

Fostering Creativity with Large Language Models: An Intervention in Rural K-12 School Poetry Education

Xuanni Zeng

*Academy of Arts& Design, Tsinghua University, Beijing, China
Lcriomidori@gmail.com*

Abstract. Due to the widespread application of Large Language Models (LLMs) today, many people have begun utilizing them for generating long passages of text. On the other hand, using LLMs to create text content has been pointed out to weaken people's thinking abilities and cause a decline in their active creativity. Within the education sector, numerous universities and institutions have explicitly stated their opposition to using LLMs in academic writing. However, for those who are currently in or about to enter K-12 education, they encounter LLM tools at a younger age, so they are more likely to use and rely on these AI tools. On this basis, this paper proposes that ethical discussions on LLMs or other generative tools should be introduced at an early stage within K-12 education, and be utilized to assist students in stimulating their originality, so as to intervene in their understanding of how to employ LLMs and correctly use LLM tools as a means of enhancing efficiency. In this case study, the learners are rural students from grades five to nine who have never been exposed to AI-related products. The course design firstly guides students to get to know generative AI and analysis the ethical controversy, then use LLM tools to assist students in conducting brainstorming sessions for poetry writing. The results indicate that effective, restrained LLM assistance can enhance students' creative productivity without compromising the quality of their work.

Keywords: Large Language Models, children's creativity, K-12 education, self-expression, artificial creativity

1. Introduction

Children's creativity is widely regarded as one of the core goals of education. Its value extends beyond artistically expressive interpretation and perception is perceived as a broad ability to question, stimulate creativity, and anticipate resolution in an ambiguous world [1]. Observational studies in preschool and primary school settings indicate that creative thinking is closely associated with exploratory, engaged, and persistent behavioral patterns. Educational contexts and tools can either amplify or inhibit these behaviors [2].

In China, the rapid development of Chinese educational large language models (Ce-LLMs), such as ChatGLM developed by Tsinghua University and MOSS developed by Fudan University, has drawn increasing attention. LLMs have shown notable potential in instructional assistance, material generation, and personalized learning. Some studies also report positive effects of LLMs in rapid

content production, evaluative support, and construction of teaching resources [3]. Meanwhile, international reviews point out that LLMs can reduce learners' anxiety and offer immediate feedback, yet they do not achieve genuine linguistic competence [4]. They also struggle with pragmatic concepts such as irony or metaphor, and may produce cultural misreadings or weaken students' critical thinking when over-relied upon [5-9]. Such limitations indicate that LLM tools should not—and cannot—become dominant agents in classrooms; instead, they can only function as constrained assistants. Empirical evidence, such as randomized controlled trials of AI-supported writing tools in higher education, similarly shows that AI assistance can improve efficiency but must be carefully designed to avoid undermining student agency [10].

Based on the above background, this paper proposes two AI-based interventions for fostering creative thinking in K-12 education. First, introducing ethical and cognitive education about generative AI early in the curriculum. Second, using LLMs as a controlled and guided auxiliary tool within classroom activities to stimulate rather than substitute students' original writing. Through a combination of instructional interventions and post-class follow-up, this paper examines whether “limited and well-regulated LLM assistance can improve students' creative writing efficiency without compromising literary originality.” This question speaks directly to both the practical and regulatory discussions surrounding Ce-LLMs in China, and is also fundamentally related to the protection and cultivation of children's creativity [1,3].

2. Methods

2.1. Research settings

This study was conducted in a rural private charity primary school located in a poverty-stricken mountainous area of Sichuan Province, China. Although the region is adjacent to a well-known tourist destination, the village where the experimental school is situated lies deep inside an undeveloped part of the scenic area. Its remote geographical position, inconvenient transportation, and limited external interaction contribute to a general scarcity of educational resources. As the only primary school in the village, this school bears the main responsibility for providing basic education to local children. The main local industry is tourism, and residents have certain experience of using digital devices. The penetration rate of mobile phones is relatively high, and the school is equipped with basic instructional facilities such as computers and projectors.

However, the application of information technology by local teachers and students remains at a relatively primary level. Mobile phones are mainly used for mobile payment, social communication, and entertainment. Their knowledge of experience with AI tools is extremely limited, and most minors have only restricted access to the internet. This context ensures that the participating students have none or minimal exposure to AI tools in their everyday lives, and such a condition helps minimize the influence of prior experience on the intervention outcomes, increasing the reliability of the observations made during this study.

2.2. Participants

The participants included students from Grades 5 and 6 of the primary school and former graduates of the same primary school who were currently Junior high school students in Grades 7 to 9 and living in the village, including 38 primary school students and 21 middle school students, totaling 49 individuals. The pretest of the course indicated that most students lacked basic knowledge of AI

tools and any experience with poetry writing. Therefore, the potential interference from prior knowledge or skills was low, making them suitable subjects for the present study.

2.3. Research design

This study employs classroom observation method to explore the impact of how AI-assisted instruction influences students' creativity. The teaching activities were designed with reference to the pedagogical framework for creative practices developed by Cheung, which includes four steps: Motivation, the Divergent Process of Generating Possibilities, the Convergent Process of Selecting Ideas, and Evaluation [11,12]. In addition, the study outcomes were assessed using the ACCT framework proposed by Robson and Rowe [1]. The intervention was organized into three sequential instructional courses—Courses A, B, and C, for observing the changes in their performance throughout the courses to evaluate the impact of AI assistance on students' creativity. Course A and Course C were poetry-writing classes conducted before and after the introduction of AI tools respectively, while Course B served as an introductory session on the use of AI tools.

3. Research procedure

The research process consisted of three main stages: Pretest, Class Observation and Posttest.

3.1. Pretest

Before the intervention, an pretest was conducted regarding these three aspects: mobile phones usage rate, awareness of AI tools, and previous experience with poetry writing. Here are the result.

In terms of mobile phones usage rate, none of the current primary school students owned personal mobile phones. Among the middle school students, four (all from Grades 8–9) had their own mobile. Students without personal phones usually accessed mobile phones by borrowing them from parents or elder relatives. Their main purposes for using mobiles included searching for information, browsing entertainment applications (such as TikTok and Snack Video) and playing games.

In terms of AI tools, the pretest indicated that about 60% of students stated that they “had never heard of AI tools” or “had heard of AI but did not know what it is.” Around 30% stated that they “knew AI generally means “Artificial Intelligence” but were not sure what it can do.” Only two students stated they “knew what AI is and had heard of mainstream LLM-based tools such as ChatGPT, DeepSeek, or Doubao.”

In terms of poetry-writing experience, none of the participating students had learned poetry beyond the requirements of the compulsory education curriculum. Most students (more than 40) had no experience with independent poetry creation, and a small number (fewer than 10) expressed that they were unfamiliar with basic poetic forms.

3.2. Course design and observation

This course was designed based on the pedagogical framework for creative practices developed by Cheung, with the introduction of an LLM tool to support students during the brainstorming stage [11,12]. The framework includes four steps for course process as shown in Table 1.

Table 1. Pedagogical framework for creative practices developed by Cheung [11,12]

Step	Definition	Activities
Motivation	Introducing a creative task related to children 's prior learning. This encourages the child to make meaningful connections with his or her previous learning experience.	Introducing the creative task of “completing a poem” and encouraging students to explore possible approaches to creation
Divergent process of generating possibilities	Ask children to look for ideas or possibilities for solving the problem.	Guiding students to use brainstorming, association, and group discussion to engage in divergent thinking and obtain creative inspiration
Convergent process of selecting ideas	Asks children to select what they consider the best idea or solution.	Requiring students to move from short phrases or fragmented lines toward producing a complete poem
Evaluation	Asks children to evaluate the quality of the ideas and make recommendations for improvement.	Encourage students to comment on each other’s work. Collecting students’ poetry works after class and conducting follow-up interviews

3.2.1. Design of course A

Before the course began, a preliminary check showed that none of the participating students had previous experience with a lesson focused on poetry writing. In addition, the class included students from different grade levels, which produced a wide span in learning backgrounds. Therefore, the goals of the first poetry lesson were to help students understand what poetry is, experience poetic qualities, learn basic techniques that support poetry writing, and eventually guide them toward producing their own poems during class. The reference textbook for this lesson was *Mom, I Wrote a Poem*(Guomaimai , 2017). The criteria used to define a “poetry work” in this course were:

- 1.No significant plagiarism from the textbook or from external literary or artistic works; the poem must be entirely created by the student during the lesson.
- 2.The poem should demonstrate some degree of literariness and reflect basic characteristics of poetic form.
- 3.The poem should reflect the student’s thinking and emotions to some extent, showing elements of self-expression.

The lesson consisted of five stages: understanding poetry, experiencing poetic qualities, experiencing connections, learning writing techniques, and free creation. In Course A, students would read the model poems they were expected to write about, experience poetic qualities through defamiliarized expression, explore the internal relations among images by proposing different imagery words, learn rhetorical techniques for creation, and finally write and share their own poems during the free-creation stage.

Since this study focuses on the role of “individual creativity–AI-assisted creation”, primarily connected to the stages of experiencing poetic qualities and experiencing connections, only these two stages are discussed in detail below.

The Experiencing Poetic Qualities stage guided students to experience the literary features embedded in poetry. In this section, “poetic qualities” leans more towards expressions that are similar to those in children's literature—imaginative, playful, and carrying a sense of childlike wonder. The activity required students to describe familiar everyday objects using different

adjectives or symbolic expressions, and encouraging them to use unconventional or low-association words for their descriptions. For instance, instead of using conventional descriptions for “sky” such as “blue” or “bright blue,” students were encouraged to try unusual phrases like “smiling,” “like ice surface,” or “infinity.” The purpose of this stage was to encourage students to break away from linguistic conventions, and expand the boundaries of associative thinking. They achieve a brainstorming effect by publicly raising their hands and sharing their ideas on the same topic multiple times. This stage also served as preparation for the next stage, experiencing connections.

In the Experiencing Connections stage, students proposed imagery words independently and then used the defamiliarized expressions from the previous stage to connect these images. They are required to write one word on a small paper. The paper was then shuffled and exchanged within the group. Students were asked to identify the connection between the word they received and the word they wrote by themselves, and then to create one short sentence linking the two words. Similar to the previous stage, students were encouraged to share their works through raising hand and discussion. After many students shared, students were guided to continue their creation in forms such as “continuing the sentence” or “linking multiple words together.” The goal of this stage was to stimulate students’ imagination by randomly and restrictively providing words, and then expanding their thinking boundaries through the acting of “exchanging words,” by participating a collaborative brainstorming environment. Throughout this stage, students frequently applied the “defamiliarized expression” techniques introduced earlier, and strengthened their ability to employ this method during their further creative expression.

3.2.2. Design of course B

Since the participating students generally have a limited understanding of AI, one major objective of this session is to help them recognize mainstream AI tools, gain a brief understanding of how these tools work, and learn to operate two widely used LLM tools in China, “DeepSeek” and “Doubao.” As AI-generated text and images have become highly controversial, with many cases related to academic misconduct, copyright disputes, and similar issues, another important goal of this course is to introduce proper usage norms while students learn about AI. The course guides them to explore ethical questions concerning AI tools, clarify the boundaries of reasonable and lawful use, and develop healthy and responsible habits in their interaction with AI.

The main components of the course included understanding AI tools, learning about AI-related controversies, engaging in debate-style discussions on the advantages and disadvantages of AI tools, and hands-on experimentation. The class continues to use group-based instruction, with each group supported by one teaching assistant and provided with a mobile device installed with both “DeepSeek” and “Doubao.” With assistance from the teaching assistants, students learn how to input and adjust prompts in order to generate the intended results. After they acquire basic knowledge of how to use AI tools, students analyze several social cases involving illegal or unethical uses of AI and participate in discussion sessions to reflect on appropriate and responsible ways to use such tools.

3.2.3. Design of course C

Course C builds upon Course A and introduces the two LLM tools, DeepSeek and Doubao, into the “experiencing connections” stage as well as the subsequent free-creation stage. These tools are used to support students’ brainstorming and their final poetry creation.

The main procedure of Course C begins with a brief review of the creative methods taught in Course A and the technical skills introduced in Course B. After this short recap, the lesson moves directly into the “experiencing connections” activity, where AI tools are incorporated. Students first repeat the behavior from Course A by writing their own keywords on paper slips. Then, within each group, students integrate the words they have written and input them into the LLM tool DeepSeek, asking it to imitate the same behavior and generate five new words (referred to as “first-round new words”). Students may specify their own requirements for generating the words, such as “derive new words based on one selected keyword” or “generate five words related to land, ocean, and sky.”

After obtaining the first-round new words, students tried to select several keywords from both the original word set and the generated one and use them to create short connected sentences. Each group keeps a record of the total number of created sentences, and after the first round of generation and creation, groups share their outcomes with the class. Before moving to the second round of generation, each group may adjust or keep their previous generation requirements. They then extend the first-round new words by writing down five intuitive associations that immediately came to mind after seeing the generated words (the “second-round new words”). These second-round new words will be input into DeepSeek along with the sentences independently created by students in the first round, and DeepSeek will be required to imitate the students' behavior in the first round to select several words from both the first and second rounds of new words for stringing together to create sentences. This process will be repeated in a loop. Eventually, students will organize all the vocabulary and sentences created by their group in class into two major categories: "Human Creation" and "AI Generation".

By the end of the course, students may freely comment on their creations. Here are some sample prompting questions:

- 1.What kind of influence do you feel AI had on your creative process?
- 2.Overall, do you prefer the AI-generated creations or your own creations? Why?
- 3.Is there any AI-generated work or classmate's work that you particularly liked? Why?

After the class, the works created during the session will be posted in the classroom with students' consent, and each student can vote for their favorite works independently.

3.3. Posttest

After the course ended, researchers collected each group's draft papers, poetry works, and the generation logs from the AI tools. These materials were used to track and evaluate the quality of students' participation in class, the frequency of exploratory actions, and the frequency of creative production, etc. In addition, researchers conducted follow-up interviews with some students (about 10) after class. The interviews took the form of open-ended interviews, and the participants were selectively chosen to cover varying levels of participation in the class, from high to low. This sampling strategy helped avoid potential survivor bias that might occur if only highly engaged students were interviewed.

4. Results

To investigate students' creative performance during the lessons, this study refers to the ACCT framework and classifies children's creative behavior performance into three dimensions: (a) exploratory competence, (b) engagement and enjoyment, and (c) persistence. Some of the more detailed indicators under these dimensions were also applied to classify and observe students' in-class behaviors, so as to examine the overall differences in creative performance before and after the

introduction of AI tools. The results show that, after integrating AI tools, students made clear progress in exploration, in trying new ideas, and in completing challenges. Table 2 presents the behavioral coding analysis of the participants under these three dimensions.

Table 2. Behavior coding analysis referencing the ACCT framework

Dimension	Creative behavior indicators	Performance in course a	Performance in course b	Conclusion
Exploration	Exploring	Students rarely proposed more words beyond the required number.	Most students actively used AI to generate more words than required.	Students significantly increased exploratory behaviors with the help of AI tools.
	Engaging in new activity	Students seldom initiated a new round of word generation; only a few groups with stronger literary skills attempted additional rounds.	Most students conducted multiple rounds of word generation using AI tools, and the number of self-proposed words also increased notably.	AI tools clearly enhanced students' frequency of engaging in new activities.
	Trying out ideas	A few students with stronger literary foundations attempted to create multiple poetic lines.	More students began trying to create multiple poetic lines using AI-generated words.	Students showed an increased willingness to produce new creations with AI assistance.
Involvement & enjoyment	Analyzing ideas	Students showed almost no discussion about the proposed words.	Students began to analyse and filter words, or explain unfamiliar words to peers.	The abundance of AI-generated reference material encouraged students' analytical behaviors.
	Involving others	Students were highly enthusiastic about sharing and discussing, often commenting on peers' work.	Students remained highly enthusiastic; some previously less-active students gained more material to share due to AI-generated content.	Students were already very enthusiastic; AI brought only limited additional increase in interaction.
Persistence	Persisting	Most students followed the lesson flow; a few lacked creative ability and could not finish the final free-creation stage.	With AI assistance, all students completed the full lesson process, including free creation.	AI tools compensated for students' insufficient creative ability and increased task completion rates.
	Completing challenges	Most students completed at least one full poem; some gave up when frustrated and turned to unrelated activities.	With AI assistance, students explored new ways to complete their work, ensuring every student produced at least one full poem.	AI tools provided students with new means to complete creative tasks.

4.1. Exploratory competence

According to the framework proposed by Robson and Rowe, the “exploration” dimension emphasizes children’s spontaneous tendency to investigate materials, tasks, or activities, as well as their sense of purpose and desire for novelty. It represents the starting point of creative thinking. In this study, students’ creative behaviors were observed and evaluated particularly through the sub-dimensions of “exploring” and “undertaking new activities.”

In Course A, students' independent thinking and exploration were heavily dependent on teacher guidance. For example, in the "experiencing connections" stage, students rarely proposed words beyond the required quantity. A few students did generate additional words after sharing their initial ones, and attempted new combinations. However, based on the draft papers collected after class, most students proposed only 0–5 words and produced merely 1–3 short poetic lines. Some students who did not generate additional words later reported that they "did not know from which direction to think," or that they "had many ideas in mind but felt none of them were good enough, so they could not decide." And after Course B, where AI tools were introduced, students' creative pace increased significantly. Almost all students—assisted by AI—generated more than 10 words, and every student engaged in more than two rounds of word-generation exploration.

In post-class feedback, several students described the difference between these two stages. When relying only on themselves, they needed to repeatedly search for possible imagery, compare multiple ideas, and avoid "collisions" with classmates' choices—steps that could take several minutes before making a decision. After the introduction of AI tools, their decision-making became noticeably faster. One reason was that students were unconsciously influenced by the speed of AI outputs and felt that "if AI can give answers in a few seconds, I can also decide more quickly." Another reason was that AI-provided words served as inspiration; many students mentioned discovering themes they had never considered before—such as travel, occupations, or historical references—and these new themes stimulated the generation of additional associations.

Furthermore, during the independent creation stage of Course B, some students began experimenting by inputting their partly written poetic lines into the AI tools and asking the AI to complete the whole poem. This behavior suggests that students were beginning to explore other forms for AI-assisted creative beyond simple brainstorming.

4.2. Engagement and enjoyment

The dimension of "engagement and enjoyment" emphasizes the initiative of children's cognitive, emotional and social interaction demonstrated in activities, which is the main indicator of the active development of creative thinking in action. In this study, students' creative behaviors were observed and evaluated through three sub-dimensions: "trying new ideas," "analysing ideas," and "involving others."

In Course A, some students with relatively strong literary skills attempted to create multiple poetic lines by recombining different words proposed within their group. In Course B, however, both AI and students generated a much larger number of creative words compared with Course A, offering far more possibilities for recombination. As a result, the number of poetic lines produced during the "experiencing connections" stage increased noticeably. Another phenomenon also emerged in Course B: because AI generated a considerable number of random words, students began to analyse and filter the vocabulary after generation. They discussed the characteristics or potential logic of certain words in order to exclude those they did not want, or to explain unfamiliar words to their peers. This phenomenon corresponds well to the behavioral indicator of "analysing ideas," and such analytical discussions were largely absent in Course A. It suggests that, when facing a larger range of choices, students began to adopt more deliberate strategies of analysis and selection to focus their creative work.

Regarding the indicator of "involving others," there was no substantial difference between Courses A and B in students' willingness to share ideas; overall, both courses maintained a high level of active participation. For some students whose engagement was relatively low in Course A, the introduction of AI in Course B made them slightly more active, and their creative output

improved to some degree. However, the overall improvement in this aspect was not especially significant.

4.3. Persistence

The dimension of “persistence” focuses on children’s reaction when encountering difficulties, ambiguous situations, when facing uncertain things. It is a key indicator in the ACCT framework for assessing the depth and stability of creative thinking. In this study, students’ creative behaviors were observed and evaluated through two sub-dimensions under persistence: “persevering” and “completing challenges.”

Since most students had no prior experience in writing poetry, a small number of students in Course A already showed signs of struggling to come up with words during the stage of suggesting words. Although the collaborative environment gradually reduced their anxiety due to tasks and encouraged them to propose some words, these students still showed difficulties during the subsequent free-creation stage. They expressed concerns such as “I don’t know how to write a whole poem” or could produce only a small number of fragmented sentences. A few students even performed abstraction or just do other unrelated things instead, for unable to come up with content during the independent creation session. In Course C, however, these same students voluntarily proposed to adjust the task sequence. They hope that the AI can generate five random words firstly as inspiration for creation, and they also adopted their peers’ strategy of inputting partially written lines into the AI tool and asking it to complete the poem while including certain words. This approach ensured that every student was able to create a poetry work they considered “complete,” and substantially increased their motivation to continue creating.

5. Conclusion

The results of this study indicate that the introduction of AI tools had a clearly positive impact on students’ creative behavior. Although students already demonstrated strong enthusiasm for creative work before AI was introduced, the AI tools significantly improved their creative productivity, especially during the brainstorming stages. Students can browse a large amount of inspirational information through AI tools, which can stimulate their associative and divergent thinking. This effect can be attributed to the fact that students only had very little of experience with such associative thinking training before, so they lack of accumulated imagery and creative resources. Therefore, the feature of AI tools to generate relevant information promptly and in large quantities can help them quickly broaden their thinking within a short time. On the other hand, this form of brainstorming also offered students a way to explore and gradually build their own divergent-thinking strategies, enabling them to eventually disengage from AI and conduct such associative thinking independently once they had accumulated more creative material.

In addition, given the current immaturity of AI tools in application and the considerable ethical controversies surrounding its use, this study deliberately emphasized the moral and ethical considerations of AI tools during the course. Students were encouraged to discuss the reasonable boundaries of AI usage, and throughout the creative activities, it repeatedly reinforced that “humans are the main body of creation”. The use of AI was intentionally limited to the role of “providing inspiration,” in order to prevent students from gradually giving up active thinking and becoming passively dependent on AI.

However, due to several limitations such as only including small number of participating students, the short duration of the course, and insufficient longitudinal tracking—the study can only

reflect the short-term, small-scale influence of AI on students' creativity. It remains difficult to determine the long-term effects of AI on broader populations of students. If future research could involving more classes and longer time spans, for instance, establishing experimental groups within a primary or secondary school, the research results may have more universal application value.

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