

Scaffolding or Substitution? A Dual-Path Mechanism of Generative AI Use, Creativity Development, and Pedagogical Mitigation in Film and Television Directing Education

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Abstract. As generative AI rapidly enters creative education in higher education, its influence on students' creativity development has become distinctly dual in nature. On the one hand, it can help students expand their ideas and improve the efficiency of expression; on the other hand, it may also replace the processes of ideation, judgment, and revision that students should have undertaken themselves, thereby weakening their originality. Based on a review of research on AI applications in education, cognitive load theory, creative self-efficacy, cognitive offloading, and human-AI collaborative creativity, this paper retains and reconstructs the dual-path perspective of "creative scaffolding–cognitive substitution." The study argues that whether generative AI can promote creativity development depends not on the mere use of technology, but on whether students' agency, thinking processes, and responsibility for judgment are preserved. The paper further analyzes the potential pedagogical risks of hollowing out the creative process, homogenizing works, weakening judgment, distorting assessment, and generating ethical concerns. It then proposes mitigation strategies, including defining clear boundaries for AI use, strengthening process-oriented assessment, developing AI literacy training, reconstructing creative training procedures, and improving teachers' capacity for guidance.

Keywords: generative artificial intelligence, creativity development, dual-path model, cognitive load, directing and production education.

1. Introduction

The development of generative artificial intelligence is reshaping the ways in which knowledge is produced and creative works are generated in higher education. Technologies represented by large language models, image-generation models, and video-generation tools are now capable of participating in learning activities such as information retrieval, text expansion, storyboard ideation, stylistic referencing, and script polishing. For students in directing and production programs, creative tasks that previously required observation of everyday life, textual reading, discussion-based revision, and repeated trial shooting can now yield initial drafts or reference proposals with AI assistance in a much shorter time. As a result, AI is viewed by students as a tool for improving efficiency and by some teachers as a new opportunity to support personalized learning and creative expression.

However, the question that truly needs to be discussed in education is not whether AI "can be used," but under what conditions it supports learning and under what conditions it substitutes for learning. According to Zawacki-Richter, O. et al[1], AI applications in higher education have long tended to emphasize technical functions while giving insufficient attention to educational processes (p.39). This problem has become more pronounced after generative AI entered the classroom: students may obtain more complete and more fluent works, but the completeness of a product does not necessarily indicate the development of competence. For directing and production education, which emphasizes original conception, narrative organization, audiovisual language, and aesthetic judgment, if AI directly takes over core creative stages, teaching may appear to become more efficient while in fact weakening students' opportunities to practice independent ideation and judgment.

On this basis, this paper adopts the dual-path framework of "creative scaffolding–cognitive substitution" as an analytical tool. "Creative scaffolding" refers to the use of AI as a tool for inspiration, feedback, comparison, and expressive refinement, helping students broaden their ideas and improve

the quality of revision. “Cognitive substitution,” by contrast, refers to AI replacing students in core learning activities such as ideation, judgment, and revision, leading to reduced cognitive engagement and a hollowing out of the creative process. The central argument of this paper is that the educational value of AI is not determined by the technology itself; rather, it is jointly shaped by pedagogical goals, task design, teacher guidance, and assessment methods.

2. Related Research Review and Theoretical Foundations

The educational application of AI is not a new phenomenon. Early research primarily focused on intelligent tutoring systems, learning analytics, automated assessment, and personalized recommendation. The systematic review by Zawacki-Richter et al. [1] indicates that related studies have paid greater attention to learning outcomes and system functions, while discussions of teachers’ roles, classroom interaction, and educational processes remain insufficient. Ouyang and Jiao [2] further classify AI in education into three paradigms: “AI-directed, learner-as-recipient,” “AI-supported, learner-as-collaborator,” and “AI-empowered, learner-as-leader”. This classification is instructive for teaching with generative AI. If students merely receive AI outputs, the technology is likely to move toward substitution; if AI is embedded into processes of discussion, reflection, and re-creation, students continue to occupy an agentic position, and the technology is more likely to become a form of learning support.

The impact of generative AI on creativity is dual in nature. On the one hand, it can lower the threshold for creation and rapidly provide ideas, linguistic expression, and structural references. The experiment conducted by Noy and Zhang [3] shows that ChatGPT can improve both the efficiency of writing tasks and the quality of written products, with particularly notable benefits for participants who initially had weaker abilities. On the other hand, improved efficiency does not equal creativity development. Doshi and Hauser’s [4] study of story creation found that generative AI can enhance the creative evaluation of individual works while potentially reducing the diversity of content at the collective level. This suggests that if students frequently use similar prompts and templates, classroom works may become more complete, but they may also become increasingly homogeneous.

Cognitive load theory provides an important perspective for understanding this contradiction. Sweller [5] argues that learners’ cognitive resources are limited, and instructional design should reduce extraneous load unrelated to learning goals so that students can devote more resources to meaningful knowledge construction. From this perspective, AI can take on lower-level tasks such as organizing materials, adjusting formats, and polishing language, helping students focus their attention on topic selection, characterization, structure, and audiovisual expression. However, cognitive load theory does not advocate eliminating all learning difficulty. Creative learning itself requires necessary generative processing, including problem definition, comparison of alternatives, revision after failure, and value judgment. If AI replaces these processes as well, what appears to be “burden reduction” in fact diminishes the thinking required for competence formation.

Creative self-efficacy is also worthy of attention. Tierney and Farmer [6] point out that an individual’s belief in their ability to complete creative tasks affects their creative performance. In teaching, AI can provide students with immediate feedback and inspirational support, helping them overcome the anxiety caused by creative blocks. However, such confidence may also contain a false element. If students mistake fluent AI-generated text for their own ability, or accept AI-generated plans without sufficient understanding, they may easily fall into the misconception that “AI can create on my behalf.”

3. Pedagogical Risks from the Dual-Path Perspective

The teaching risks discussed above do not operate independently. Rather, they form a cumulative chain of “declining cognitive engagement—weakening professional judgment—homogenization of creative work—distorted assessment—displacement of responsibility.” Each risk develops from and reinforces the preceding one. When generative artificial intelligence is first introduced into film and television directing education, it is generally used to reduce the difficulty of creative tasks and improve the efficiency of scriptwriting and content expression. At this stage, it mainly serves as an auxiliary creative tool. However, once AI moves beyond basic support tasks, such as information organization and language polishing, and begins to penetrate core creative processes, its role changes fundamentally. These processes include determining thematic intentions, constructing character motivations, designing plot events, and arranging cinematic language. A creative scaffold that was originally intended to expand students’ thinking may gradually replace their independent reasoning and lead to comprehensive cognitive substitution. Therefore, this section does not examine individual teaching risks in isolation. Instead, it analyzes the closed-loop risk structure that emerges when students, AI technologies, and classroom institutions interact with and reinforce one another.

The risk chain begins when reasonable cognitive offloading gradually becomes uncontrolled, eventually hollowing out the process of film and television creation. From an academic perspective, cognitive offloading is not inherently negative. People may use external tools to store information, perform calculations, or organize materials, thereby reallocating limited cognitive resources to higher-order problems [7]. In the routine teaching of film and television directing, students may use AI to retrieve background materials, check document formats, and generate preliminary shot lists. Such uses can reduce repetitive and mechanical work, allowing students to concentrate on core creative tasks, including thematic expression and audiovisual design. However, the situation changes when students delegate all major creative activities to AI. These activities include constructing the main storyline, defining character relationships, designing central dramatic conflicts, and organizing storyboard logic. Students would normally develop professional competence by observing real life, independently identifying creative problems, comparing alternative solutions, and repeatedly revising their work. Once these tasks are outsourced, they lose the practical activities through which such competence can be developed. Under these circumstances, students may submit polished and seemingly mature products, but the work no longer reveals their actual creative reasoning or professional development. More importantly, the hollowing out of the creative process is highly concealed. It does not necessarily result in lower course grades. On the contrary, AI-generated work is often more fluent and structurally complete and may therefore receive higher scores. These apparent improvements can further conceal students’ insufficient engagement and lack of independent thinking.

As students’ cognitive engagement continues to decline, the homogenization of their creative work should not be understood merely as aesthetic convergence. It is an observable manifestation of widespread cognitive substitution at the group level. Doshi and Hauser [4] found that generative AI could improve evaluations of the creativity of individual works while reducing overall variation across different works. This phenomenon is particularly evident in film and television directing education. At present, students tend to use highly similar AI models, prompt templates, and narrative structures. Many works follow a generic pattern of “conflict escalation—plot reversal—conflict resolution.” AI systems are designed to prioritize highly probable, mature, and broadly applicable content solutions. Such outputs are often visibly formulaic and lack distinctive personal characteristics. When students lack sustained field observation, personal experience as a source of creation, and independent professional aesthetic judgment, they are more likely to reproduce the apparently mature solutions provided by AI. As a result, an entire class may submit highly similar work. The causal relationship between these risks is therefore clear. The hollowing out of the creative process deprives students of opportunities to integrate personal experience into their work and establish an individual aesthetic position. In turn, the mass production of standardized AI-generated content reinforces students’ dependence on and trust in AI tools. Students may consequently develop

the mistaken belief that the central purpose of film and television creation is to obtain a complete and mature creative solution as quickly as possible, rather than to produce original content that carries a distinctive personal identity and cannot be easily replicated.

Students' uncritical trust in AI tools may further weaken their professional judgment and eventually create a self-reinforcing cycle of dependence. Outputs generated by mainstream large language models often feature polished sentences, orderly logical structures, and an apparently professional register. Even when the content contains factual errors, problematic value orientations, or inconsistencies in character behavior, students may still regard it as professional and reliable creative guidance. Kasneci et al. [8] noted that although generative AI can provide feedback and personalized support, it also introduces risks related to misinformation, bias, academic integrity, and overreliance. In film and television directing education, the deterioration of students' judgment can be observed at two levels. At the first level, students become unable to identify logical flaws and factual errors in AI-generated content. At the second level, they become unable to explain the underlying rationale of their own creative decisions. For example, they may be unable to justify a character's behavior, explain why a key shot must be retained, or demonstrate how the complete narrative supports the central theme of the work. When students repeatedly avoid independent reflection, content verification, and the rejection of unsuitable proposals, their professional judgment gradually declines. This decline makes it even more difficult for them to identify defects in AI-generated content and further intensifies their dependence on the technology.

When individual dependence on AI extends into course assessment, a personal problem of tool reliance becomes an institutional problem of distorted evaluation. Traditional assessment in film and television directing courses generally infers students' learning outcomes and overall creative competence from the quality of their final scripts, storyboards, or completed productions. However, generative AI has disrupted the previously stable relationship among product quality, learning effort, and individual professional competence. Even when teachers can accurately identify obvious traces of AI generation, they cannot determine from the final product alone how much independent thought and original creation the student contributed during plot development, shot design, and content revision. This issue should therefore not be defined simplistically as academic cheating. The central dispute concerns whether the professional competence represented by a work originates from the student's own creative activity or from the AI system. Distorted assessment can also amplify secondary ethical risks, including copyright disputes, privacy breaches, and problematic value orientations. When both teachers and students focus primarily on the visual quality and completeness of the final product, they may overlook less visible concerns. These include the copyright provenance of AI training data, the legal authorization of commercial materials, the leakage of personal creative information through platform uploads, and stereotypes embedded in AI-generated content. UNESCO [9] has emphasized that the governance of generative AI in education should simultaneously protect human agency, transparency, data privacy, and clear boundaries of responsibility. This position indicates that the ethical risks associated with AI are not merely additional problems attached to the technology. Rather, they are systemic teaching problems jointly produced by an opaque creative process, ambiguous responsibility among teachers and students, and assessment standards that have failed to keep pace with technological change.

In summary, the risks arising from the use of AI in film and television directing education cannot be controlled solely by improving students' AI literacy. An effective risk prevention framework must integrate multiple safeguards. These safeguards should include the development of individual AI literacy, clearly defined boundaries for AI use in coursework, process-based assessment throughout the creative process, targeted classroom guidance from teachers, and institution-wide regulations governing AI use. Even when students are proficient in using AI tools, they must remain fully and non-transferably responsible for defining creative problems, selecting among alternative solutions, verifying factual content, and approving the final version of their work. Only through a multilayered and coordinated protection mechanism can AI remain a creative scaffold that supports film and

television directing education. Without such safeguards, the convenience of AI may allow it to replace students' independent cognition and move teaching toward the negative path of cognitive substitution.

4. Mitigation Strategies for Embedding Generative AI in Directing and Production Education

First, boundaries of use based on “assistance without substitution” should be established. For directing and production programs, AI use can be divided into three categories. The first consists of auxiliary stages in which AI use may be permitted, such as material organization, conceptual explanation, language polishing, format checking, and multi-option referencing. The second consists of collaborative stages that should be restricted, such as expanding story directions, inferring character relationships, providing storyboard references, and simulating audience feedback; in these cases, students must explain how they selected and revised the AI suggestions. The third consists of core stages that, in principle, should not be replaced, such as thematic intention, core character motivation, key plot choices, the rationale for shot design, and creative reflection. The purpose of this categorization is not simply to prohibit AI, but to reposition AI as a scaffold for learning.

Second, process-oriented assessment should be strengthened so that traces of students' thinking are retained. Preventing AI from substituting for learning cannot rely primarily on detection tools; rather, the object of assessment must be changed. Teachers can require students to submit topic statements, sources of inspiration, story drafts, storyboard sketches, revision records, AI prompt logs, and reflective statements. Assessment should consider not only the final work, but also how students developed their ideas, how they handled AI suggestions, and why they retained or deleted certain content. In this way, even when students use AI, they must still demonstrate their own processes of judgment and selection.

Third, AI literacy training should be provided to cultivate students who are able to question AI. UNESCO's [10] AI competency framework for students emphasizes that students need to develop integrated competencies in areas such as human-centered values, ethics, technical understanding, and system design. In the context of directing and production programs, AI literacy should include at least four dimensions: understanding the basic principles and limitations of generative AI; learning to pose clear questions and compare different outputs; being able to verify facts, identify biases, and recognize formulaic expression; and understanding copyright, privacy, and attribution responsibilities.

Fourth, creative training procedures should be reconstructed, following the principle that thinking comes first and AI intervenes later. In short-film creation training, students can first independently write the story core, character arc, and main conflict, and then use AI to generate several reference plans. Students should then compare AI-generated plans with their original conceptions and explain the reasons for their final choices and revisions. This approach preserves students' initial independent thinking while also using AI to expand the space of possible solutions. In scriptwriting courses, storyboard courses, and director's statement training, a procedure of “individual first draft–AI feedback–human synthesis–classroom defense” can also be adopted, so that students do not rely on AI thinking from the very beginning.

Finally, teachers' capacity for guidance should be enhanced, rather than shifting the responsibility for governance entirely onto technology. AI detection tools carry the risk of false judgment, so a more effective approach is to improve teachers' understanding of AI tools and their ability to interpret assessment. Teachers need to determine what abilities an assignment truly assesses, which stages can be opened to AI assistance, and which stages must remain human-completed. In this way, AI is no longer merely a generative tool; it also becomes an object through which critical thinking and professional judgment can be trained.

5. Conclusion

After generative AI entered the field of education, the core issue facing creativity education has not been whether the technology is advanced, but whether it preserves students' agency. On the basis of reviewing AI education research, cognitive load theory, and creative self-efficacy theory, this paper proposes the dual-path model of "creative scaffolding–cognitive substitution" as an analytical tool and critically discusses the potential risks of generative AI in teaching as well as corresponding mitigation measures. AI does not naturally promote or destroy creativity; the key lies in whether it is used to assist or to substitute. Assistive use can reduce extraneous cognitive load, stimulate creative exploration, and enhance students' confidence in creation. Substitutive use, however, may lead to overreliance, homogenized works, weakened original judgment, and a hollowed-out learning process. Therefore, directing and production education should not simply prohibit AI. Instead, AI should be incorporated into a pedagogical framework that is explainable, traceable, and reflective through clear use boundaries, process-oriented assessment, AI literacy training, and teacher guidance.

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