections indicated growing ethical awareness and social-emotional insight. Moreover, the observation data and writing artefacts provided deeper insight into the development of key character traits. The study concludes that microlearning modules, when embedded in local culture and supported by AI tools, can foster meaningful development in both digital competence and character education. This approach holds promise for holistic, value-oriented instruction in digitally mediated learning environments.

Keywords: *character development, digital literacy, microlearning, narrative writing*

INTRODUCTION

In the modern context of the 21st century, the notion of digital literacy has experienced a profound evolution, broadening its focus from simply technical expertise to encompass a comprehensive range of critical skills, including ethical judgment, the capacity to assess content quality, and the imperative for responsible interaction with swiftly advancing technologies, particularly in relation to artificial intelligence (AI). Although it is evident that Indonesian students generally demonstrate a satisfactory level of capability in navigating various digital platforms, empirical research has persistently revealed that a significant proportion of these students still face considerable difficulties in executing essential tasks such as evaluating the reliability of online information, managing their digital well-being, and comprehending the extensive ramifications associated with algorithmic technologies

(Afrina et al., 2024; Wardani et al., 2024). This discrepancy underscores the pressing demand for improved digital literacy education that transcends mere technical competencies to also cultivate critical thinking and ethical considerations regarding technology usage, especially within Indonesia (Nurmalahayati et al., 2025). Tackling these issues necessitates a multi-dimensional strategy that weaves digital literacy education into the curriculum, emphasising both technological competencies and the ethical implications of technology utilisation.

Simultaneously, character education has gained renewed attention in Indonesia's national curriculum, aiming to cultivate values such as empathy (Charitas & Prahmana, 2025; Ramadhani et al., 2024), honesty (Pugu et al., 2024; Siregar et al., 2025), and social responsibility (Lestari, 2024). However, existing programs often rely on didactic instruction and fail to anchor moral reasoning within students' lived experiences or disciplinary knowledge. This gap highlights the need for innovative pedagogical strategies that integrate character education with experiential learning and critical thinking approaches. The integration of character education into the curriculum requires collaboration among teachers, parents, and the community to overcome existing barriers and promote a supportive learning environment (Asri & Deviv, 2023). A shared commitment to character education is essential in supporting Indonesia's diverse and evolving classrooms. When students feel seen, respected, and included, they are more likely to develop empathy, integrity, and a sense of social responsibility. By weaving local values into inclusive learning practices, teachers can help students navigate cultural differences with understanding and respect.

The convergence of microlearning and AI-enhanced writing tools presents a timely pedagogical opportunity to address this dual challenge. Microlearning, defined as short, focused learning experiences, has been shown to enhance retention, motivation, and personalisation, especially in digitally mediated contexts (Lestari, 2024). In Indonesia, microlearning platforms have improved student engagement and conceptual mastery in digital literacy and ethics education (Pebriantika et al., 2025). Furthermore, it reduces cognitive load and allows learners to consume content at their own pace, making it a flexible and accessible pedagogical approach (Mostrady et al., 2025). Moreover, the integration of AI-based writing tools such as ChatGPT or QuillBot facilitates personalised feedback, supports iterative writing development, and encourages metacognitive awareness and self-regulation (Zheldibayeva et al., 2025), allowing students to reflect on the ethical dimensions of their work (Song & Song, 2023). This approach not only fosters writing proficiency but also cultivates a deeper understanding of ethical considerations in digital communication and composition. By leveraging these innovative strategies, teachers can create an environment that promotes both effective writing skills and ethical literacy among students in the digital age (Astiwardhani & Sobandi, 2024; Herdian et al., 2023; Judijanto, 2025). This synergy between microlearning and AI tools exemplifies a progressive shift in educational methodologies, emphasising the importance of ethical awareness alongside skill acquisition.

Narrative writing, particularly when interwoven with culturally pertinent themes, represents a formidable approach to fostering character values. Storytelling that is anchored in indigenous culture provides a substantial medium for ethical contemplation, identity construction, and the cultivation of empathy. The utilisation of digital storytelling, underpinned by artificial intelligence and microlearning design principles, has demonstrated a pronounced efficacy in augmenting both linguistic capabilities and character

consciousness among Indonesian learners (Kodriyah et al., 2025). Umar et al. (2023) previously revealed that digital storytelling also supports the development of other language skills such as listening, speaking, reading, and writing, while motivating learners to engage actively in the learning process. Furthermore, AI integration in digital storytelling enhances English language teaching by fostering creativity and improving learning quality (Astiwardhani & Sobandi, 2024; Baskara, 2023; Belda-Medina & Goddard, 2024; Compagnoni, 2025; Eragamreddy, 2025). This dual emphasis on language acquisition and character education highlights the critical significance of incorporating technology within culturally responsive pedagogical frameworks. Additionally, AI-based digital storytelling has been effective in improving literacy skills, including reading comprehension and critical thinking among university students, indicating its broad applicability in enhancing linguistic competence (Tarigan et al., 2023). Moreover, the incorporation of digital storytelling in educational contexts can effectively bridge the divide between language acquisition and cultural identity, ultimately fostering a more inclusive and participatory classroom atmosphere. Furthermore, this approach is consistent with empirical findings that underscore the efficacy of digital storytelling in enhancing student engagement and advancing language proficiency across diverse educational settings (Nassim, 2018; Zhang & Chen, 2023).

Despite these promising developments, few studies have explored the integration of microlearning, AI tools, and culturally grounded narrative writing as a composite strategy for fostering both digital literacy and character education in Indonesian classrooms. Most existing research treats these domains in isolation—focusing either on technical skill development, or moral instruction, without examining their synergies. Furthermore, the role of generative AI in supporting ethical reflection and narrative expression among adolescent learners remains largely underexplored in the Indonesian context.

Literature Review

The integration of AI in microlearning presents a promising medium for enhancing digital literacy and character development. This approach leverages AI's capabilities to personalise learning experiences, making them more engaging and effective. By focusing on bite-sized, easily digestible content, microlearning can address diverse educational needs and foster essential 21st century skills such as critical thinking, communication, and creativity. The combination of AI and microlearning not only supports digital literacy but also contributes to character development by promoting ethical considerations and digital citizenship. The following sections delve into the key aspects of this integration.

Digital Literacy and AI

AI is reshaping digital literacy by enabling personalised, interactive, and inclusive learning experiences. This approach not only enhances student engagement but also supports the development of critical and creative thinking skills. For instance, AI digital literacy encompasses understanding basic AI techniques, recognising the societal and ethical impacts of AI, and being able to critically analyse AI-generated information (Almatrafi et al., 2024; Zebua et al., 2025). Furthermore, AI enhances digital literacy by providing personalised, interactive, and inclusive learning experiences, which improve student engagement and learning outcomes (Susi et al., 2025). AI-integrated platforms have shown significant improvements in students' digital literacy skills, with increased motivation and comprehension (Prasetyo et al., 2024). A comprehensive framework for digital literacy in

the AI era includes technical understanding, practical skills, critical evaluation, and ethical considerations, which are crucial for preparing students for an AI-driven world (Baskara, 2025).

Research indicates that students with higher digital literacy can navigate digital environments more critically, analyse information more effectively, and make productive use of AI technologies in daily life (Joseph et al., 2024). However, studies also reveal that the current level of AI digital literacy among high school students is relatively low, particularly in areas such as critical analysis, understanding social impacts, and ethical considerations (Zebua et al., 2025). This underscores the need for integrating AI literacy into educational curricula and providing hands-on training and interactive tools (Almatrafi et al., 2024; Joseph et al., 2024; Zebua et al., 2025). A comprehensive framework for digital literacy in the AI era should include:

1. technical understanding: basic knowledge of AI systems and digital tools (Almatrafi et al., 2024; Zebua et al., 2025);
2. practical skills: ability to use digital and AI tools for academic and daily tasks (Almatrafi et al., 2024; Joseph et al., 2024);
3. critical evaluation: skills to assess information, especially AI-generated content, for accuracy and bias (Almatrafi et al., 2024; Zebua et al., 2025);
4. ethical considerations: awareness of privacy, data security, and the broader ethical implications of AI use (Almatrafi et al., 2024; Zebua et al., 2025).

The challenge, however, is not just in teaching these skills, but in addressing the potential drawbacks of AI, such as concerns about ‘technostress’ from over-reliance on digital tools and ‘cognitive disengagement’ that may reduce human interaction. This study aims to directly address this problem by proposing a pedagogical model that maintains student agency and encourages deep engagement, rather than passive acceptance of AI outputs.

Character Development through Digital Literacy

Digital literacy plays a pivotal role in character development by fostering critical thinking, communication, collaboration, and creativity (Utaminingsih, et al., 2023). Furthermore, AI's role in digital citizenship development emphasises understanding digital ethics, privacy, and data security, which are integral to character development (Susi et al., 2025). Research highlights that digital literacy, when integrated with character education, helps students develop responsible, ethical, and positive behaviours in technology use. Strategies for character building through digital literacy include:

- utilising digital devices and media in learning to promote religious and ethical values;
- encouraging independent learning, creativity, and discipline through online research and content creation; and
- implementing school-wide digital literacy movements, such as watching educational videos and reflective digital activities.

These activities help students construct new knowledge, improve digital skills, and develop social and ethical character traits necessary for responsible digital citizenship.

Microlearning Strategies

Microlearning is increasingly recognised as a flexible, accessible strategy that supports lifelong learning by delivering brief, focused sessions. It aligns well with self-directed and informal learning, and its integration with emerging technologies like AI enhances personalisation and engagement (Judijanto, 2025). Microlearning effectively develops soft skills such as leadership, communication, and emotional intelligence among university students. It promotes active participation and self-directed learning through concise, engaging formats, including interactive videos and gamified lessons, which boost confidence and practical application (Luo & Li, 2025). Moreover, the use of AI in microlearning allows for adaptive material adjustments and instant feedback, which cater to individual learning needs and promote continuous learning (Susi et al., 2025).

For Generation Z, microlearning meets their preference for rapid information consumption and shorter attention spans by providing content in small, digestible chunks. This enhances engagement, self-directed learning, and long-term retention, although successful implementation requires adequate technological support (Sutarman et al., 2025). Studies show that microlearning combined with digital tools like Canva improves students' reading skills and vocabulary retention by making learning more interactive and motivating (Pinandhita & Yasin, 2025). Furthermore, experimental research confirms that microlearning significantly improves student learning outcomes, with statistical evidence showing higher post-test scores compared to pretest scores, demonstrating its effectiveness as a learning method (Pebriantika et al., 2025).

While AI-integrated microlearning offers numerous benefits, challenges such as technological dependence and limited access to technology must be addressed. A holistic approach that considers ethical aspects, infrastructure, and digital literacy is essential for effective implementation (Susi et al., 2025). This perspective highlights the need for balanced integration of technology in education to ensure equitable access and foster comprehensive character development.

While microlearning offers numerous benefits, challenges such as technological dependence and limited access must be addressed for effective implementation. This study builds on this by demonstrating how the microlearning framework can serve as an enabler for deliberate practice and scaffolded reflection.

Research Gaps and Study Objectives

This study seeks to fill this critical gap by investigating how a pedagogical model that combines:

1. microlearning modules on digital ethics and literacy,
2. AI-assisted narrative writing, and
3. culturally embedded character themes

can holistically support students in becoming not only competent users of technology but also reflective, responsible, and culturally rooted digital citizens.

Thus, there is a clear research gap: no study has yet examined how an integrated pedagogical model incorporating microlearning, AI tools, and local cultural storytelling can foster both digital literacy and character development in Indonesian university classrooms.

This study aims to address the existing gap by developing and evaluating a pedagogical model that integrates microlearning modules on digital ethics and literacy, AI-assisted narrative writing, and cultural-marker-based character development using traditional stories such as *The Legend of Suro and Boyo*.

Research Question

How does the integration of microlearning, AI-assisted narrative writing, and culturally embedded character themes enhance students' development in both digital literacy and character?

METHODS

Context and Participants

This study employed a qualitative case study approach involving four undergraduate students enrolled in a basic writing course at a university in Surabaya, Indonesia. Participants were selected based on willingness and prior experience with AI tools. As a qualitative inquiry, the study's objective was not to generalise findings to a broader population, but rather to provide a deep, contextual exploration of a specific pedagogical model. The small sample size was a deliberate design choice that allowed for a rigorous and in-depth investigation of how the integrated model fostered digital literacy and character development within this unique, culturally embedded context.

The study involved four undergraduate students enrolled in a basic writing course at a university in Surabaya, Indonesia. Participants were selected based on willingness and prior experience with AI tools. Ethical clearance was obtained, and informed consent was secured. This study was conducted in the context of an AI-integrated microlearning module designed to enhance digital literacy and character development through narrative writing. The module was implemented over four sessions in an Indonesian university setting, where students reimagined the traditional story *The Legend of Suro and Boyo* using digital tools such as ChatGPT and QuillBot for drafting, feedback, and reflective writing. Each session is elaborated as follows.

1. Session 1 – Prompt & Planning: Students encountered the legend and brainstormed a modern retelling.
2. Session 2 – Drafting: Students composed 5–7 sentence narratives using Padlet.
3. Session 3 – AI Feedback: Students pasted drafts into ChatGPT, PaperRater and QuillBot to receive suggestions; they reflected on logic, style, and ethical accuracy.
4. Session 4 – Revision & Reflection: Students revised narratives, self-assessed digital and character skills, and participated in group discussions.



Figure 1. Microlearning The Legend of Suroboyo

Data Collection

To ensure a robust understanding of student development, this study employed multiple data sources. This triangulated approach allowed researchers to capture technical, cognitive, and affective dimensions of learning from both student-generated and observational data.

1. Student Self-Assessment: digital literacy checklist and character rubric (5 domains each)
2. Writing Artefacts: drafts, revisions, and reflection logs
3. Observational Field Notes: tracked student engagement with AI and revision decisions.
4. Reflection Responses: documented student awareness of AI ethics and values

The instruments used in this study were specifically aligned with established digital literacy and character education frameworks to provide structured insights into students' growth.

1. Digital Literacy Checklist: reflecting UNESCO's five domains
2. Character Rubric: five core traits with a 4-point scale (Empathy, Responsibility, Respect/Humility, Honesty/Integrity, Perseverance)

Data Validation and Triangulation

Acknowledging the inherent limitations of self-reported data, which can be influenced by self-perception bias or a desire to provide favourable responses, the researchers actively mitigated this through a systematic process of triangulation and validation. This involved cross-referencing three key data sources:

1. Student Self-Assessment: These scores captured the students' subjective perceptions of their own development.
2. Writing Artefacts: The final drafts and revision logs provided an objective, external measure of student performance. For instance, improvements in a student's writing served as a concrete validation of their self-reported proficiency in 'content creation'.

3. **Observational Field Notes:** The researcher's real-time observations of student engagement provided a 'third-party validation' that contextualised and confirmed the students' self-reported ethical and reflective engagement with the AI tools.

Data Analysis

This research employed a qualitative case study approach. Data were analysed using descriptive and interpretive techniques. Self-assessment scores were tabulated and averaged to quantify student proficiency across digital literacy and character domains. These numerical insights were supported by narrative analysis of student reflections and writing artefacts to contextualise behavioural and attitudinal changes. Observational field notes were thematically coded to track engagement, revision patterns, and ethical decision-making in the writing process. This mixed-methods approach enabled a comprehensive view of both cognitive and character development throughout the microlearning intervention.

FINDINGS AND DISCUSSION

Enhancing Digital Literacy and Character Development through an Integrated Pedagogical Model

This section presents findings related to the research question: how the integration of microlearning, AI-assisted narrative writing, and culturally embedded character themes influences students' development in both digital literacy and character. Drawing on multiple data sources, including writing artefacts, observations, and guided reflections, the analysis reveals that the synergy between these three pedagogical elements created a meaningful learning environment. Students demonstrated increased competence in using digital tools creatively and responsibly, while also showing deeper engagement with culturally grounded moral values such as empathy, perseverance, and responsibility. The integration of traditional narratives and reflective AI-supported writing tasks enabled students to connect ethical reasoning with digital practice, indicating the model's potential for holistic student development. To triangulate researcher observations and writing artefacts, a student self-assessment was conducted using a checklist and rubric adapted from the UNESCO Digital Literacy Global Framework (UNESCO, 2018) and character education domains. All four students completed the self-assessment after the final microlearning session.

Digital Literacy Self-Assessment

Students evaluated themselves across five domains: functional skills, information evaluation, content creation, ethical use, and reflective AI application. This study assessed students' digital literacy development across five key domains outlined by UNESCO: functional digital skills, information evaluation, digital content creation, ethical use of AI tools, and reflective use of AI in writing. A structured self-assessment and observation tool was used to collect data from four undergraduate participants during and after the microlearning sessions.

Functional digital skills were uniformly strong. All four students demonstrated independent use of AI writing tools (e.g., ChatGPT, QuillBot, PaperRater), effective navigation of platforms (Google Docs, Padlet), and fluency in basic digital operations (copying, pasting, linking, saving). These results suggest that students are technologically competent and well-

prepared for AI-assisted writing environments. In the domain of information evaluation, some of the students critically assessed AI-generated content and identified irrelevant or inaccurate suggestions. However, a student failed to filter out flawed outputs, indicating a need for targeted instruction in digital discernment.

For digital content creation, all students successfully revised their drafts using their own voice and style, even when using AI to brainstorm. This reflects their ability to integrate AI support without compromising originality. The results affirm the creative potential of combining narrative tasks with AI-enhanced scaffolding. Meanwhile, the performance in ethical AI use was mixed. While some students demonstrated responsible authorship by paraphrasing and citing AI support, one student directly copied output with minimal modification. Teachers must explicitly address when and how to ethically use generative tools in writing.

Finally, in the area of reflective use of AI, all students provided thoughtful responses on how AI influenced their writing decisions, story structure, and value alignment. This suggests strong metacognitive growth and supports prior research on AI as a catalyst for reflection when guided by pedagogical structure. The results are visualised in Figure 1, showing clear mastery in technical and creative skills, while critical evaluation and ethical usage remain developmental priorities.

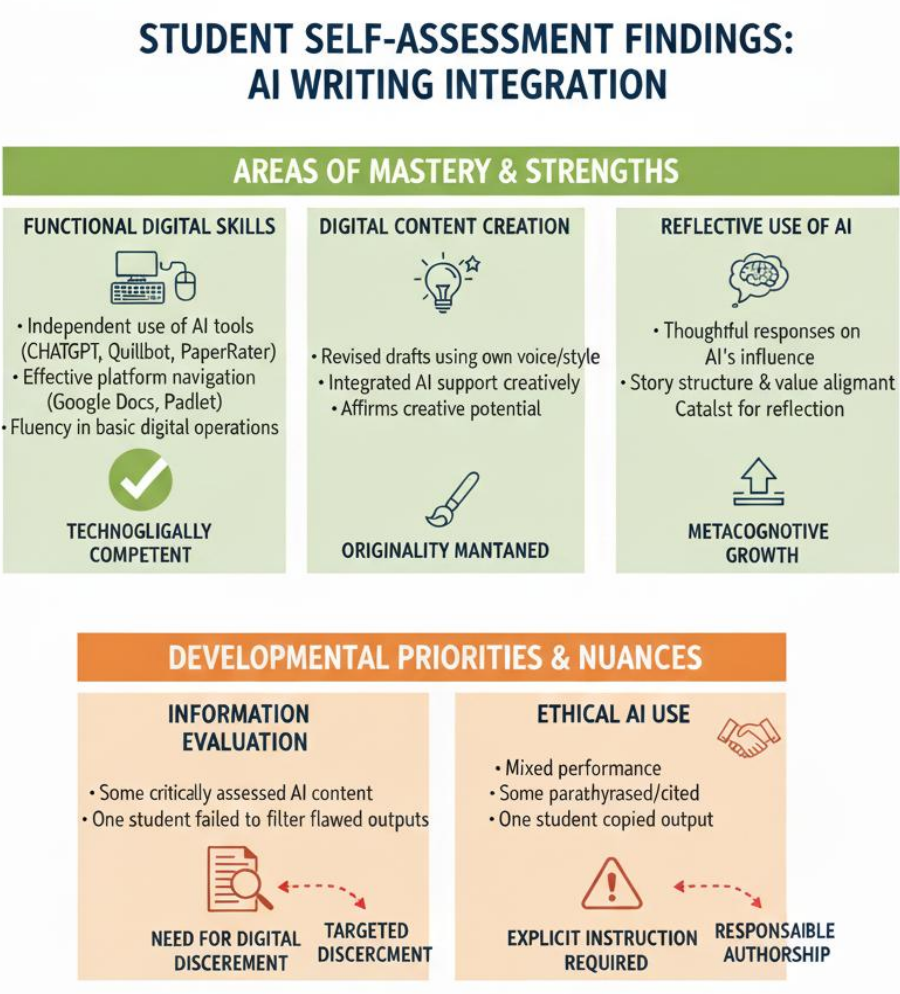


Figure 2. Student's Self-Assessment Findings

These findings indicate that AI-integrated microlearning can effectively promote foundational and reflective digital competencies, but also require scaffolding in ethical and evaluative practices. Future modules should embed real-time decision-making tasks and digital dilemmas to deepen understanding of responsible AI use.

The self-assessment study findings on student digital literacy are strongly supported by the behavioural observations. The observation checklist provided concrete evidence that aligns with the study conclusions about functional digital skills, content creation, and reflective use of AI. The student's comfort and engagement with the AI, their ability to follow instructions, and their completion of the module all corroborate the finding that students are technologically competent. Similarly, the observation that the student selectively revised their work and improved their draft provides behavioural proof that students can integrate AI support while maintaining their originality. The student's willingness to challenge the AI, justify their decisions, and view mistakes as learning opportunities directly supports the study finding of strong metacognitive and reflective growth.

The observation data also adds important nuance to the study's more mixed results on ethical use and information evaluation. While the study noted one student who copied AI output, the observed student demonstrated strong ethical behaviour by using the AI respectfully and without attempts to 'trick' it. This places the observed student within the majority of responsible users identified in the study. Regarding information evaluation, the observation that the student's revision sometimes introduced new errors despite challenging the AI's feedback highlights a key developmental need. It shows that while students are capable of critical assessment, they may still require targeted instruction to refine their 'digital discernment' and prevent the introduction of new mistakes during the revision process.



Figure 3. Observational Notes

The student artefacts also provide a critical third point of triangulation, unifying the self-reported digital literacy and character development findings with the direct behavioural

STUDENT 1: EVOLUTION OF DRAFTS

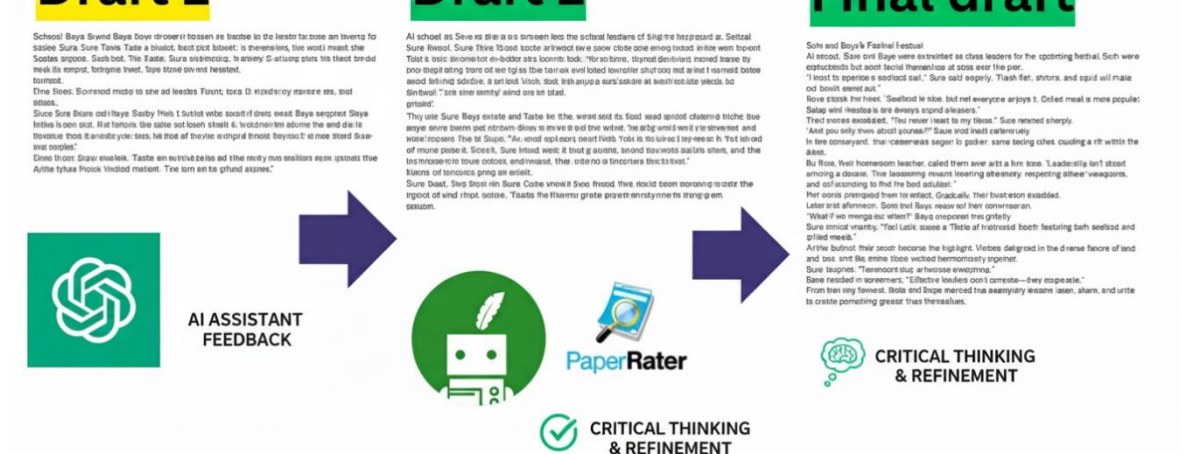


Figure 4. Students' Writing Artefact

The revised student narratives directly reflect the findings on digital literacy by showing the processes of information evaluation and content creation. Students were instructed to ask the AI for feedback on specific elements, such as dialogue and the ending, and then to 'choose what to keep, and what to change'. The revised versions of the stories demonstrate this discernment; for example, in Student 1's revision, new lines are added to escalate the conflict ('You don't understand!') before a resolution, showing a thoughtful and selective integration of AI feedback to improve the narrative. Similarly, the revisions in Students 2 and 4's stories, which include more detailed descriptions of emotions and actions, show how students successfully revised their drafts using their own voice, thereby affirming their ability to integrate AI support without compromising originality.

The artefacts also provide a powerful lens into the students' character development, validating the self-reported and observational data. The core conflict in nearly every story (Sura and Baya fighting over a stall idea, a seat, or noodles) is a direct mirror of the character traits being assessed. The revised stories consistently show the characters demonstrating respect, empathy, and perseverance by compromising, apologising, or finding shared solutions. This behavioural shift within the narratives themselves supports the finding that students internalised character values not just through the plotlines but through the revision process, where persistence and thoughtfulness were key. The student who 'persists when faced with a difficult task or feedback' in the observation checklist is the same student who, in their story, revises their dialogue to show a more cooperative and thoughtful resolution. This integrated evidence demonstrates that the AI-supported microlearning environment effectively fostered both digital and character-based growth.

Character Development through Narrative Writing

The impact of AI-integrated microlearning on students' character development was assessed using a 4-point rubric measuring five core values: empathy, responsibility, respect/humility, honesty/integrity, and perseverance. The rubric was completed by all four participants through self-assessment and researcher triangulation via narrative artefacts and reflective prompts. Each domain was scored from 1 (Needs Work) to 4 (Excellent), with average scores summarised below:

Table 1. The Students' Character Development

Character Trait	Average Score (n=4)	Interpretation
Empathy	3.5	Strong understanding of others' feelings and perspectives reflected in characters' actions.
Responsibility	3.5	Students showed commitment to revising drafts and following feedback.
Respect / Humility	3.5	Characters resolved conflict fairly and demonstrated respectful communication.
Honesty / Integrity	3.25	Stories maintained truthful representation; minimal exaggeration noted.
Perseverance	3.0	Students revised multiple times but varied in depth and effort.

These results suggest that AI-supported narrative writing can serve as a valuable platform for fostering moral reasoning and social-emotional growth. Students internalised character values not just through the plotlines of their stories, but also in the revision process where persistence, integrity, and thoughtfulness were key.

The observational checklist confirms the students' commitment to revising their work, a behavioural manifestation of the self-reported high scores for responsibility. Similarly, the observation that the student persisted when faced with a difficult task and tried different approaches to solve a problem provides concrete evidence supporting the self-assessment finding on perseverance. This corroborates the conclusion that the revision process itself fosters these values. Furthermore, the observational data introduces the concept of a growth mindset, which underpins these traits, noting that the student views mistakes as a learning opportunity and eagerly seeks to improve their work. The ability to accept constructive criticism gracefully further reinforces this, demonstrating how students internalise character values not just through the content of their stories but through their active engagement with the AI-guided revision process itself. This integrated evidence highlights AI-supported narrative writing as a valuable platform for fostering social-emotional growth and moral reasoning.

Qualitative data from reflection journals supported these findings. One student noted, '*I wanted Suro and Boyo to learn to listen before fighting, because in real life, I also had a misunderstanding with a friend.*' Another reflected on the role of AI in helping them revise more patiently, stating, '*The AI gave me ideas to fix the story without giving up.*'

While scores across domains were closely clustered, honesty/integrity and perseverance emerged as areas with slightly lower averages. This suggests that while students valued truthfulness in their storytelling, some struggled to consistently apply rigorous editing or reflect critically on moral dilemmas. These traits, often reinforced through longer-term writing projects, may require extended exposure and deeper dialogue to mature.

Overall, the structured microlearning sessions anchored in local folklore and supported by reflective AI use enabled students to connect narrative content with personal values, demonstrating the potential of this pedagogical approach for integrated character education. Embedding character education in narrative tasks, especially when scaffolded with culturally relevant themes and AI-assisted reflection, provides fertile ground for developing empathy, responsibility, and moral insight in writing classrooms.

The Impact of Microlearning Modules on Students' Digital Ethics, Literacy, and Character Growth

The integration of microlearning modules within the instructional framework yielded significant improvements in students' digital literacy, ethical awareness, and character development. The modular design, which segmented learning into concise and focused units, facilitated incremental acquisition of digital competencies while concurrently fostering reflective and values-oriented engagement with the writing tasks.

Enhancement of Digital Literacy Skills

The data indicated that students exhibited substantial growth in operational and critical digital literacy. All participants demonstrated proficiency in navigating digital platforms (e.g., Google Docs, Learning Management Systems) and in executing basic digital functions such as copying, pasting, linking, and sharing. Furthermore, students effectively utilised AI-powered writing tools—namely ChatGPT and QuillBot—not solely for content generation, but also for the purposes of idea organisation and textual refinement. This reflects a progression from surface-level tool usage to strategic and purposeful digital engagement.

Crucially, students exhibited an emerging ability to critically evaluate AI-generated content. While all students made efforts to assess the clarity and relevance of AI outputs, variations in discernment were observed. Students 1 and 2 actively disregarded inaccurate or irrelevant suggestions, whereas Students 3 and 4 demonstrated a lesser degree of selectivity. These findings underscore the value of microlearning in supporting the development of nuanced digital judgment, a cornerstone of ethical digital literacy.

Development of Ethical Awareness in Digital Contexts

The microlearning framework also contributed to students' heightened awareness of digital ethics. All students acknowledged their use of AI tools in their writing processes and engaged in reflective practices regarding the influence of AI on their creative choices. Notably, the majority refrained from directly copying full AI responses, opting instead to rephrase content in their own words, an indication of emerging academic integrity. One exception (Student 2) highlighted the continued need for reinforcement of ethical standards in AI usage.

Through structured reflection activities and guided discussions, students demonstrated increased transparency, accountability, and ethical self-regulation. The modular format allowed for periodic ethical checkpoints, enabling students to pause, assess, and make informed decisions concerning their digital practices. This iterative process was instrumental in cultivating responsible digital behaviour.

Advancement in Character Development

Analysis of students' written artefacts and reflections revealed meaningful integration of character values throughout the narrative writing process. All students embedded core ethical traits—such as empathy, responsibility, perseverance, respect, and honesty into the content and character development within their stories. The use of culturally grounded source texts (e.g., *The Legend of Suro and Boyo*) served as an effective foundation for exploring moral themes, which were further reinforced through AI-supported revisions and reflective prompts.

Student responses articulated values such as teamwork, conflict resolution, mutual respect, and ethical leadership. The self-assessment data, with mean scores ranging from 3.0 to 3.5 across character domains, indicated a strong alignment between students' moral reasoning and their narrative outputs. These findings affirm the potential of character-infused microlearning to support affective and ethical dimensions of students' growth.

Efficacy of Microlearning for Incremental and Reflective Growth

The microlearning approach proved particularly effective in fostering incremental development and sustained reflection. By structuring learning into modular components, students were able to engage deeply with each task, receive timely feedback, and iteratively revise their work. This scaffolded process not only enhanced digital literacy and ethical discernment but also supported metacognitive engagement and character internalisation.

Furthermore, the microlearning format promoted accessibility and retention, allowing students to process complex digital and moral concepts in manageable segments. As a result, learners demonstrated increased self-awareness, improved peer collaboration, and a greater capacity for value-driven digital composition.

The findings of this study suggest that microlearning modules exert a positive and multifaceted impact on students' development in the domains of digital literacy, ethical awareness, and character formation. By integrating culturally responsive content, AI-assisted writing tools, and reflective learning scaffolds, the instructional design fostered the emergence of responsible, literate, and morally grounded digital citizens. These outcomes support the pedagogical potential of microlearning as a transformative approach for holistic education in the digital age.

Discussion

This study investigated the pedagogical impact of a microlearning-based instructional model integrating AI-assisted narrative writing and culturally embedded character education on students' digital literacy, ethical awareness, and character development. The findings underscore the efficacy of this tripartite approach in promoting both cognitive and affective learning outcomes within a technologically mediated literacy environment. The discussion below offers a detailed interpretation of the results through the lens of relevant theoretical frameworks and empirical literature.

The data revealed substantial progress in students' digital literacy, evidenced by their proficient navigation of digital platforms and the effective utilisation of AI tools such as

ChatGPT and QuillBot for drafting and revising narrative texts. These outcomes reflect not only functional digital competence but also the emergence of strategic and reflective engagement, consistent with conceptualisations of digital literacy as a multi-dimensional construct encompassing technical, cognitive, and socio-emotional domains (Rahayu et al., 2022).

The ability of students to critically evaluate AI-generated content, demonstrated by their capacity to discern relevance, accuracy, and appropriateness, indicates an important shift from superficial tool usage to a more discerning and autonomous digital practice (Huang et al., 2025). This aligns with the notion of critical digital literacy, wherein learners are expected not only to access and produce digital texts but to interrogate their sources, intentions, and implications (Milković et al., 2025; Arvianto et al., 2023). While the findings highlighted individual variability in the critical engagement with AI (e.g., Student 2's reliance on AI-generated text without modification), the overall trend towards reflective tool use suggests that microlearning can effectively scaffold complex digital literacies by breaking down sophisticated skills and concepts into small, manageable learning units that enhance comprehension, engagement, and retention (Mostrady et al., 2025; Sutarman et al., 2025; Yuniarti & Kusumawardani, 2025).

A salient finding of the study pertains to students' growing awareness of ethical issues in the use of generative AI. Most participants displayed a conscientious approach towards the integration of AI-generated content, avoiding direct replication and instead synthesising or rephrasing ideas into original expressions. All students openly acknowledged the role of AI in their writing process, thereby demonstrating an emerging sense of digital responsibility and academic integrity. This aligns with the notion of ethical behaviour that students reflect in their ability to make morally sound decisions, respect academic integrity, and act responsibly toward others and their community. This responsibility is demonstrated through adherence to principles such as honesty, respect for intellectual property, fairness, and social awareness (Buwono et al., 2025; Ramadhani et al., 2024).

The microlearning format appears to have contributed meaningfully to this outcome by embedding moments of ethical reflection into each instructional session. The structured and iterative nature of the intervention allowed students to engage with digital ethics not as abstract principles but as situated practices embedded within their writing tasks. This finding resonates with constructivist theories of moral development, which posit that ethical understanding is best cultivated through experiential learning and reflective dialogue (Supaat, 2016). Furthermore, through guided reflection, students develop moral reasoning and cultural self-awareness, which are essential for ethical growth and responsible citizenship (Caldwell-O'Keefe & Recla, 2020).

Although ethical missteps such as direct copying of AI responses were observed in isolated cases, these instances may be understood as indicative of the nuanced challenges inherent in teaching ethical reasoning in emergent technological contexts. They also underscore the need for continuous ethical scaffolding and reinforcement within digitally-enhanced learning environments. This resonates with the notion of multi-source scaffolding, dialogical and reflective scaffolding, and technology-supported feedback (Herold & Seufert, 2025; Korhonen, 2020; Zhong & Lyu, 2022).

Character development emerged as a significant area of students' growth, facilitated through the integration of culturally resonant narratives and value-based writing tasks. All students were able to articulate and embed key character traits such as empathy, honesty, responsibility, and perseverance within their stories. These values were not only thematically explored but also reflected in narrative decisions and character arcs, suggesting a depth of moral engagement that extended beyond superficial representation.

This finding is in accordance with established theories of moral education, which emphasise the importance of explicit and implicit character instruction through literature, storytelling, and reflection (Dewi et al., 2024; Hidayati, 2019; Huriyah, 2018; Lomi et al., 2024; Rahasya, 2017). The use of *The Legend of Suro and Boyo* as a foundational text offered a culturally situated entry point for exploring ethical dilemmas and character formation, thereby enhancing the relevance and resonance of the learning experience.

The iterative writing process facilitated by AI feedback and peer interaction provided students with multiple opportunities to revisit and refine their moral positions, thereby reinforcing the internalisation of values through sustained engagement. This aligns with Narvaez's (2008) framework for integrative ethical education, which posits that narrative, reflection, and guided practice are central to character development in educational contexts. The structured design of the intervention, predicated on the principles of microlearning, significantly contributed to students' cognitive and moral development. By segmenting content into focused, goal-oriented learning units, the instructional model reduced cognitive overload and promoted sustained attention to task-specific objectives. This is consistent with Mayer's (2002) cognitive theory of multimedia learning, which posits that modular instruction facilitates deeper processing of information by minimising extraneous cognitive load.

Microlearning also functioned as an enabler of deliberate practice, allowing students to engage in repeated cycles of performance, feedback, and reflection. Such cyclical engagement supported the consolidation of both technical skills (e.g., digital composition) and dispositional learning (e.g., ethical reflection, value internalisation). Moreover, the scaffolded reflection activities embedded within each session encouraged metacognitive engagement, prompting students to consider the rationale behind their creative and ethical decisions (University of Michigan, 2015).

Importantly, the modular structure allowed learners to progress at a manageable pace, fostering a sense of autonomy and mastery. This approach also enhanced learner accessibility and inclusivity by breaking down complex tasks into smaller, cognitively digestible components (Judijanto, 2025; Silva et al., 2025; Sutarman et al., 2025). As such, the findings support the broader utility of microlearning as an effective pedagogical strategy for integrating cognitive, technological, and character-based learning objectives.

CONCLUSION

This study provides empirical support for the efficacy of a microlearning-based pedagogical model that integrates AI-assisted writing and culturally grounded character education. The model was found to significantly enhance students' digital literacy, ethical awareness, and character development through iterative, reflective, and scaffolded instructional design. These findings contribute to the growing body of literature advocating for holistic, value-

oriented approaches to digital education, and offer a promising framework for cultivating responsible, literate, and morally grounded learners in the digital age. The results of this study offer several implications for both instructional practice and future research. Pedagogically, the findings underscore the value of integrating AI tools into narrative writing tasks not merely for efficiency, but as catalysts for ethical reasoning and creative reflection. Teachers are encouraged to leverage microlearning structures to scaffold these complex processes, ensuring that digital literacy instruction is embedded within culturally and morally meaningful contexts. Furthermore, the study highlights the need for ongoing teacher facilitation to support critical and ethical engagement with AI, particularly in light of the nuanced and evolving nature of digital authorship and accountability. Future research may expand upon these findings by examining the long-term retention of digital and moral competencies acquired through microlearning, exploring the model's applicability across diverse demographic and educational contexts, and investigating its integration within interdisciplinary curricula.

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BIO STATEMENT

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