

Prompt Literacy and Generative AI Readiness for AI-Assisted Animation Creative Workflows in Higher Education

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Abstract—Generative AI technologies are increasingly being adopted within creative learning environments, particularly in animation and digital media education. As AI-assisted tools become more accessible, there is a growing need to understand how students perceive and adapt to these technologies in their creative workflows. This study explores prompt literacy and generative AI readiness among animation students in higher education creative workflows. A quantitative survey was conducted involving 74 animation students to examine AI usage patterns, perceived benefits, workflow integration, and challenges related to generative AI adoption. The collected data were analyzed using descriptive statistics and reliability analysis through Jamovi software. The findings indicate that students generally viewed generative AI positively, especially in supporting idea development, creative experimentation, and improving workflow efficiency. At the same time, concerns related to originality, prompt construction, ethical issues, and output consistency were frequently highlighted by respondents. The instrument demonstrated excellent reliability with a Cronbach's alpha value of 0.943. The study suggests that prompt literacy and AI readiness are becoming increasingly relevant within animation education and creative digital learning environments. The findings may provide useful insights for educators and curriculum developers in integrating generative AI tools into animation-related teaching and learning practices.

Keywords—Generative AI; prompt literacy; AI readiness; animation education; creative workflows; higher education

I. INTRODUCTION

The emergence of generative artificial intelligence (AI) has begun to reshape the way creative work is approached within digital media and higher education environments. Over the past few years, AI-assisted tools such as ChatGPT, Gemini, Midjourney, Runway, and Sora have become increasingly common among students and digital creators. These technologies are now capable of supporting various creative processes including idea development, visual generation, scripting, and content experimentation [1], [6], [13]. In creative disciplines such as animation, the use of AI is gradually moving beyond technical automation and becoming part of everyday creative workflows [4]. Moreover, recent studies have also shown that generative AI technologies are increasingly influencing visual storytelling, concept development, and digital content production practices within creative media education environments.

Within higher education, generative AI has attracted growing attention due to its potential to support teaching, learning, and creative production activities. Students in animation and digital creative programs are increasingly exposed to AI-assisted tools during concept development, storyboarding, visual ideation, and content planning stages. The accessibility of these tools has also changed how students approach creative problem-solving and production efficiency. For some students, AI tools provide faster ways to generate references and explore ideas, while others view them as useful support systems during technical or creative challenges [2], [3]. The growing accessibility of AI-assisted systems has further encouraged experimentation-based learning approaches among students within digital creative disciplines, particularly in areas involving rapid ideation and multimedia production [8], [16].

Despite these advantages, the integration of generative AI into creative education continues to raise several concerns. Questions related to originality, creative dependency, ethical usage, and the role of human creativity are becoming more visible within AI-assisted production environments. In addition, the ability to communicate effectively with AI systems has emerged as an increasingly important skill. Students are now expected not only to use AI tools, but also to understand how prompts influence the quality and relevance of generated outputs. In this study, prompt literacy refers to students' ability to construct and use prompts effectively to obtain meaningful and relevant outputs from generative AI systems. It also involves understanding how prompt wording, context, and specificity influence AI-generated responses during creative tasks. This growing reliance on prompt-based interaction has contributed to increasing attention towards prompt literacy, particularly within creative learning environments where communication, visual interpretation, and experimentation play important roles [5], [14], [15].

Existing studies on AI integration in education have mainly focused on general technology acceptance, academic performance, and AI-assisted learning practices. However, research specifically related to animation students and creative production workflows remains relatively limited. There is still insufficient understanding of how students in animation-related programs perceive generative AI readiness within creative workflows, particularly in relation to prompt literacy, creative support, and workflow integration. As generative AI technologies continue to evolve rapidly, understanding students' readiness and perceptions may help institutions better

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prepare future creative professionals for emerging digital production environments [12].

Therefore, this study provides an exploratory examination of animation students' perceptions of prompt literacy and generative AI readiness within AI-assisted creative workflows. Rather than testing predictive relationships among the study variables, the research focuses on understanding students' experiences, perceived benefits, workflow support, and challenges associated with the integration of generative AI in animation education. The findings are expected to provide baseline insights that may assist educators and curriculum developers in designing effective strategies for integrating generative AI into creative learning environments, while also serving as a foundation for future studies employing more advanced analytical approaches.

Animation education provides a distinctive context for examining prompt literacy and generative AI readiness because students engage in visually driven and iterative creative processes that require continuous interaction between human creativity and AI-generated outputs. Unlike many text-based learning tasks, animation production involves concept development, visual storytelling, character design, scene composition, and creative refinement, all of which rely heavily on effective prompt construction and critical evaluation of AI-generated content. As a result, animation students require not only technical proficiency but also the ability to guide, assess, and creatively adapt AI outputs throughout the production process. Understanding these experiences offers valuable insights into how generative AI can be integrated into creative education while maintaining the central role of human creativity.



Fig. 1. Original 3D animation scene developed through traditional production workflow.

Note: The original 3D animation scenes were produced by the authors prior to AI-assisted refinement.



Fig. 2. AI-assisted visual refinement for animation scene enhancement.

Note: AI-assisted refinement was conducted using prompt-based generative AI tools while preserving the original narrative direction and scene composition developed by the authors.

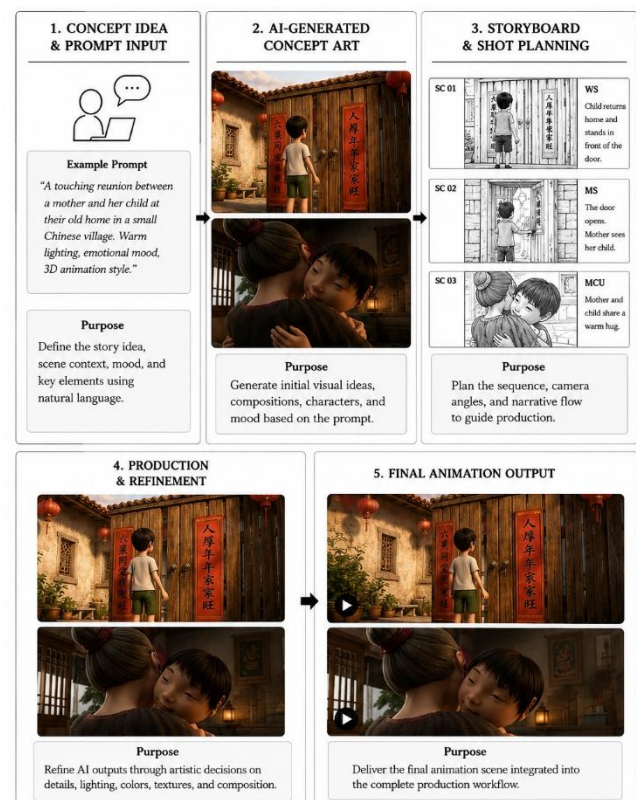


Fig. 3. Example of AI-assisted animation concept development workflow.

Recent developments in generative AI technologies have introduced new possibilities for animation production workflows, particularly during early-stage ideation, visual refinement, and storyboard planning processes. Fig. 1 and Fig. 2 demonstrate examples of animation scenes before and after AI-assisted refinement. The comparison illustrates how generative AI tools may support improvements in visual quality, environmental detail, lighting consistency, and emotional atmosphere within animation-related creative workflows.

Fig. 1 presents examples of original 3D animation scenes developed through conventional production approaches prior to AI-assisted enhancement. In contrast, Fig. 2 demonstrates the same scenes after undergoing AI-assisted visual refinement using prompt-based generative AI support. The refined outputs exhibit improved environmental textures, cinematic lighting, visual depth, and overall scene composition while preserving the original narrative direction and emotional context of the animation scenes.

Fig. 3 further illustrates an example of an AI-assisted animation concept development workflow adapted from contemporary creative production practices. The workflow demonstrates how generative AI technologies may support different stages of animation development, including prompt construction, AI-generated concept generation, storyboard planning, production refinement, and final animation output. Despite the increasing role of AI-assisted systems, human creativity, artistic interpretation, and production decision making remain essential throughout the refinement and finalization stages of animation production workflows.

Overall, the integration of generative AI technologies within animation education environments may provide students with additional opportunities for creative experimentation, rapid ideation, and workflow support. At the same time, the workflow also reflects the continuing importance of human-centred creative direction in maintaining originality, narrative consistency, and artistic quality within AI-assisted animation production practices.

II. LITERATURE REVIEW

A. Generative AI in Higher Education and Creative Learning

The development of generative artificial intelligence (AI) technologies has introduced significant changes to teaching, learning, and creative production practices within higher education environments [2], [3], [13]. In recent years, AI-assisted systems such as ChatGPT, Gemini, Midjourney, and Runway have become increasingly accessible to students across various academic disciplines. These tools can support content generation, idea exploration, visual development, and communication processes, which lead many educators and institutions to explore their potential within educational settings [1]. The growing accessibility of generative AI has also contributed to wider discussions regarding the future role of AI within digital learning environments and creative education.

Within higher education, previous studies have reported that AI-assisted technologies may support productivity, improve learning flexibility, and encourage exploratory learning approaches among students [2], [8]. Students are increasingly using generative AI tools for brainstorming, summarizing information, generating references, and supporting project development processes. On the other hand, in creative disciplines, the integration of AI technologies has become particularly noticeable due to the increasing demand for digital content production and rapid visual experimentation. As a result, AI-assisted creative workflows are gradually becoming part of the learning experience within animation, design, and digital media programs [4]. Apart from that, previous studies have suggested that AI-assisted creative environments may encourage more iterative and exploratory learning experiences, particularly among students involved in design-oriented and visual production activities [9].

In animation education, generative AI tools are beginning to influence multiple stages of creative production workflows, including concept development, scriptwriting, storyboard planning, visual ideation, and asset generation. AI-assisted systems may help students accelerate early-stage ideation and reduce technical barriers during content development processes [4]. For some students, generative AI tools also provide opportunities to explore different visual directions and creative outcomes more efficiently compared to traditional production methods. This increasing interaction between students and AI systems has contributed to the emergence of more collaborative human-AI creative practices within digital creative learning environments. Hence, human-AI collaboration has increasingly been discussed as part of emerging co-creative production models where AI functions as a supportive ideation partner rather than a replacement for human creativity [7].

Despite the potential advantages of generative AI integration, concerns regarding ethical usage, originality, and creative dependency continue to be widely discussed within higher education contexts. Several researchers have highlighted that excessive reliance on AI-generated outputs may affect critical thinking, independent creativity, and content authenticity among students [3], [10]. In creative disciplines such as animation, these concerns become particularly relevant because originality and artistic interpretation remain central elements of creative practice. Consequently, educators are increasingly encouraged to develop balanced learning approaches that integrate AI technologies while still preserving human creativity and creative decision-making processes.

B. Prompt Literacy and Generative AI Readiness in Creative Workflows

As generative AI technologies become more prompt-driven, the ability to communicate effectively with AI systems has emerged as an increasingly important digital skill. In recent discussions surrounding AI-assisted learning, the concept of prompt literacy has gained attention as part of emerging digital and AI-related competencies. Prompt literacy refers to an individual's ability to understand, construct, refine, and evaluate prompts when interacting with generative AI systems. Within animation and creative workflows, prompt literacy extends beyond basic prompt writing and includes the ability to communicate visual intentions, creative requirements, stylistic preferences, and contextual information effectively to AI-assisted systems [14], [15]. Students with stronger prompt literacy are more likely to obtain relevant outputs, refine generated content efficiently, and maintain greater creative control throughout AI-assisted production processes [5]. Within creative workflows, prompt literacy may influence how effectively students interact with AI systems during idea generation, visual experimentation, and creative problem-solving activities.

Previous studies have suggested that students often experience difficulties when attempting to generate accurate or contextually appropriate outputs from AI systems due to unclear prompting strategies or limited understanding of AI behavior [5]. In creative production environments such as animation workflows, prompt construction may directly influence the quality, consistency, and usability of generated outputs. As a result, students who possess stronger prompt communication skills may demonstrate higher confidence and adaptability when working with AI-assisted creative technologies.

Apart from that, AI readiness has become another important area of discussion within higher education environments. AI readiness is commonly associated with an individual's preparedness, confidence, and willingness to adopt AI technologies within learning or professional settings. Previous research has shown that students' readiness towards AI integration may be influenced by perceived usefulness, technical familiarity, learning support, and ethical considerations [6]. In creative disciplines, AI readiness may also involve students' ability to balance AI-assisted production with personal creativity, artistic control, and workflow decision-making.

To note, although generative AI adoption continues to expand rapidly within educational settings, research focusing specifically on animation students and creative production workflows remains relatively limited. Many existing studies have focused primarily on general AI adoption or broader educational technology acceptance models without examining the specific creative practices involved in animation-related learning environments [2], [3]. In addition, there is still limited understanding regarding how prompt literacy and AI readiness may influence students' experiences within AI-assisted creative workflows. Therefore, further investigation is needed to better understand how animation students perceive generative AI integration within higher education creative environments [4], [12].

Overall, previous studies have consistently highlighted the growing role of generative AI in higher education, with particular attention given to its potential for enhancing learning, creativity, and productivity. Existing research has also emphasized the importance of prompt literacy and AI readiness as essential competencies for effective interaction with AI systems. However, most studies have examined these topics from a general educational perspective, with limited attention to disciplines that rely heavily on iterative visual creativity and AI-assisted content development. Furthermore, relatively few studies have explored how animation students perceive the integration of generative AI within their creative workflows. By focusing on animation education, this study extends the current literature by examining prompt literacy and generative AI readiness within a creative learning environment where human creativity and AI-assisted production are closely interconnected.

III. METHODOLOGY

A. Research Design

This study adopted a quantitative survey approach to examine prompt literacy and generative AI readiness among animation students involved in creative workflows within higher education environments. The quantitative method was selected as the study aimed to obtain a broader understanding of students' experiences, perceptions, and readiness towards the use of generative AI technologies in animation related creative activities. The study focused on students' exposure to AI-assisted creative workflows, including idea development, workflow support, and learning-related experiences associated with generative AI usage.

The intention of this study was to provide an overview of how animation students perceive prompt literacy and generative AI readiness within their creative workflows. As the research was exploratory in nature, descriptive statistical analysis was considered appropriate for summarizing respondents' experiences and identifying overall response patterns. The study was not designed to examine predictive or causal relationships among the variables, but rather to establish an initial understanding that may support future empirical investigations in animation education.

B. Participants and Data Collection

Data collection was conducted using an online questionnaire distributed to students enrolled in animation and creative media-related programs at a Malaysian public university. A total of 74 valid responses were collected and used for analysis. The participants were selected because they were actively engaged in animation-related creative activities and had prior exposure to generative AI tools through their academic learning. The participants reported experience with a variety of generative AI applications used in creative learning, including text-generation, image-generation, and other AI-assisted tools that supported different stages of the animation production process. The respondents represented varying levels of familiarity and experience in using generative AI within both creative practice and coursework. Although the study was conducted within a specific educational context, the findings provide preliminary insights into students' perceptions of prompt literacy and generative AI readiness that may inform future research involving broader populations and different educational settings.

The questionnaire was shared through online communication platforms commonly used by students. Participation in the survey was voluntary, and respondents were informed that the information collected would be used solely for academic and research purposes. The online distribution approach allowed students to respond based on their own experiences and perspectives regarding AI-assisted creative workflows in animation-related learning environments.

C. Research Instrument

The questionnaire was developed based on the research objectives and relevant literature on prompt literacy, generative AI readiness, and AI-assisted creative learning. It consisted of three sections. The first section collected participants' demographic information and their experience with generative AI tools. The second section included multiple-choice questions and five-point Likert-scale items (1 = Strongly Disagree to 5 = Strongly Agree) that examined students' perceptions of generative AI readiness, workflow efficiency, idea generation, technical support, productivity, creative experimentation, learning support, and their use of prompts during AI-assisted creative activities. These items provided an indication of students' prompt literacy by examining their perceived ability to use prompts effectively when interacting with generative AI tools. The final section comprised open-ended questions that invited respondents to share their experiences, opinions, and challenges related to AI-assisted creative workflows. Responses to the open-ended questions were analyzed using thematic categorization, in which similar responses were grouped into recurring themes. These themes were used to complement and provide additional context for the quantitative findings.

D. Data Analysis

The responses collected were analyzed using Jamovi statistical software. Descriptive statistical analysis was carried out to examine respondent demographics, AI usage frequency, and students' perceptions towards generative AI integration in animation creative workflows. Mean scores and standard deviation values were calculated to identify overall response patterns across the Likert-scale items.

Reliability analysis was also conducted to evaluate the internal consistency of the survey instrument. The results showed a Cronbach's alpha value of 0.943, indicating excellent reliability among the measurement items used in the study. In addition to the quantitative analysis, responses from the open-ended questions were analyzed using thematic categorization. Similar responses were grouped into recurring themes related to idea generation, workflow efficiency, creative experimentation, prompt construction challenges, and ethical concerns associated with generative AI usage. The thematic findings were used to complement and strengthen the interpretation of the quantitative results.

IV. RESULTS AND FINDINGS

A. Demographic Profile of Respondents

A total of 74 valid responses were collected for this study. The respondents consisted of students enrolled in animation and creative media-related programs with varying levels of experience in using generative AI tools within creative workflows. Based on the collected data, female respondents represented the majority of the participants, followed by male respondents. The respondents also represented different years of study, allowing the study to capture perspectives from students with varying academic and creative experiences.

The demographic analysis provided an overview of the respondents' educational background and AI usage exposure within animation-related creative environments. Detailed demographic information is presented in Table I.

TABLE I. DEMOGRAPHIC PROFILE OF RESPONDENTS

Variable	Category	Frequency (n)	Percentage (%)
Gender	Female	43	58.1
	Male	31	41.9
Age	18–20	8	10.8
	21–23	59	79.7
	24 and above	7	9.5
Year of Study	Year 1	35	47.3
	Year 2	25	33.8
	Year 3	14	18.9

A total of 74 respondents participated in the study. Female students represented the majority of respondents (58.1%), while male students accounted for 41.9%. Most respondents were between 21 and 23 years old (79.7%). In terms of academic level, Year 1 students formed the largest group of participants, followed by Year 2 and Year 3 students.

B. Generative AI Usage Among Students

The findings indicated that generative AI tools are increasingly being used by students within animation-related creative workflows. Most respondents reported using AI-assisted technologies at least occasionally during idea development, creative experimentation, and content production activities. AI tools such as ChatGPT, Gemini, and Canva AI were among the most used platforms reported by students.

The results also showed that students mainly utilized generative AI tools for brainstorming, workflow support, reference generation, and technical assistance during creative production processes. While some respondents reported frequent use of AI technologies, others indicated more moderate usage depending on project requirements and familiarity with AI-assisted systems. The overall findings suggest that generative AI has already become part of students' creative learning experiences within animation education environments.

Detailed AI usage frequency information is presented in Table II.

TABLE II. AI USAGE FREQUENCY AMONG RESPONDENTS

AI Usage Frequency	Frequency (n)	Percentage (%)
Rarely	21	28.4
Sometimes	34	45.9
Often	15	20.3
Very Often	4	5.4

The findings indicate that generative AI tools are already being used by students within animation-related creative workflows. Most respondents reported using AI-assisted technologies "Sometimes" (45.9%), followed by "Rarely" (28.4%) and "Often" (20.3%). Only a smaller group of respondents reported using generative AI tools "Very Often" (5.4%). The results suggest that while generative AI technologies have become increasingly accessible within creative learning environments, the frequency of usage among students still varies depending on individual familiarity, workflow needs, and project requirements.

Generative AI encompasses a wide range of tools with different functions and capabilities. For example, large language models such as ChatGPT are commonly used for text generation, brainstorming, and prompt development, whereas image generation platforms such as Midjourney and Adobe Firefly support concept art and visual ideation. More recently, AI video generation tools, including Runway Gen-3 and Pika, have been introduced to assist with animation prototyping and motion-based content creation. Although these platforms differ in their outputs and underlying technologies, they all require users to communicate effectively through prompts and critically evaluate AI-generated results. Consequently, prompt literacy remains a fundamental competency regardless of the specific AI platform used.

C. Students' Perceptions Towards Generative AI Creative Workflows

The descriptive analysis revealed generally positive perceptions towards generative AI integration within animation creative workflows. Most respondents agreed that AI-assisted tools were useful for improving workflow efficiency, supporting idea generation, and encouraging creative experimentation. Students also reported that generative AI technologies helped reduce technical difficulties and supported productivity during animation-related creative tasks.

At the same time, several respondents expressed concerns regarding originality, output consistency, and ethical issues associated with AI-generated content. Some students also highlighted difficulties in producing accurate outputs due to ineffective prompt construction and limited control over generated results. These findings suggest that while students recognize the benefits of generative AI technologies, challenges related to prompt literacy and creative dependency remain important considerations within animation education.

The overall mean score analysis for students' perceptions towards generative AI creative workflows is presented in Table III.

TABLE III. MEAN SCORE ANALYSIS OF STUDENTS' PERCEPTIONS TOWARDS GENERATIVE AI CREATIVE WORKFLOWS.

Variable	Mean	Standard Deviation
Workflow Efficiency	3.57	0.97
Faster Task Completion	3.55	1.00
Creative Idea Support	3.61	0.99
Ease of Use	3.89	0.90
Productivity Improvement	3.38	0.98
Visual Quality Support	3.12	1.27
Creative Experimentation	3.38	1.11
Technical Support Assistance	3.41	1.03
Confidence in Using AI Tools	2.89	1.08
Learning Support	3.28	1.10
Course Integration Support	2.92	1.28

The mean score analysis showed that respondents generally demonstrated moderate to positive perceptions towards generative AI integration within animation creative workflows. Among the evaluated items, ease of use recorded one of the higher mean values ($M = 3.89$), indicating that many students perceived generative AI tools as relatively accessible and manageable during creative activities. Creative idea support also showed a positive response pattern ($M = 3.61$), suggesting that students found AI-assisted systems useful during brainstorming and idea development processes.

Several workflow-related aspects, including workflow efficiency, faster task completion, technical support, and creative experimentation, also recorded moderate mean values. These findings indicate that generative AI tools are increasingly being viewed as supportive technologies within animation related creative tasks. However, lower mean values were observed for confidence in using AI tools ($M = 2.89$) and course

integration support ($M = 2.92$), which may suggest that some students still experience uncertainty or require additional guidance when integrating AI technologies into formal learning and creative production environments.

D. Reliability Analysis

Reliability analysis was conducted to evaluate the internal consistency of the Likert-scale items used in the study. The reliability results are presented in Table IV. The analysis produced a Cronbach's alpha value of 0.943, indicating excellent reliability and strong internal consistency among the measurement items. The findings suggest that the survey instrument was reliable in measuring students' perceptions and experiences related to generative AI readiness and creative workflow integration within animation education contexts.

TABLE IV. RELIABILITY ANALYSIS OF SURVEY INSTRUMENT

Construct	Number of Items	Cronbach's Alpha
Generative AI Readiness and Creative Workflow Perceptions	11	0.943

E. Thematic Analysis of Open-Ended Responses

To provide additional insights into students' experiences with generative AI, responses from the open-ended questions were grouped into several recurring themes. Table V summarizes the identified themes and their frequencies. The analysis revealed that students primarily perceived generative AI as a useful tool for idea generation, workflow efficiency, and creative experimentation. At the same time, respondents also reported challenges related to prompt construction, output consistency, and ethical concerns associated with AI-generated content.

TABLE V. THEMATIC ANALYSIS OF OPEN-ENDED RESPONSES

Theme	Frequency
Idea Generation Support	28
Workflow Efficiency	21
Creative Experimentation	17
Prompt Construction Challenges	15
Ethical Concerns	12

As shown in Table V, idea generation support emerged as the most frequently reported theme ($n = 28$), followed by workflow efficiency ($n = 21$) and creative experimentation ($n = 17$). Prompt construction challenges ($n = 15$) and ethical concerns ($n = 12$) were also identified, indicating that while students recognized the benefits of generative AI, they remained aware of its practical and ethical limitations. The thematic findings generally support the quantitative results by providing further insights into how students experience generative AI within animation-related creative workflows. Many respondents highlighted the usefulness of AI-assisted tools for brainstorming, idea generation, visual exploration, and improving workflow efficiency during creative tasks. At the same time, students also expressed concerns regarding prompt construction, output consistency, originality, and ethical considerations when integrating AI-generated content into their

projects. These findings suggest that while students are generally receptive towards generative AI adoption, the development of prompt literacy and responsible AI usage remains important for effective integration within animation education environments.

V. DISCUSSION

A. Generative AI and Creative Workflow Practices

The findings from this study show that generative AI tools are gradually becoming part of students' creative routines within animation-related learning environments. Many respondents appeared comfortable using AI-assisted systems during idea development, creative exploration, and workflow support activities. Rather than viewing AI purely as a replacement technology, most students seemed to approach these tools as practical assistants that could help simplify certain stages of the creative process.

One noticeable pattern from the findings was the frequent use of AI tools during brainstorming and early concept development stages. This may be related to the nature of animation production itself, where students are often required to generate multiple visual ideas and creative directions within limited production timelines. In this context, generative AI tools may provide students with faster access to references, visual experimentation, and alternative creative possibilities. Similar observations have also been discussed in recent educational technology studies where AI-assisted systems were found to support exploratory and idea-based learning approaches [2], [8], [13], [16].

The findings also suggest that students generally perceive AI-assisted workflows as useful for improving efficiency and reducing technical barriers during production tasks. This observation is consistent with previous studies, which have shown that generative AI can enhance idea generation, streamline creative processes, and support learning in higher education environments [2], [13], [16]. Within animation education, these findings indicate that AI is most valuable as a creative support tool that assists students during ideation and content development rather than replacing human creativity. By reducing the time required for repetitive tasks and early-stage concept exploration, students can devote greater attention to artistic refinement, storytelling, and creative decision-making.

At the same time, the findings do not suggest that students are fully dependent on AI technologies for creative outcomes. Many respondents still acknowledged the importance of human creativity and personal artistic direction within animation workflows. This reflects a more balanced perception towards AI integration, where students appear to value AI as a supporting creative tool rather than a complete substitute for human input and interpretation [17], [18].

B. Prompt Literacy and AI Readiness in Creative Learning

Another important aspect observed in this study relates to prompt literacy and students' readiness towards generative AI

usage. Although many respondents reported positive experiences with AI-assisted creative workflows, several students also highlighted challenges related to generating accurate or satisfying outputs from AI systems, particularly when prompts lacked clarity or contextual detail [5], [12]. In many cases, the effectiveness of the generated results appeared to depend heavily on how prompts were written and refined during interaction with AI tools. This finding supports recent studies suggesting that prompt literacy is a key factor influencing the quality and relevance of AI-generated outputs, particularly in creative disciplines where users are required to communicate complex visual and contextual ideas through prompts [14], [15].

This finding suggests that prompt literacy may play an increasingly important role within AI-assisted creative environments. Students who can provide clearer instructions and more structured prompts may experience better control over AI-generated outputs during idea generation and creative experimentation processes. Within animation-related workflows, prompt construction may influence not only the quality of generated visuals or ideas, but also the overall efficiency of the creative process itself [5], [9].

The growing importance of prompt literacy has also been highlighted in recent discussions surrounding AI-assisted education and digital competency development [5], [12]. As AI systems become more integrated into creative learning environments, students may gradually require stronger communication and critical evaluation skills when interacting with AI-generated systems. Several recent discussions have also highlighted prompt engineering and AI communication skills as emerging forms of digital literacy within technology-enhanced learning environments. In animation education specifically, this may involve understanding how prompts affect visual consistency, artistic direction, and content relevance during creative production activities. As generative AI technologies continue evolving, students may increasingly require adaptive prompting strategies and critical evaluation skills to maintain creative control over AI-assisted production outcomes [12].

The findings further indicate that most students appear generally open towards generative AI integration within higher education creative workflows. Many respondents viewed AI-assisted systems as beneficial tools that could support learning, experimentation, and workflow flexibility [6]. This finding may reflect the growing normalization of AI-assisted creative technologies among younger digital native learners who are already familiar with interactive and technology-driven creative environments [8], [9]. This may reflect the increasing normalization of AI-assisted technologies within creative digital environments, particularly among younger generations of students who are already familiar with digital production tools and online creative platforms.

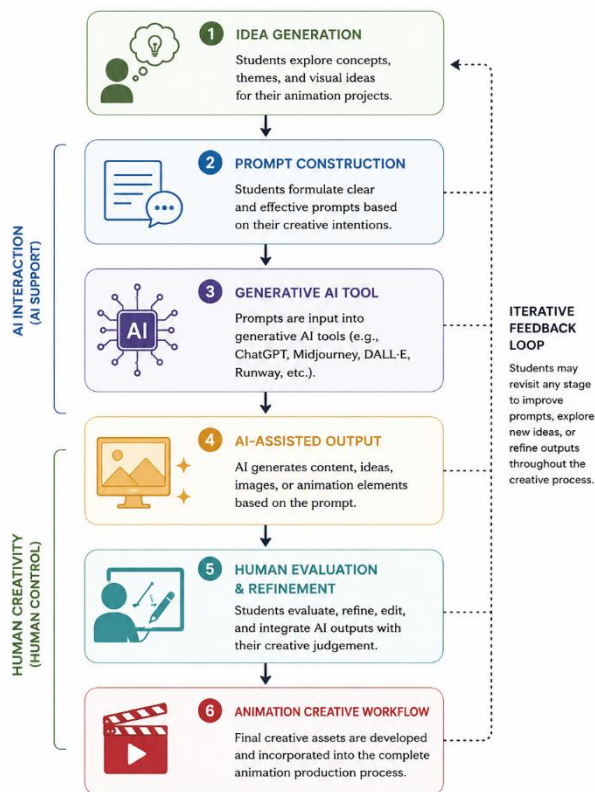


Fig. 4. Proposed human-AI creative workflow in animation education.

Next, Fig. 4 presents a proposed human-AI creative workflow derived from the overall findings and observations obtained in this study. The workflow illustrates how animation students interact with generative AI systems throughout different stages of the creative production process. The process begins with idea generation, where students explore initial concepts, themes, and visual directions for animation-related projects. At this stage, human creativity remains central in determining the creative intention and artistic direction of the workflow.

The second stage involves prompt construction, where students formulate instructions and descriptive inputs to communicate their creative intentions to generative AI systems. This stage reflects the growing importance of prompt literacy within AI-assisted creative environments, as the quality and clarity of prompts may influence the relevance and consistency of generated outputs. Students then interact with generative AI tools such as ChatGPT, Midjourney, Runway, and other AI-assisted platforms to generate visual references, creative ideas, or supporting content during the production process.

Following AI-assisted generation, students evaluate, refine, and selectively integrate the generated outputs into their own creative workflows. The findings of this study suggest that students do not rely entirely on AI-generated outputs but instead use these technologies as supportive creative tools that assist brainstorming, experimentation, and workflow efficiency. Human judgment, creative interpretation, and artistic decision-making continue to play important roles during the refinement stage of the workflow.

The iterative feedback loop illustrated in the figure further reflects the non-linear nature of AI-assisted creative production. Students may revisit earlier stages multiple times to improve prompts, refine generated outputs, or explore alternative creative directions throughout the animation development process. Overall, the proposed workflow highlights the increasingly collaborative relationship between human creativity and generative AI technologies within contemporary animation education environments.

In addition, the workflow also reflects several challenges experienced by students during AI-assisted creative processes, including prompt ambiguity, inconsistent AI-generated outputs, ethical concerns, and limited artistic control over generated content. These challenges suggest that although generative AI technologies may support creative workflows, effective AI integration within animation education still requires critical evaluation, responsible usage, and stronger prompt literacy skills among students.

C. Challenges and Concerns in AI-Assisted Creative Environments

Although respondents generally expressed positive views towards generative AI integration, several concerns were also identified throughout the study. One of the most common concerns involved originality and the authenticity of AI-generated outputs. Some students appeared uncertain about the extent to which AI-generated content should be considered part of original creative work, especially within academic and artistic contexts where personal creativity remains highly valued. Maintaining a balance between technological assistance and authentic creative expression therefore remains an important consideration within AI-assisted animation education environments [7], [12].

Concerns regarding output consistency and creative control were also mentioned by several respondents. While AI tools may assist with rapid idea generation, some students reported difficulties in obtaining outputs that accurately matched their intended artistic direction. These findings suggest that effective use of generative AI requires more than technical access to AI tools. Students also need the ability to critically evaluate AI-generated outputs, refine prompts, and balance AI assistance with their own creative judgment. This reflects the growing emphasis on human-AI collaboration, where AI supports creative production while human creativity remains central to artistic interpretation and decision-making [17], [18].

Apart from that, another issue observed from the findings relates to possible overreliance on AI-assisted systems [3], [10]. Although AI technologies may improve efficiency, excessive dependency on generated outputs could potentially reduce opportunities for independent exploration and problem solving among students. Similar concerns have also been raised in previous studies discussing AI integration within higher education and creative learning environments [3].

In sum, the findings suggest that generative AI technologies present both opportunities and challenges within animation education. While AI-assisted systems may support workflow efficiency, creative exploration, and technical assistance, institutions may also need to consider how AI technologies are

introduced responsibly within creative learning environments. This includes encouraging ethical awareness, strengthening prompt literacy, and maintaining the role of human creativity within AI-assisted animation workflows.

VI. CONCLUSION

This study explored prompt literacy and generative AI readiness among animation students within higher education creative workflows. The findings indicate that generative AI technologies are increasingly becoming part of students' creative practices, particularly in areas related to idea generation, workflow support, and creative experimentation. Most respondents demonstrated generally positive perceptions towards AI-assisted creative workflows and viewed generative AI tools as useful support systems within animation-related learning environments.

Besides, the study also highlighted that students' experiences with generative AI are closely connected to their ability to communicate effectively with AI systems through prompts. While many students recognized the benefits of AI-assisted technologies, several challenges related to originality, prompt construction, output consistency, and ethical concerns were also identified. These findings suggest that prompt literacy may become an increasingly important skill within future creative digital learning environments. Besides, the findings also suggest that future animation education environments may increasingly involve hybrid human-AI collaborative production approaches that combine creative interpretation with AI-assisted workflow support.

In the context of animation education, the findings provide practical implications for educators and curriculum developers. As generative AI becomes increasingly integrated into creative learning environments, animation programs should incorporate prompt literacy, ethical AI practices, and critical evaluation of AI-generated content into teaching and learning activities. Such initiatives can help students use generative AI more effectively while maintaining originality, creative judgment, and professional responsibility. This aligns with broader discussions on educational transformation, which suggest that higher education institutions need to continually adapt curriculum design and teaching practices in response to emerging technologies and changing learning environments [11]. Although generative AI can support creative exploration and workflow efficiency, the role of human creativity, artistic interpretation, and critical thinking remains essential throughout the animation production process.

Several limitations should be acknowledged when interpreting the findings. The study adopted a descriptive approach to explore students' perceptions within a specific educational context and did not investigate statistical relationships among prompt literacy, AI readiness, and creative workflow practices. Future studies could involve inferential statistical techniques, such as correlation or regression analysis, to examine these relationships in greater depth.

This study contributes to the growing discussion surrounding generative AI integration in creative education by providing preliminary insights into animation students' perceptions of prompt literacy and generative AI readiness

within AI-assisted creative workflows. As the study was conducted in a single Malaysian public university and employed descriptive statistical analysis, the findings should be interpreted within this context. Future research should involve multiple higher education institutions, larger and more diverse samples, and inferential statistical approaches to examine the relationships among prompt literacy, generative AI readiness, and creative performance. Longitudinal or experimental studies could also investigate how prompt literacy training influences students' creative outcomes and AI-assisted animation workflows over time.

FUNDING

This research was supported by the Centre for Research, Development, Innovation, Commercialization, and Economy (RDICE) and the P. Ramlee Chair 2026, Faculty of Applied and Creative Arts, Universiti Malaysia Sarawak.

ACKNOWLEDGMENT

The authors would like to acknowledge Universiti Malaysia Sarawak (UNIMAS) for the support provided towards this publication.

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