

The Effects of 'Physics, Let's Dance', as an Integrated Dance Art Education Program Related to Science Subject, on the Personality and Creative Thinking Ability of Elementary School Students

Kim Young-Mi¹ and Hong Hye-Jeon^{2*}

¹Department of Physical Education, Seowon University, Cheongju, Chungbuk, 28674, Republic of Korea; move98@hanmail.net

²Department of Dance, Dankook University, Yongin, Gyeonggi, 16890, Republic of Korea; hyejeon007@hanmail.net

Abstract

Background/Objectives: This study tried to investigate the effects of 'Physics, Let's Dance', as an integrated dance art education program, on the personality and creative thinking ability of elementary school students. **Methods/Statistical Analysis:** This study selected a total of 30 elementary school students in the 1st and 2nd grade in Seoul Special Metropolitan City. Dance art group (experimental) attended Saturday Culture School 'Physics, Let's Dance' and the control group attended afterschool science experiment class. Both experimental and control group took creative personality test and creative thinking ability test before and after the treatment. **Findings:** As the study results, first, there was significant difference in both creative personality and creative thinking ability between the art dance group (that attended the integrated subject program of science and art of dance 'Physics, Let's Dance') and the science class group that didn't 'Physics, Let's Dance'. The experimental group that attended 'Physics, Let's Dance' showed significant improvement in creative personality and creative thinking ability than the control group. Second, The experimental group had significantly higher post-test scores than pre-test scores in all the sub-scales of creative thinking ability and creative thinking ability after treatment. **Application/Improvements:** It should continue to develop various convergence education programs to cultivate the creative abilities and personality of children.

Keywords: Creative Personality, Creative Thinking Ability, Integrated Dance Art Education Program, Let's Dance, Physics

1. Introduction

Along with the recent changes in the world economy, creativity has become a big story of 'education' and the importance of art education is being emphasized all over the world¹. The Korean government began to expand its support for art education from the 7th Educational Curriculum Revision under the education doctrine of "Creativity/Personality" and has stressed the importance creative art education². U.S. Obama administration is also carrying out a policy to ardently advocate art education, organizing President's Committee on Arts and the Humanities (PCAH) for art and the humanities³.

As evidencing it, Sparks of Genius⁴ could identify 13 thinking tools from the descriptions that hundreds of scientists made of their creative ability. They are 'observing', 'imaging', 'abstracting', 'recognizing patterns', 'patterning', 'analogizing', 'body thinking', 'empathizing', 'multi-dimensional thinking', 'modeling', 'playing', 'changing forms' and 'integrated thinking'. Then, those thinking tools are what artists have developed for a long time. Creative imagination is to find similarity hidden under the basics from some different else in the field of science, art or whatever, using those thinking tools. Therefore, it is natural for an artist who is well trained in arts or scientific thinking to exert excellent creative imaginations.

* Author for correspondence

'Physics, Let's Dance' is an integrated dance art education program related to science subject that Hong Dance Company developed and carried out. It applies the knowledge of physics to education of dance art. Science is aims to develop child's intellectual left brain, which is involved with understanding new concepts, through such activities of observation, inference, classification and comparison while art of dance is intended to develop his sensory and emotional right brain, which is related to potential creative desire to express his creative thoughts and emotions. In this respect, the present study aims to find out the effect of integrated subject program of science and art of dance 'Physics, Let's Dance' upon creative personality and creative thinking ability by comparing its impact on the development of creative personality and creative thinking ability of science group(experimental group) and control group.

2. Research Methods

2.1 Study Subjects

As research subjects, this study selected a total of 30

elementary school students in the 1st and 2nd grade in Seoul Special Metropolitan City (Table 1). They were randomly divided into two groups (experimental and control group and each group consist 15 students). Dance art group (experimental) attended Saturday Culture School 'Physics, Let's Dance' and the control group attended after-school science experiment class. Each of the groups attended its respective class once a week and 15 times (180 minutes for each time) from March the 15th to June the 28th, 2014. The experimental group was given the integrated subject program of science and art of dance while the control group was treated with science activity in the afterschool science experiment class. Both experimental and control group took creative personality test and creative thinking ability test before and after the treatment.

2.2 Progress Order and Educational Theme of 'Physics, Let's Dance' Program

'Physics, Let's Dance' was proceeded in such order as seen in Figure 1 and 2. The experimental group first watched the performance of professional dancers; understand



Figure 1. Progress Sequence of 'Physics, Let's Dance'.



Figure 2. Represents a Course of Study by the Sequence.

the principles of physics; learned creative motions; and created their own motions and made presentation on them.

'Physics, Let's Dance' is characterized as follows. First, this integrated dance art education program with science subject using the principles of physics develops both left brain and right brain of school-age children at the same time. Second, physical motions and movements help the young students release energy and relieve stress, which improve self-expression and concentration. Third, watching the professional performance of dancers let them directly experience such motions as well as learn the principles of physics, which lead to re-creating their own motions. This maximizes creative imagination and individual talents in art as well as experiencing the world of art. Table 2 shows the themes of 'Physics, Let's Dance' by class.

Table 1. Study subjects

Group	Male	Female	Total
Experimental Group	5 persons	10 persons	15 persons
Control Group	9 persons	6 persons	15 persons

Table 2. Physics Education Theme of Dance Movement

Class No.	Educational Theme of Dance Movement	Class No.	Educational Theme of Dance Movement
1	Air	9	Composition of Forces and Equilibrium
2	Tonado	10	Afterimage
3	Gravity and Force	11	Light
4	Friction Force and Acceleration	12	The Principles of Convex Lens
5	Law of Lever	13	Sound
6	3 Newton's Laws	14	Plane and Solid(Body)
7	Velocity and Speed	15	Reflecting 'Physics, Let's Dance'
8	Centrifugal Force and Centripetal Force		

2.3 Investigation Tool

Creative Personality Scale (CPS-R)

CPS-R is a scale that Ha⁵ developed to measure subjects from elementary school students to adolescents⁶. Its sub-scales consist of 6 factors: curiosity, self-assurance, imagination, patience/obsession, spirit of independence and spirit of adventure.

Creative Thinking Ability Test (TTCT-A)

Torrance Test of Creative Thinking: Thinking Creatively with Pictures, Form A, which was developed by Tarrance⁷ was used to measure creative thinking ability. This test consists of 3 sub-tests: Picture Completion, Drawing Two Hyperbolas and Drawing Lines. Each sub-test is limited to 10 minutes, so taking 30 minutes. As for scoring, the present study employed the scoring criterion of Kim's⁶ TTCT (Figure)-A Type; rated 4 evaluation domains (fluency, originality, elaboration and resistance to abstractness of titles); standardized the scores; and used them for the score of creative thinking ability.

2.4 Data Analysis

Windows SPSS 21.0 program was used for data analysis and independent t-test, paired t-test and one-way ANOVA were conducted with the data. Significance level was set to $p < .05$.

3. Results

3.1 Homogeneity Test of Group

To test the homogeneity of creative personality and creative thinking ability between the experimental group and control group before the main experiment, this study carried out independent t-test and confirmed that the experimental group and the control group of the elementary school students in the 1st and 2nd grade had homogeneity in their creative personality and creative thinking ability before the treatment.

3.2 Verification of the Effectiveness of Integrated Dance Art Education Program with Science Subject 'Physics, Let's Dance' on Creative Personality

There was difference in creative personality between the art dance group (that attended the integrated subject program of science and art of dance 'Physics, Let's Dance') and the science class group that didn't 'Physics, Let's Dance'. The experimental group that attended 'Physics, Let's Dance' showed that all the post-test scores of curiosity, self-assurance, imagination, patience/obsession, spirit of independence, spirit of adventure, which are the sub-scales of creative personality, were significantly higher than the pre-test scores (Table 3 and Figure 3).

Table 3. Between-Group Difference in Creative Personality by Attendance in Integrated Program

Variable	Group	Pre-Test	t	Post-Test	t	Change Pre-Post	F
		M(SD)		M(SD)			
Creative Personality	Experimental	80.15(7.44)	-.456	107.15(6.77)	13.588***	-27.003	39.200***
	Control	81.10(5.60)		82.55(4.44)			
Curiosity	Experimental	9.05(.76)	-1.793	14.45(.61)	13.806***	-5.339	8.620***
	Control	9.60(1.14)		10.45(1.15)			
Self-Assurance	Experimental	9.10(1.07)	-2.103	14.50(.76)	12.649***	-5.347	6.061***
	Control	9.85(1.18)		10.50(1.19)			
Imagination	Experimental	8.35(1.57)	-.107	12.85(2.16)	8.287***	-4.431	4.451***
	Control	8.40(1.39)		8.05(1.43)			
Patience/Obsession	Experimental	7.60(1.35)	.135	11.10(1.29)	7.935***	-3.500	3.870***
	Control	7.55(.95)		8.50(.69)			
Spirit Of Independence	Experimental	7.75(1.55)	.742	11.3(1.27)	6.425***	-3.593	5.843***
	Control	7.40(1.43)		8.65(1.39)			
Spirit Of Adventure	Experimental	8.25(1.33)	.129	12.85(1.35)	15.187***	-4.631	12.030***
	Control	8.20(1.11)		7.30(.92)			

*p<.05, **p<.01, ***p<.001

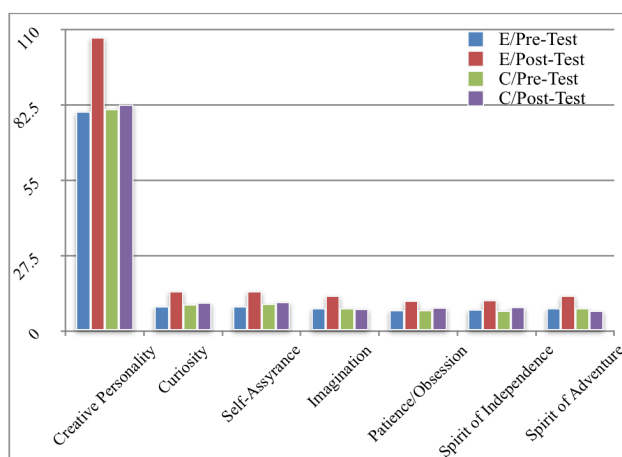


Figure 3. Between-Group Difference in Creative Personality by Attendance in Integrated Program.

3.3 Verification of the Effectiveness of Integrated Dance Art Education Program with Science Subject 'Physics, Let's Dance' on Creative Thinking Ability

Pre-test and post-test were conducted on both groups to know the difference in creative thinking ability by the participation in the integrated subject program of science and art of dance 'Physics, Let's Dance'. As a result, a significant difference was observed in the experimental group (art dance group). The experimental group had significantly higher post-test scores than pre-test scores in all the sub-scales of creative thinking ability: fluency, originality, elaboration and abstractness of titles (Table 4 and Figure 4).

Table 4. Between-Group Difference in Creative Thinking Ability by Attendance in Integrated Program

Variable	Group	Pre-Test	t	Post-Test	t	Change Pre-Post	F
		M(SD)		M(SD)			
Creative Thinking Ability	Experimental	48.55(2.78)	-2.839	69.35(3.76)	14.494***	-20.731	26.201***
	Control	51.00(2.68)		51.75(3.92)			
Fluency	Experimental	14.30(1.30)	-.896	20.40(1.73)	9.578***	-6.019	6.014***
	Control	14.75(1.83)		15.20(1.70)			
Originality	Experimental	6.75(.64)	-.603	10.56(.71)	10.189***	-3.800	6.226***
	Control	6.90(.85)		7.50(1.19)			
Elaboration	Experimental	17.35(1.41)	-2.333	24.70(1.76)	10.867***	-7.344	5.323***
	Control	18.80(1.44)		18.25(2.03)			
Abstractness of Titles	Experimental	9.65(1.45)	-1.939	13.60(1.89)	5.325***	-3.899	5.188***
	Control	10.55(1.15)		10.58(1.49)			

*p<.05, **p<.01, ***p<.001

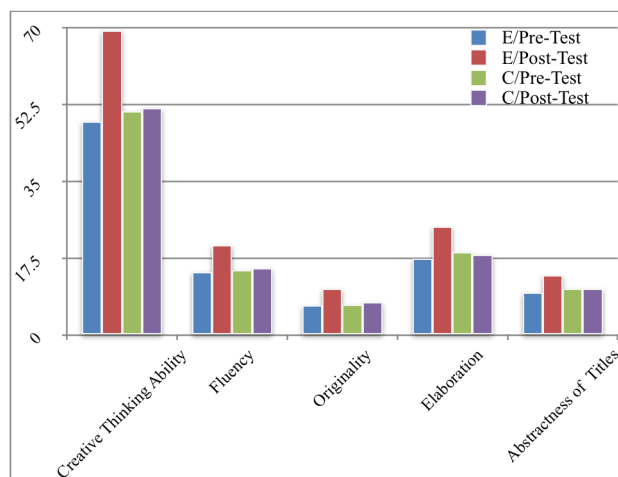


Figure 4. Between-Group Difference in Creative Thinking Ability by Attendance in Integrated Program.

4. Conclusions

It is required to develop human's diverse abilities in balance and provide a variety of art education program besides classroom education. Currently, South Korea is required to establish programs to develop children's creativity in the field of education. To address current problems related to creativity education, a creativity development program is necessary by integrating physical and cognitive activities of children. 'Physics, Let's Dance' is the very integrated subject program of science and art of dance that the knowledge of physics is approached and fused into education of dance art, improving convergent thinking and ability to solve problems.

This study selected a total of 30 elementary school students in the 1st and 2nd grade in Seoul Special Metropolitan City. They were randomly divided into two groups (experimental and control group and each group consist 15 students). Dance art group (experimental) attended Saturday Culture School 'Physics, Let's Dance' and the control group attended afterschool science experiment class. Each of the groups attended its respective class once a week and 15 times (180 minutes for each time) from March the 15th to June the 28th, 2014. The experimental group was given the integrated subject program of science and art of dance while the control group was treated with science activity in the afterschool science experiment class. Both experimental and control

group took a creative personality test and creative thinking ability test before and after the treatment.

The findings are as follows. First, homogeneity test was carried out before treatment to see whether or not there was difference in the creative personality and creative thinking ability between the experimental group and control group and confirmed that the experimental group and the control group of the elementary school students in the 1st and 2nd grade did not have significant difference in all the variable of creative personality and creative thinking ability. Second, there was significant difference in both creative personality and creative thinking ability between the art dance group (that attended the integrated subject program of science and art of dance 'Physics, Let's Dance') and the science class group that didn't 'Physics, Let's Dance'. The experimental group that attended 'Physics, Let's Dance' showed significant improvement in all of the sub-scales of creative personality (curiosity, self-assurance, imagination, patience/obsession, spirit of independence and spirit of adventure) and all the sub-scales of creative thinking ability (fluency, originality, elaboration and abstractness of titles) than the control group. Therefore, it was confirmed that there was a significant difference in creative personality and creative thinking ability between two groups. However, it can be reasonably presumed that there can be the difference in creative personality and creative thinking ability at the individual level. Therefore, it is considered that in-depth study will be necessary to examine the difference in creative personality and creative thinking ability by personal characteristic in future. Third, the analysis of between-group difference in creative personality and creative thinking ability by attendance in integrated dance art education program with science subject 'Physics, Let's Dance' showed a significant difference between two groups. The experimental group had significantly higher post-test scores than pre-test scores in all the sub-scales of creative thinking ability (fluency, originality, elaboration and abstractness of titles) and all the sub-scales of creative thinking ability (fluency, originality, elaboration and abstractness of titles) after treatment. Therefore, the findings of this study demonstrated that the integrated subject program of science and art of dance 'Physics, Let's Dance' has a greater impact on the development of creative personality and creative thinking ability of the elementary school students in the 1st and 2nd grade than science subject.

In this respect, it is considered that a follow-up in-depth study is necessary upon creative factors such as creative personality and creative thinking, especially in the time when the Korean government began to expand its support for art education and is stressing the importance of experiencing creative art education under the education doctrine of "Creativity/Personality". Particularly, when considering the precedent study⁸ maintaining that the influential factors over ability to solve problems differ depending on the extent to which creative thinking ability is structured, examination of the measuring tools for evaluating creativity and consideration of study subjects are required prior to beginning further studies. In addition, researchers to follow this study are expected to approach the understanding of children on 'Physics, Let's Dance' from their inner factors such as participatory experience rather than external factors. In addition, the researchers are expected to carry out a study on the teachers who assume this kind of education.

5. References

1. Choi UC, Im SJ. The types and role of indirect teaching methods in ballet education. *The Journal of the Korea Society for Dance Documentation*. 2013; 30:219-43.
2. Hong AR. Korea: Seoul National University: A comparative study of world art dance education programs. MA Thesis. 2008.
3. Lee MK. Korea: Korea Education Development Institute: Development of integrated programs for fostering creativity. PhD Thesis. 2011.
4. Root-Bernstein RS, Lamore R, Lawton J, Schweitzer J, Root-Bernstein MM, Roraback E, Van DM. Washington DC, USA: The Arts, New Growth, and Economic Development, National Endowment for the Arts & The Brookings Institution: Arts, crafts and STEM innovation: A network approach to understanding the creative knowledge economy. 2013.
5. Ha JH. The development of creative personality scale. *The Journal of Educational Psychology Studies*. 2000; 14(2):187-210.
6. Kim YC. Seoul, Korea: Jungang Juksung Publishing Co.: Outline of Torrance creativity test (Figure). 2002.
7. Torrance EP. Bensenville, USA: Scholastic Testing Service IL: Torrance tests of creative thinking. 1990.
8. Lee H, Cho Y. Factors affecting problem finding depending of degree of structure of problem situation. *The Journal of Educational Research*. 2007; 101(2):113-24.
1. Choi UC, Im SJ. The types and role of indirect teaching