

Research Article

A Study on the Design of Music Curriculum-Based Ecological Environment Convergence Education Program for Elementary School Learners

Bolim Lee^{1,2}

1. Seoul National University, Korea, Republic of; 2. Dankook University, Korea, Republic of

This study aims to devise a convergence education program with the ecological environment based on the music of elementary school learners. Various agendas surrounding the environment, such as carbon neutrality, the climate crisis, and ecological environment conservation, are also being discussed with enthusiasm in the education world. From this point of view, this study is expected to be an education that can be practiced in their lives in the future by properly establishing elementary school learners' values for nature and the environment, as well as music subject content in the music education field. To this end, this study developed a new music education program that can further implement environmental education based on two previous studies on music-based convergence education through literature research methods. Through this, conclusions corresponding to four implications were drawn, and it can be said that a review showing that environmental education can be practiced in a fusion manner within music education has been conducted to some extent.

Correspondence: papers@team.qeios.com — Qeios will forward to the authors

I. Introduction

1.1. Necessity and purpose of research

Various issues surrounding the ecological environment, such as climate change and carbon neutrality, have emerged, and discussions are expanding. The general definition of climate change is 'the long-term fluctuation or change of the entire climate system due to natural factors such as volcanic eruptions,

changes in solar activity, changes in Earth's orbit, or factors caused by human activities such as fossil fuel combustion, land use, and industrial activities.' The main factors are the greenhouse effect and global warming. Carbon neutrality means that the net emission becomes '0' by reducing the emissions from human activities and increasing the amount of absorption to prevent the increase in the concentration of greenhouse gases in the atmosphere, which is sometimes referred to as 'Net-Zero'. Korea is currently working to achieve carbon neutrality with the goal of 2050. In such a situation where the environment is being destroyed, practice in daily life is paramount, but educational preparation is also inevitable. Such education is ecological environment education, and the purpose of ecological environment education is to understand environmental issues based on knowledge and experiences of the interaction between ecosystems and human society, and to cultivate desirable values and attitudes toward the environment^[1].

In the 2022 Korean revised curriculum, there was an emphasis on ecological environment education in both general and specific theories. In the general overview of the elementary and secondary school curriculum, the phrase 'the ability to actively respond to future social uncertainties caused by digital transformation, changes in climate and ecological environments, etc., and to lead one's own life and learning' is specified^[2]. In addition, in the music curriculum, 'expression and empathy through music expand the meaning and value of music in society and culture, and thus transfer to a sensitivity that sympathizes with the sustainable development of the natural environment or ecosystem, contributing to the preparation of a future life in which learners will live together^[3]'. These educational notices at the national level reflect the needs of the times and can be interpreted as a context consistent with the flow of the international community.

The above-described sense of social responsibility for the ecological environment has become a necessity, not an option. Then, is it correct to have a sense of purpose, teaching and learning methods, and strategies for this in the music subject? Here, it is not difficult to infer the instructor's concerns. In other words, concerns and worries may arise about how ecological environment education can be carried out while ensuring the characteristics and essence of the music subject. This is the time when the wisdom of Yang Gyeom-jang (兩手兼將) is required. For this, convergence education is needed that allows both to be combined. Convergence means 'creating a field in which different fields have new characteristics through chemical bonding,' and in the academic world, convergence means creating new knowledge by linking and integrating subdivided academic fields. This starts with self-reflection that the current academic system is too differentiated to understand the phenomenon to be explored in a segmented manner, but there was a limit to grasping the overall appearance and meaning^[4].

Further discussion is needed on whether the agenda of "ecological environment" can be created as a major interdisciplinary category for elementary and secondary learners, but what is important is that effective teaching and learning on the issue should be made by combining the cross-curricular "ecological environment" and "music education."

Therefore, the purpose of this study is to develop a convergence education program for music subject-based ecological environment education specifically for elementary school learners. To this end, based on hermeneutic research methods, this paper develops a music-based ecological environment education program by mixing a convergence music class model based on the Da Vinci thinking principle with 13 tools of thinking reconstructed for convergence education in the field of culture and arts education. Currently, we exist in the middle of the era of the 4th industrial revolution. The era of the 4th industrial revolution refers to the era of technological convergence in which the boundaries between physical space, digital space, and biological engineering space are diluted based on the digital revolution such as IT and electronic technology (the 3rd industrial revolution).

Furthermore, in the era of the 4th Industrial Revolution, creative and convergent talents are required to flexibly cope with future social changes and create new things. Here, creative and convergent talents mean "people who can create new knowledge and create new values by combining humanities and imagination, science and technology creativity, and right personality^[5]. Therefore, through this study, through the convergent approach of ecological environmental education and music education, not only the cultivation of theory and practice but also the creativity and flexible thinking of learners can be expected.

1.2. Research method

This study synthesizes the music-based convergence education research^[6] based on Lee Borim's Da Vinci thought decoration and the 13 ideas of the Root Bernstein couple, and develops a music subject-based ecological environment convergence education program for elementary school learners based on this. The method of this study is a literature research analysis, which can be said to be a hermeneutic study that analyzes and interprets various documents.

II. Theoretical background

2.1. Principles of Convergence Classes Based on Da Vinci Thought Principles¹

The principle of convergent music class is based on the seven principles of Da Vinci's thinking suggested by Gelb^[7]. Gelb organized the thinking process of Da Vinci in the Renaissance by dividing it into seven characteristics. Convergent music classes based on Gelb's theory should help foster the ability to create new knowledge by approaching various knowledge and phenomena from a creative perspective^[6].

Da Vinci's Principles of Thought	convergence class Principle	teaching and learning objectives	Teaching and learning content
Curiosity	a curiosity about music	I am interested in various phenomena of music.	<ul style="list-style-type: none"> You can observe everything related to music with interest. After listening to and imagining through music with an open mind, you can express with senses other than hearing.
The spirit of experimentation	the use of music	They have an attitude of using music in various situations.	<ul style="list-style-type: none"> You can discuss the results of the combination of music and other fields. I can acknowledge my prejudices and accept new knowledge.
Sense	musical Sense	It constantly increases sensitivity to music.	<ul style="list-style-type: none"> Discuss the difference between sound and music and its use in life. You can distinguish when musical senses are used with other senses.
Embracing Uncertainty	an inclusiveness to a variety of musical subjects	Use positive thoughts on various topics related to music.	<ul style="list-style-type: none"> Discuss and express the ambiguity brought about by the combination of music and non-music. You can feel comfortable creating something new.
Art and science	a wide range of thoughts centered on music	Expand your thinking around music.	<ul style="list-style-type: none"> I can logically explain the abstract characteristics of music. The auditory signal can be expressed by replacing it with writing, formulas, or pictures.

Da Vinci's Principles of Thought	convergence class Principle	teaching and learning objectives	Teaching and learning content
Physical character	the expressive power of music musical	Music is expressed in various ways through language, body, and pictures.	<ul style="list-style-type: none"> The combination of music and non-music can be expressed in creative body expressions. You can conduct music with both hands.
Connection relationship	musical relevance Exploring	Explore the relationship between music and what is outside of music.	<ul style="list-style-type: none"> You can complete the combination of music and non-music. You can finally evaluate your results (thoughts or works).

Table 1. Principles of Convergence Music Classes Based on Da Vinci's Thinking Principles

2.2. 13 Tools Reconstructing Root Bernstein's Branches of Thinking Tools for Convergence Education in the Arts and Culture²

It was discussed by the Root Bernstein couple that the 13 tools of thought consist of observation, shape, abstraction, pattern recognition, pattern formation, analogy, thinking with the body, empathy, dimensional thinking, model making, play, transformation, and integration, each of which can be used for integrated educational thinking. The 13 reconstructions of the Root Bernstein couple's tools of thought for convergence education in the field of culture and arts are as follows^[8].

1. Sensory observation

Sensory observation is an educational method that allows a sensory approach to each field of culture and art. For example, it can be said that the experiences felt by the body while listening to music, looking at paintings, touching crafts, and dancing belong to this. This method is suitable for the beginning of education.

2. The embodiment of the senses

The embodiment of senses is an educational method that helps to lay the foundation for realizing

something new by recalling feelings and senses in the head. In music or art education, instructors will be able to educate learners to imagine things they have not heard or seen before, and in the case of craft education, they will be able to encourage them to come up with new textures.

3. A representation of the senses

The representation of senses is an educational method that clearly summarizes complex objects and phenomena in simple principles. This abstraction of culture and art, which requires extracting the core concepts and functions of each culture and art, can be an educational method that has the advantage of being able to compressively examine the entire art field.

4. Structuralization

Structuring is an educational method that allows discovering rules and structures. Culture and arts fields such as music, art, design, cartoons, and animation have their own patterns. Patterns pursue unity and cause change and tension when they deviate.

5. Create a new structure

Creating a new structure is an educational method that allows you to create unfamiliar but original patterns, away from regular, customary, and regular patterns. This type of training can be the basis for independent and active culture and arts education rather than passively performing by absorbing the existing culture and arts structure as it is.

6. Search for Relationality

Relational search is an educational method that allows you to infer similarities in two or more fields of culture and arts. This process may be criticized by some in that it may not be an accurate and scientific method in fact, but rather, due to such imperfections, it is possible to bridge the gap between the rational and the emotional. For example, it can be seen that explaining the tone through various instrument sounds in music by comparing it with the color in the art field corresponds to this analogy. This can be the process of creating something new.

7. Embodiment

Embodiment is an educational method that allows you to express yourself through your body. In the field of culture and arts, not only inner movements such as reason, logic, and emotional emotions, but also outward expression are most important. To this end, it can be seen that it is important to be embodied in the muscles and senses of the body and to allow immediate expression. Of course, this often requires a lot of training; for example, a pianist playing a long work as an ambassador, a structured improvised movement of a dancer, and a theater actor acting as a tearful act belong to practical performance.

8. Empathy

Empathy is an educational method that makes you make an effort to feel it. This includes leaving one's prejudices and desires behind and empathizing with one object only. At this time, a deeper aesthetic experience of the culture and art one performs can be possible.

9. Reconfiguration through perspective

It is an educational method that allows expression in various forms. It can be seen that this is the case for mutual expression between arts or various forms of expression even within a single field of culture and art. In other words, it can be seen as an act that can cross multiple dimensions with flexibility. It is necessary to think extensively with a variety of perspectives.

10. Symbolization

It is an educational method that allows a work to be symbolically expressed within the field of culture and art. Setting the title of the work also corresponds to this, and compressed expression can be included. The important thing here is to simplify my performance.

11. Liberalization

It is an educational method that is not bound by a prescribed framework and freely enjoyed with the way of play. It is a method of enjoying culture and art, such as improvised play, based on one's intuitive perception, while excluding the structure and form of the activity for a while.

12. Meta pattern

It is an educational method that solves a problem by using various educational methods. For example, when conducting culture and arts education linking music and dance, it can be used in this way, such as structuring and embodiment symbolization.

13. Convergence

It is an educational method that uses various methods such as rationality, knowledge, emotion, and emotional sense to gain insight. This can require a process of thinking logically while feeling sensibly at the same time, and convergence is a rather high-level educational method that requires a lot of training as it is located at the back of the hierarchy of educational methods.

III . Music curriculum-based ecological environment convergence

education program for elementary school learners

3.1. Program Derivation Overview

No.	Da Vinci's Principles of Thought	Principles of Convergence Music Classes Based on Da Vinci Thought Principles (Lee et al., 2021)		No.	Root Bernstein's Theory 'Thinking Tool'	13 tools of thought reconstructed for convergence education in the field of culture and arts (Lee, 2022)		No.	Music-based Ecological Environmental Education Program
1.	Curiosity	a curiosity about music	+	1.	Observation	sensory observation	{	a.	Interest in music and the environment
2.	The spirit of experimentation	the use of music		2.	embodiment	the embodiment of the senses		b.	Looking for ways to protect the ecosystem using music
3.	Sense	a musical sense		2.	Abstract painting	a representation of the senses		c.	To be sensitive to the ecological environment through musical elements
				4.	Pattern recognition	Structuralization		d.	Making music out of nature
4.	Embracing Uncertainty	an inclusiveness to a variety of musical subjects			Pattern	Create a new		e.	Symbolizing Music and Nature in New Dimensions
5.	Art and science	a wide range of thoughts centered on music			formation	structure		f.	Enjoying music freely in nature
6.	Physical character	the expressive power of music			An analogy	Search for Relationality		g.	Use your body to express music in nature and nature in music
				6.	Thinking with your body	embodiment		h.	Combining music with nature and digital media
				3.	Empathy	Empathy			
				5.	Dimensional thinking	Reconfiguration through perspective			
					Model making	symbolization			
7.	Connection relationship	Exploring musical relevance		7.	Play	liberalization			
					Transformation	Metapattern			
				8.	Integration	Convergence			

Table 2. 'The process of deriving the theme of 'Music-based Ecological Environment Class' (Model)

*In this model, color plays an important function.

3.2. The Level Interpretation of Program Process

a.	Interest in music and the environment	Find sounds that can be heard in nature, such as the sound of birds, breezes, and grasshoppers, and look at the elements of sounds that are considered music.
b.	Looking for ways to protect the ecosystem using music	We investigate various spaces on Earth where the ecological environment has been destroyed and look for necessary musical treatments. For example, it can play cold and cool music for polar bears who are struggling because the temperature continues to rise, or it plays music that resembles clear air for trees dying of fine dust.
c.	To be sensitive to the ecological environment through musical elements	Enjoy music depicting nature, such as spring, summer, autumn, winter, flowers, snow, rain, and wind, and sympathize with each natural element and ecological environment more.
d.	Making music out of nature	It actually 'musicizes' natural sounds that resemble music. Various activities such as melody, rhythm, harmony, and lyrics are possible.
e.	Symbolizing Music and Nature in New Dimensions	Express music and nature with 'poetry' or 'art'. Objects of expression include both music and nature.
f.	Enjoying music freely in nature	Play, appreciate, or create music in a place where nature unfolds. This activity is an activity that is not 'foundational' at all, and can be said to be improvisation, appreciation of desired music, and free creation.
g.	Use your body to express music in nature and nature in music	A short melody is created and sung spontaneously, and this melody is expressed with leaves, stones, soil, water, etc. And the various climates in natural ecosystems are expressed through music.
h.	Combining music with nature and digital media	It integrates music and nature in a digital situation where there is infinite convergence potential. Through digital media, music can be audibly and nature can be visually combined, and sometimes the two can be expressed alternately.

Table 3. Explanation of the model of ecological environment education program based on music subject for elementary school students

IV. Conclusion

Based on the 7 Da Vinci ways of thinking for convergence education and the 13 tools of thinking by the Root Bernstein couple, this study derives a 'music subject-based environmental education program plan' for elementary school students. This study, which is described based on the literature research analysis method, has implications that environmental education can be implemented in a sufficiently convergent education method even within the music subject, and the main conclusions are as follows in the four items.

Through this study, it is expected that environmental education from various perspectives can be implemented within the music subject in the future.

1. In order to effectively realize ecological environmental education based on music subjects, the purpose, content, and main ideas of teaching and learning must be clear.
2. A systematic teaching model is needed.
3. In designing the teaching and learning structure, it is necessary to explore the harmony of musical elements and nature from various perspectives.
4. Although the ecological environment is an important issue of the present era, it should not be characteristically ambiguous with the nature of the music subject.

Footnotes

¹ The contents of this item were prepared based on the research contents of Bolim Lee^[6].

² The contents of this item were prepared based on the research contents of Bolim Lee^[8].

References

1. [△]Seo GS (2021). Jeonbuk Ilbo Internet Newspaper. <https://www.jjan.kr/article/20210207726117>.
2. [△]Korean Ministry of Education (2022). "General overview of the primary and secondary school curriculum." Korean Ministry of Education. 2022-33. Annex 1.
3. [△]Ministry of Education (2022). "Music curriculum." Ministry of Education. 2022-33. Annex 12.
4. [△]Bae SH (2018). "Doing 'convergence education' properly in college." Happy Education. 2018(5). <https://happyedu.moe.go.kr/happy/bbs/selectHappyArticle.do?bbsId=BBSMSTR000000005103&nttId=8307>.

5. [△]Korean Ministry of Education (2015). "General overview of the primary and secondary school curriculum." Korean Ministry of Education. 2015-74. Annex 1.
6. [△], [△], [△]Lee B, et al. (2021). "Design of Convergence Music Class based on Leonardo da Vinci's Principles of Thinking." *Journal of Music Education Science*. 49:1-20.
7. [△]Gelb MJ (2016). *Seven Principles of Being a Da Vinci Genius*. Kang Yi Books.
8. [△], [△]Lee B (2022). "A Study on the Class Plan for Convergence Education in the Field of Culture and Arts Education." *Korean journal of culture and arts education studies*. 17(1):75-102.

Declarations

Funding: No specific funding was received for this work.

Potential competing interests: No potential competing interests to declare.