



## Development of self-expression activity class program for elementary school students to cultivate AI literacy

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### Abstract

**Purpose** –In general, elementary school is the time to take the first social step away from family relationships with parents or siblings. Recently, AI technology has been widely used in everyday life and society. The purpose of this study is to propose a program that can cultivate AI literacy and self-expression for elementary school students according to the trend of the times.

**Research design, data, and methodology** – In this study, prior to developing a self-expression class program for cultivating AI literacy, we looked at the related literature on what AI literacy is. In addition, the digital learning program was analyzed considering that the current AI literacy is based on the cutting edge of digital technology and is located in the same area as digital literacy.

**Result** –This study developed a curriculum for self-expression and AI literacy cultivation. The main feature of this study is that the education program of this study allows 3rd, 4th, and 5th graders of elementary school to express themselves and to express their career problems by combining culture and art with AI programs.

**Conclusion** –Self-expression activity education for cultivating AI literacy should be oriented toward holistic education and should be education as a way to express oneself in order to improve the quality of life of learners

**Keywords:** AI literacy, Self-expression, Class program, Elementary school students

**JEL Classification Code:** I20, I21, I29

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## **1. Introduction**

Literacy in the traditional sense means literacy and refers to the ability to read and write texts. However, today's literacy refers to the ability to access knowledge and information and solve problems by evaluating, analyzing, and communicating with it in a broader sense than the ability to read and write. In particular, digital literacy refers to an individual's ability to access the media of a digital platform, obtain accurate information, evaluate the authenticity, and utilize the obtained information (WIKIPEDIA, 2022).

In a reality that must continuously reflect the social capabilities required by the times, a new skill in literacy, that is, communication, has the meaning of a new writing system. This means becoming an object of literacy education. Therefore, literacy means an important basic ability to design the future (Lee & Park, 2021).

AI literacy can be said to be an essential ability to help students think and judge comprehensively, not only with critical awareness to understand the problems of society, but also about the civilization that dominates society. At a time when technology is changing from assisting humans to AI technology that resembles humans, it is becoming an essential skill to understand AI technically and socially. The concept of AI literacy has emerged in the midst of these demands of the times.

AI literacy is a core technology of digital technology and is based on cutting-edge technology. Considering these characteristics, it can be said that it is in the same field as digital literacy. AI technology is not simply a result of a human auxiliary role as a technology, but has the character of a subject that interacts with humans. Human beings adapt to social changes that change from the fundamentals of life due to AI and understand AI as the subject of designing their own lives. Education for this purpose is AI literacy education. In terms of AI literacy, we try to redefine AI education and present the goals and system of primary education in detail.

Elementary school students show various emotional characteristics by grade, so even if there is only one grade difference, they may show interest in class content or not show interest at all. In particular, it is difficult to express oneself freely because, in the process of growing up from the lower grades to the upper grades, they are conscious of how others see themselves. If the self-expression activity class is conducted using the characteristics of elementary school students who are still not good at expressing themselves, students can develop their own individuality by developing self-confidence and creativity. The expression activity class, which consists of creation, expression, and appreciation, provides elementary school students with various and confident self-expression opportunities and helps them to recognize their potential with interest. In addition, it can form a positive and active self-concept. Furthermore, it can help develop character by making them think about their relationships with others as well as themselves (Kim & Hong, 2016).

Expressive activities to experience a new world provide an opportunity to communicate with others, understand others, and broadly understand the current culture in which one lives by thinking creatively and expressing oneself. If we connect the problem-solving ability through new experiences and the method to go through the process of growth with the needs of the present age, it can be seen that self-expression activity education is necessary for cultivating AI literacy.

In this study, we intend to develop a self-expression activity class program for elementary school students to cultivate AI literacy by linking the importance of this self-expression method with the need for AI literacy education. Paragraph 4 above discusses the necessity for cultivating AI literacy, and after the second paragraph discusses the importance of self-expression activities in the 3rd, 4th, and 5th grades of elementary school. It was intended to present a program for elementary school self-expression activity classes to cultivate AI literacy to improve the ability to express oneself using AI technology in the 3rd, 4th, and 5th year of elementary school.

## **2. Literature Review**

### **2.1. Literature on AI literacy education**

With the development of AI, there is interest in convergence with AI technology in all fields. Therefore, the demand for AI education in the field of education is also increasing. The Ministry of Education plans to announce the 'AI Education Basic Plan' in the first half of 2020. In the content of this announcement, it was said that the topic would be the plan so that anyone could have basic knowledge and proper ethics related to AI as a citizen with 'AI' (Lee, 2020).

From this point of view, in order to understand the social phenomena that can occur while working with AI, and to respond to it, it is necessary to consider the problem of AI convergence permeating all fields in the context of public education. Therefore, the development of an AI literacy education program is required in order to study the educational composition and program suitable for the domestic educational environment. In particular, considering the situation of COVID-19, artificial intelligence education programs that can be used online and offline should be developed. In addition, the focus is on the promotion of creative convergence and complex capabilities so that learners who will live in the future can express themselves and understand others by understanding social phenomena and interactions according to technology and using tools correctly, rather than simply using technology. should be kept (Kim & Lee, 2021).

The purpose of AI literacy education should be as follows. Learners ① have an attitude to use AI critically while gradually recognizing it with curiosity, ② have the knowledge and skills to complete tasks or actively solve problems by searching for data through interaction with AI, ③ The goal of AI literacy education can be to have the executive ability to work together to solve problems and practice. Based on that purpose, through AI literacy education, learners can ① recognize that computers perceive the world through sensors and motivate language learning, ② enable intelligent agents to appropriately and diversely express the world, and understand the need to use them to infer and predict stories, ③ can use computer learning from data to develop communication skills, and ④ communicate and collaborate with artificial intelligence to complete tasks or problems ⑤ It is to recognize that the use of artificial intelligence can have a positive and negative impact on society (Kim, 2020).

However, if you look at most of the literature related to AI education, although educational tools are presented, there are many studies at the level of instructing an education system or model rather than developing a specific education program. AI literacy is a competency that everyone who will live in the future should have, and the need for education will increase in the future. AI literacy education research should also develop more specific education programs in line with this (Lee, Kim, & Lee, 2021).

## **2.2. DRCP(Digital Literacy Resource Platform)**

In terms of communication with the future society, AI education is connected to all fields. Therefore, the basic knowledge and activity of digital literacy and AI technology that everyone can properly grasp the authenticity of information must be included in the education at the same time. In this study, by analyzing the DRCP (Digital Literacy Resource Platform) [<https://dcrp.berkman.harvard.edu/>] learning program of Harvard University's Berkman Klein Center, the purpose of this study was to supplement the deficiencies in domestic education focusing on the impact of the artificial intelligence technology environment on elementary school learners (Lee & Kim, 2020).

The main contents of DRCP education are summarized as follows.

- ① Linking technological education with current social problems (racism, terrorism, climate, refugees, etc.) use.
- ② Inducing creative activities through utilization and emotional experience, not prohibition of digital use. Utilized in school classes in connection with the curriculum.
- ③ What should be noted here is that AI literacy education is an educational program to properly use AI technology as a tool in the future society, and it should include a curriculum that helps people around the world to share ethical discourse by recognizing social issues.

## **3. Development strategy for elementary school students' self-expression activity class program**

### **3.1. Reasons for developing a self-expression activity class program for elementary school students**

Piaget's development is divided into three stages. The first stage is preoperational thinking, which corresponds to the age of 2 to 7 years. It is the stage of learning how to use symbols. By acquiring intellectual symbols and imitations, symbolic play begins, and communication becomes possible by using the language and language of the symbol system. The second stage is the concrete operational stage, which mainly occurs between the ages of 8 and 12 years. Elementary school is one of the Korean curriculums. A characteristic feature of this period is that the head begins to think of things that were mainly thought of motions up to the previous stage. You can trust the improvement of length

and quantity, weight and number, and arrange according to the order of many and few. The last stage is the formal operational stage, and all age groups over 12 years old belong to this stage. It is a period in which abstract thinking, understanding of concepts, and causal relationships between objects are learned, and the ability to test hypotheses, reasoning, and adaptability are developed.

During child development, the age of 6-8 is a period of rapid development of mental skills, where children learn the best way to describe experiences and express their thoughts and feelings. It is also a time when the direction changes from interest in oneself to interest in others (CDC, 2022).

Here, if we look back at the importance of expression through Dewey's pedagogical theory of how important the expressive ability is during the developmental process of a child, as seen through the stages of Piaget's development, "Development doesn't just mean drawing something out of the mind. Development means that 'experience' develops". When a problem faced in an experiential situation is not solved by a familiar habit, the child begins to think and voluntarily makes an effort to solve the problem. Only then, the expression of development that can break through the existing frame of children and grow begins to occur. As Dewey puts it, "the intellectual component of a habit makes possible continual growth by linking it to a variety of flexible uses"

What is most important here is not whether the child's manifestation approaches the 'finished product', but what kind of experience the expressed content puts into what kind of growth process. Children's immersion or self-expression activity must be a factor that teachers should consider sensitively for the growth of their experiences (Kim, 2016).

Considering the impact of the elementary school curriculum on lifelong education, the cultivation of the ability to express oneself confidently and creativity through self-expression activities consisting of creation and expression is emphasized as a major educational area. The self-expression activity class using AI literacy provides elementary school students with various and confident self-expression opportunities and can help them recognize their potential with interest. In addition, it provides an opportunity to find interesting ways to communicate with others while creatively solving problems in the future society and the ability to express oneself in various ways.

### **3.2. Why DRCP was applied**

If AI literacy education as a public education can secure educational institutions and receive continuous education with a systematic curriculum, the purpose of the education should be the correct use of digital devices and the ability to use critically, not technical acquisition.

Harvard University's Berkman Klein center's online resource platform DRCP (Digital Literacy Resource Platform) Youth Digital Life Online Learning Program is an example to present a problem-solving strategy. First of all, introducing the DRCP learning program, the youth, digital environment, and life are divided into four areas. ① Stability and cyberbullying, ② Personal information protection, ③ Digital information quality, and ④ Creative expression. For example, in the 'AI is here' activity for learning AI learning programs, the goal of education is to explore AI technology and understand the characteristics of the technology, and students can find examples of AI technology that can be found in everyday life and find them Lee & Kim(2020).

Through the process of exploring the characteristics and learning the history of AI in the second half of the 20th century, it is an education that mentions errors in data algorithms and makes you think about what AI can and cannot do. As can be seen in the example, the AI education provided by DRCP enables students to explore AI in their daily life and to conduct integrated learning in connection with other subjects through the features of AI technology. In addition, it is to present a specific situation and to engage in creative activities through emotional experience.

Based on this, if we suggest a strategy for solving problems in domestic AI literacy education,

- ① It is necessary to design an education program that critically analyzes the social phenomena caused by AI technology and properly discriminates information to increase the power to deal with digital life and social problems that one has to solve by oneself.
- ② Experiencing digital devices and moving away from the education of experiential technology acquisition using AI devices, directly creating AI robots necessary for daily life, promoting cognitive and emotional development, and creating a creative process that directly assigns character characteristics to robots AI education programs should be designed to foster creativity, inquiry, and problem-solving skills through.
- ③ The digital environment and learning materials must be incorporated into public education so that AI education is not limited to a specific region or a specific target. In addition, with the development of an online platform, an education system must be established so that it can be freely used anywhere, not just within the school.

## 4. Result

### 4.1. Contents of Education for Elementary School Students' Self-Expression Activity Classes to Cultivate AI Literacy

Not all of our next generation, who will have to live with AI, become developers who develop AI. Living with AI lies in the ability to use AI where it is needed and to solve problems that have been picked up by AI using AI. The main focus of AI education for elementary school students is whether AI can be used according to their own circumstances.

- ① Target: Targeting 3rd, 4th, and 5th graders of elementary school, about 20 students in each grade will use AI technology by fusion of self-expression activities and culture and art classes.
- ② Educational Goals: Elementary and lower grades can express themselves and their career problems by combining culture and art with AI programs. They use AI programs to express their thoughts. Outline of AI Program In order to utilize the 1st session and the art programs of technology (physical computing), art, and music, 9 sessions of 3 sessions each, a total of 10 sessions will be conducted.
- ③ Educational content: The educational content is presented in the following table.

**Table1:** Contents of Education for Elementary School Students' Self-Expression Activity Classes to Cultivate AI Literacy

Lesson	Training content	Educational Goals
1	AI Concept	Education about what artificial intelligence is and learn about artificial intelligence in our daily life and various fields that can be used.
2	AI Coding (Model Learning)	Identify your own problem situation and find a way to solve the problem using AI. Try learning the AI model yourself and think about how to use it through coding.
3	AI Expression (Physical Computing)	It is a physical computing tool that can express oneself, and uses Arduino, which is also helpful in cultivating AI literacy and ICT ability, to apply one's emotional model learning to a coded program to express emotions as traffic lights.
4	Project Presentation	Discussion after presentation on how to convey one's emotions through physical movement using AI model learning and physical computing (details about data collection, learning, and expression)
5	Drawing 'ME'	Now, I draw myself using real drawing tools. Take a picture of yourself and save it.
6	AI : Drawing 'My Future'	Using the Deep Dream Generator, find a picture or figure that represents the person you want to be with your drawing and display it based on your drawing with AI. (Comparison of artificial intelligence and AI pictures)
7	Project Presentation	Presenting yourself and your future as solved by AI, sharing opinions, and discussing the creative value of AI and humans.
8	Reading a Book and Writing an article	Select and read a book in the field you want to become or are interested in, and make a short article in connection with your future.
9	AI : Expressing 'My future' with Sound	In Chrome Music Lab, you can express your reading and your writing as pictures and learn about various sounds, such as listening to sounds. (Learn about beats and sounds)
10	Project Presentation	Present the sound that you have created to express yourself, and discuss your feelings about expressing what you want to be through sound.

### 4.2. Elementary school students' self-expression activity class results for cultivating AI literacy (Specifically presented in the 2nd, 6th, and 9th sessions)

Modern people living with AI are required to be more diverse than before in the way they express their emotions and thoughts in communication with others. Talk to students about how to express their thoughts and feelings to others,

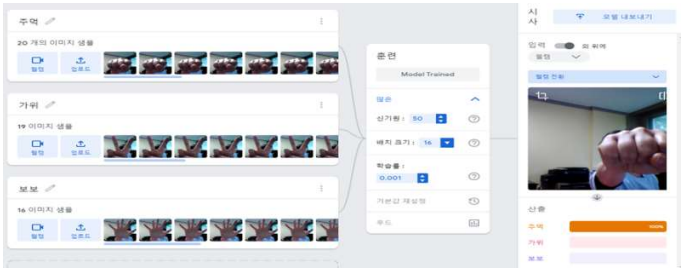
and discuss the advantages and disadvantages of expressing thoughts and feelings with AI. Learn how to best express AI in expressing yourself.

#### 4.2.1. Lesson 2\_AI Coding (Model learning)

The second class of AI coding (model learning) was made based on the ‘AI intelligent health trainer class’ that was conducted for elementary school students through the career experience bus ‘Dream Road’ class operated by the Ministry of Education and the Korea Creativity Foundation. The AI coding (model learning) class is an education using AI that recognizes motion.

As an AI experience program, Teachable Machine provided by Google was used. Among the three types of data learning, image, voice, and pose, a pose model that recognizes motion was trained. And to present a specific situation, we talked about the problematic situation that is most prominent in the covid19 pandemic situation. AI class was conducted so that students could present health in problem situations and select a health trainer for problem solving so that they could actually solve real situations that could solve problems by recognizing motions. (Situation example: Smart AI health trainer)

**Table 2:** Lesson 2 Results of AI Coding (Model Learning) Class.

Lesson	Lesson Name	Main contents of teaching and learning
2	AI (Model Learning)	a. Specific presentation of real problem situations through discussion b. Understanding how teachable machines work c. Collect motion data and train AI d. Coding as a learning model 

**Figure 1:** Korea Creativity Foundation ‘Dream Road’ class : AI block coding example

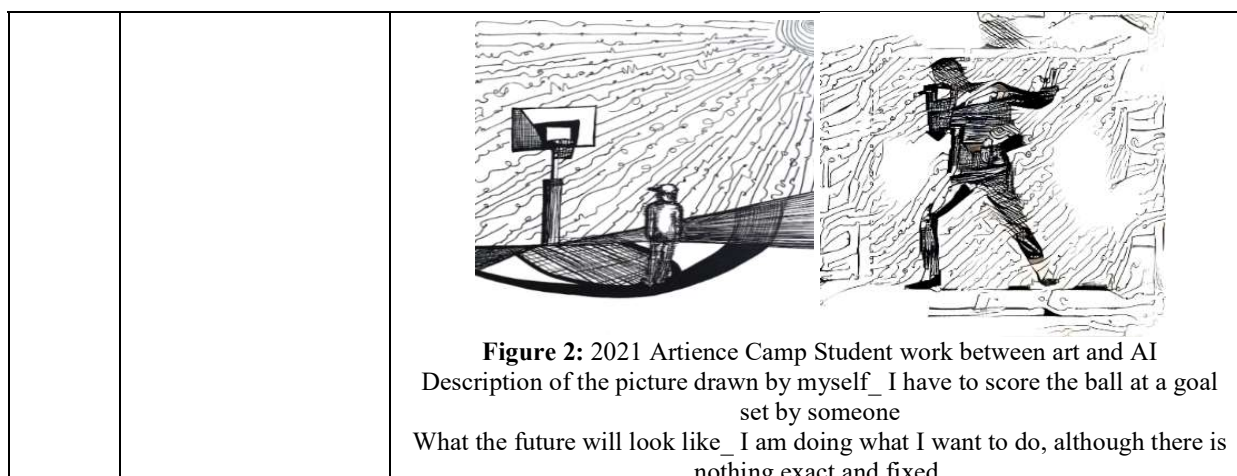
#### 4.2.2. Lesson 6\_AI: Drawing ‘My Future’.

AI My Future Drawing class was created based on the class titled 『Between Art and AI』, which was held at the 2021 Artience Camp hosted by the Daejeon Cultural Altar and sponsored by the Daejeon Metropolitan City and the Ministry of Culture, Sports and Tourism. Take time with students to consider whether the art of artificial intelligence should be viewed as a challenge to creativity or as the emergence of a new tool that expands art.

Use art tools (crayons, colored pencils, paints, magic, etc.) to perform expression activities on the theme of ‘I’. In addition, it is a class to learn one's drawings in an artificial intelligence program to which GNA (Generative Adversarial Network) is applied, and then create another creation through artificial intelligence based on one's work. In the actual class, Deep Dream Generator was used. Based on his current figure, he found the image he was dreaming of and created a picture that represents the future through the style of his own painting through AI.

**Table3:** Lesson 6 AI: Results of ‘My Future’ drawing class

Lesson	Lesson Name	Main contents of teaching and learning
6	AI: Drawing ‘My Future’	a. Drawing directly on the subject of ‘I’. (Using art tools) b. Experience the Deep Dream Generator AI program. c. The fusion of creativity and AI.



#### 4.2.3. Lesson 9\_AI: Expressing ‘My future’ with Sound

AI: Lesson 9\_AI Expressing ‘My future’ with Sound class was made based on 'AI Sound expression \_ my future', which was implemented for elementary school students among club classes that were implemented as a youth club development project supported by the Yuseong-gu Office in Daejeon. This is a class in which students and their students find and read books related to what they want to do in the future and what they want to do in the future, and express their future self through their own music based on short writings containing the impressive parts and their passions. AI Picture and Sound Expression My Future class uses AI program as an expression activity to express one's future with pictures and sounds.

As the AI experience program, Arts and Culture provided by Google was used. The self-expression activity was designed to be expressed through pictures and sounds based on the creation of writing about what one would like to do in the future. I received help from an AI program to learn Kandinsky's way of expressing music through pictures, and to add pictures and sounds for each instrument based on his own writing. What is the role of culture and art in the process of dreaming and designing one's present and future in order to raise students' thoughts on the impact of culture and art on people I thought about what kind of influence it has on us when it is fused. We also discussed the advantages and disadvantages of AI creations after they were helped.

**Table4:** Lesson 9 AI: Results of Expressing ‘My future’ with Sound class.

Lesson	Lesson Name	Main contents of teaching and learning
9	AI: Expressing ‘My future’ with Sound)	<p>a. Read books and write short stories about your future.                      b. Experience Google Arts and Culture                      c. Expressing what you want to achieve in the future through art and culture in Google Art.</p>

**Figure 3:** Example of Google Arts and Culture Experience Site

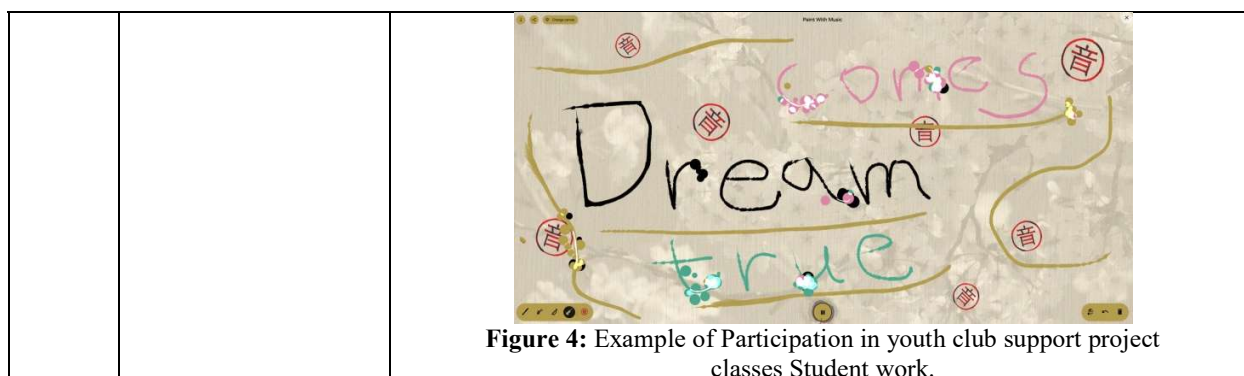


Figure 4: Example of Participation in youth club support project classes Student work.

### 4.3. Evaluation Criteria for Elementary School Students' Self-Expression Activities for Cultivation of AI Literacy

The evaluation criteria were divided into three areas. The evaluation was divided into creative design (dream design), self-expression (dream planning), and AI-literacy (dream realization). The evaluation items for each area were also different. Creativity and challenging spirit were included in the creative design, and the evaluation scale for each item was divided into high, medium, and low. There are two evaluation items for self-expression, and high, medium, and low evaluation scales were given to these items as well as achievement and self-efficacy. The last evaluation item of AI-Literacy was given an evaluation scale of high, medium, or low whether or not he expressed his desire to do something concretely and positively using AI tools as a challenge. It is shown in a table as follows

Table5: Evaluation criteria for elementary school students' self-expression activity classes for cultivating AI literacy

Evaluation Area	Evaluation Items	Evaluation Scale		
		Proficient	Reaching	Needs Improvement
Creative design (Dream design)	Creativity	You can creatively express your own movement language by using AI motion analysis.	It is possible to express movement language by using AI movement analysis.	Although the ability to utilize AI motion analysis was lacking, it expressed movement language.
	Challenge Spirit	Various methods were explored to increase the AI behavior analysis success rate.	Challenged for the success of AI movement analysis.	Rather than challenging for success in AI behavior analysis, tried only the pre-determined method.
Self-expression (Dream planning)	Achievement	Curious about new content and solved problems with concentration and persistence.	Concentrate on the task and complete it to the end.	Completed roughly due to lack of concentration or persistence.
	Self-efficacy	Confidently expressed their thoughts and future appearances using AI.	Knew what he was thinking and expressed it using AI.	Took time to express oneself, and it was somewhat difficult to use AI.
AI literacy (Dream realization)	Challenge	Actively express what they want to do and come up with new ideas for fusion with AI.	Thought about his future in connection with AI and searched for a job.	Reluctant to express or explore what they wanted to do. It was also somewhat difficult to search for related jobs using AI.



## 5. Discussion

In this study, the development of a self-expression activity class program was specifically proposed to cultivate AI literacy. With the development of technologies such as deep learning based on massive big data, AI technology has already permeated various educational courses, and in particular, many convergence classes are being presented with mathematics, science, and practical education.

Modern society is at a stage where AI can even do creative activities that were thought to be unique to humans. Reflecting these needs of society, the main goal of self-expressive education for cultivating AI literacy lies in the ability to solve problems faced by the convergence of AI technology with the learner's overall life. In future follow-up studies, based on this orientation, a more specific educational approach should be discussed and implementation of a practical educational program suitable for the situation of our educational field should be made.

Not only in the fields of culture and art, but in all fields, AI should be used as a tool that complements and converges rather than completely replaces humans. Therefore, self-expression activity education for cultivating AI literacy should be oriented toward holistic education and should be education as a way to express oneself in order to improve the quality of life of learners. In other words, education should be conducted for the purpose of communication that allows elementary school students to express themselves freely and understand others through the development of an expression activity education program fused with AI technology.

The educational program presented in this study is a self-expression activity for self-expression, meaning that you can select art, design your future in a fun way through AI technology, plan in detail, and express your chosen future using AI tools. has been given Therefore, it was intended to conduct a self-expression activity class that could cultivate AI literacy by integrating AI technology with career, art, and values education.

The educational program presented in this study is a self-expression activity for self-expression, meaning that you can select art, design your future in a fun way through AI technology, plan in detail, and express your chosen future using AI tools. has been given Therefore, it was intended to conduct a self-expression activity class that could cultivate AI literacy by integrating AI technology with career, art, and values education. However, there is a limitation in that the educational effectiveness according to the application of the curriculum could not be confirmed. In future research, it is necessary to identify differences in perceptions of education through pre- and post-test for learners and what content was useful and helpful through interviews.

We hope that educational programs will be continuously developed so that all students who will live their dreams in a rapidly changing society can use AI technology to express themselves, improve their quality of life, and realize their dreams in the future.

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