

# Developing STEAM Using KINECT: A Case Study on Motion-Capture Functions

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**Abstract.** The purpose of this study is to develop a science & art convergence STEAM program that can be experienced through the KINECT interactive activities integration of art based on knowledge of science & technology. The program is structured based on the educational content and textbooks from the current curricula for elementary, middle-, and high-school students. Based on this, we developed the four KINECT program using the motion capture function. By using STEAM with KINECT to promote interest in science, and by providing an entertaining way to learn about science, it is possible for students to be more creative and well-rounded. It is also expected that, because the program combines art with science in a novel way, it has the potential to be widely distributed in the 2016 semester.

**Keywords:** STEAM · KINECT · Interactive arts · Science · Arts fusion program

## 1 Introduction

The 21st century is the era of the creative economy. Creative economy means an economic system that is based on the ideas, innovation and creativity. Creative economy is the most important feature of the knowledge, skills, discipline is a fusion between [3]. This flow has been recognized as important in education field, STEAM education for creative fusion talent to lead the creative economy is importantly considered. STEAM education is ‘Increasing the interest and understanding of science and technology, education to develop science and technology-based fusion thinking and problem solving skills’. The STEAM education is education approach that integrates arts(A) to STEM(Science, Technology, Engineering & Mathematics) education [5]. STEM has been done to the human resources of science and technology in many developed countries, including the United States. In our country, the development of science and the arts fusion program has been attempted in a variety of ways. And gradually, not simply parallel fusion, arts-oriented programs have been developed. Art Science convergence STEAM education can develop imagination and sensibility of human to the future of science and technology talent as well as knowledge [1].

Due to the popularity of the new technologies, a variety of device that can be used in ICT-based education are being advertised. This education improves communication, cooperation, participation, openness, and sharing between learner-learner, learner-instructor, learner-content. Therefore, the ICT-based education can be a good tool for

STEAM education. In particular, gaming devices, such as KINECT has the benefit of being able to arouse the students' curiosity. KINECT is equipment that allows human gestures to be processed digitally in video. KINECT differs from other video devices as it is available to detect motion without attaching controllers to the users. KINECT is thus particularly applicable to physical activity, and creative gestures can be expanded by connecting the expressive factors from integrated artistic activities. The physical activity of these game modes attracts students' interests by applying science learning. To this end, this study joins science with art through a program called STEAM. STEAM allows users of KINECT to experience integrated and interactive art based on science, technology, and educational content. To this end, this study developed a science & art convergence STEAM program that can be experienced through the KINECT interactive activities integration of art based on knowledge of science & technology.

## **2 STEAM Program Development**

### **2.1 Direction of Development**

The purpose of this study is to develop a science • Art convergence program allows you to experience the scientific knowledge integrating arts activities using ICT. The contents of scientific knowledge has been configured to extend • deepen the subject, depending on grade and class periods. Program was composed interactive art game activities using Integrated arts of dance, music and art and KINECT. Through this, students were able to experience the process of scientific • technical and artistic aesthetic interaction, induced an interest in learning and divergent thinking is possible.

### **2.2 Method of Development**

Development team of the program is organized by scientists, engineers, artists, curriculum specialists, teachers with excellent research skills and experience in the field. Development process of the program is to analyze the curriculum, and subject were extracted by each grade level and class. And ICT's professional team has developed a KINECT technology and programming based on the contents of the program.

### **2.3 Contents of Development**

The program is structured based on the educational content and textbooks from the current curricula for elementary, middle-, and high-school students. KINECT is used in conjunction with this content to capture motion. Based on this, we developed the four KINECT program using the motion capture function. Four programs were developed for STEAM, the details for which are shown in Table 1.

**Table 1.** KINECT Program

Level	Theme	Program	Contents
Elementary school	Secrets of Nature	Cloud vs. Cloud	Getting into pairs and expressing the shape of a weather front when two clouds meet
			Playing a video showing rain when the shape of the weather front is formed
Middle school	Body	Adjusting to weather	Expressing behavioral changes according to the weather shown on the screen in order to understand the homeostasis of the human body and its relation to the weather
			Viewing the entire video upon completing the activity
		Fighting diabetes	A program designed to help students understand how insulin and blood-sugar levels are maintained
			Preventing hypoglycemia and diabetes by maintaining the height of the graph at a medium level using two arms
High school	Infinite Challenge	'Me' in a work of art	Expressing emotions by viewing pictures, photos, and sculptures on the screen, and mimicking their forms
			Viewing the recorded video upon completing the activity

**2.4 Trial Lesson Result**

Program was carried out a trial lesson at S elementary school, B middle school, I high school in Seoul. Classes took place in the science lab or classroom. Due to the lack of time, some of the resources that the students were able to experience.

After the trial lesson, the result of questionnaire provided by ‘Korea Foundation for the Advancement of Science & Creativity’ for students was surveyed as program satisfaction. For elementary school students, 74.1 % of students think that was fun. On the other hand, only 7.1 % of students were not responding fun in Table 2. In the case of middle and high school students was 55.8 % of the students responded that fun. And 29.9 % of students responded normally called in Table 3 (Figs. 1,2,3,4).

**Table 2.** Elementary students program satisfaction

	Very interesting	Interesting	Usually	No fun	Not funny at all
N	82	61	36	8	6
%	42.5 %	31.6 %	18.7 %	4.1 %	3.1 %

**Table 3.** Secondary students program satisfaction

	Very interesting	Interesting	Usually	No fun	Not funny at all
N	105	207	167	44	36
%	18.8 %	37.0 %	29.9 %	7.9 %	6.4 %



Fig. 1. Elementary school - cloud vs. cloud



Fig. 2. Middle school - adjusting to weather



Fig. 3. Middle school - fighting diabetes



Fig. 4. High School - 'me' in a work of art

### 3 Conclusion

The expected effects of this study are as follows.

First, the students were able to experience the content of scientific knowledge through interactive art activities of integration art and KINECT games by this study. This was caused an interest in science, and provide learning how new scientific knowledge. Thus, the foundation that can foster creative fusion talent.

Second, it is expected that, because the program combines art with science in a novel way, it has the potential to be widely distributed in the 2016 semester. In particular, by applying the learning of ICT technologies, such as the Kinect has expanded the range that can be used in schools and in real life.

Third, it was confirmed that the integration of the science curriculum and arts curriculum is possible. Unlike traditional learning methods was memorizing the text, the knowledge that in the short-term memory by experienced scientific knowledge in a variety of interactive activities to achieve the long-term memory as a lesson.

### References

1. Joe, H.S., Kim, H., Heo, J.Y.: Understanding of fusion talent training(STEAM) through field application case. Korea Foundation for the Advancement of Science & Creativity, Issue Paper OR 2012-02-02 (2012)
2. Kim, H. S.: 2014 Fusion talent education(STEAM) program development result report. Inha University (2014)
3. Kim, J.H., Hong, S.Y.: A development of SMART teaching and learning model for ICT gifted education. J. Korean Soc. Gifted Talent. **12**(2), 29–47 (2013)
4. Lim, H.S.: Smart education: Teach Smart. Human Science (2012)
5. Yakman, G.: STEAM education: an overview of creating a model of integrative education. In: Proceeding of PATT, pp. 335–358 (2008)