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杜威美感經驗理論運用於幼兒園科學美感主題課程實踐之研究

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中文摘要：本研究採行動研究法，探討杜威美感經驗理論運用於幼兒園科學美感主題課程之實踐與成效。本研究由研究者擔任課程諮詢者，兩位幼兒園老師擔任協同教師。研究參與者為幼兒園大班的五歲幼兒，共24位。本研究的資料蒐集包括：教室觀察、訪談、幼兒學習單與藝術作品、幼兒學習評量、教學省思札記、課程討論紀錄。研究結果如下：(一)研究者帶領幼兒園教師運用杜威美感經驗理論設計幼兒園主題課程「小菜農」，教師引導幼兒運用他們的五感觀察蔬菜，試著以他們的想法來進行科學活動，運用多元藝術媒材創作與主題相關的作品，並欣賞他們在科學與藝術的成果。(二)本次的科學美感主題課程對幼兒科學認知能力與美感能有顯著影響，同時也提高多數幼兒對科學學習的興趣。(三)本研究的幼兒教師在科學教學中遭遇些許困難，然而透過資料搜尋並與他人討論，教師藉此解決困境。(四)透過本次行動研究，幼兒教師增進其科學教學專業及統整課程設計與教學的能力。本研究有助於我們了解幼兒教師將美感結合於幼兒園科學主題課程之實踐，並作為幼兒科學教育之參考。

中文關鍵詞：科學與美感、杜威美感經驗、幼兒主題課程、行動研究

英文摘要：Using action research, the purpose of this study is to explore the implementation and effect of applying Dewey's aesthetic experience in a science aesthetic thematic curriculum in a preschool in Taiwan. The author served as a curriculum consultant, and two preschool teachers served as co-teachers. The participants were 24 young children in the class of age 5. Data sources included classroom observations, interviews, children's worksheets and artwork, children's assessment, teaching reflection notes, and curriculum discussion notes. The results were as follows. (1) The author led the preschool teachers to apply Dewey's idea of aesthetic experience to organize a thematic curriculum focused on the science theme "Young Vegetable Farmers." The preschool teachers guided the children to apply their five senses to observe the vegetables, try their ideas in doing science, apply various artistic materials to create artworks related to the theme, and appreciate the products of science and art. (2) The science aesthetic thematic curriculum had significant positive influences on the children's science cognitive abilities and aesthetic abilities. Most children also raised their interest in science learning. (3) The preschool teachers had certain difficulties in science teaching and they tried to overcome some difficulties by looking for information and discussing with others. (4) Through action research, the preschool teachers improved their science teaching profession and their abilities in integrated curriculum design and instruction. This study provides us with a lens to examine how preschool teachers integrate aesthetics into

a science thematic curriculum in a preschool classroom. It also provides a reference for early childhood science education.

英文關鍵詞： science and aesthetics, Dewey's aesthetic experience, early childhood thematic curriculum, action research

杜威美感經驗理論運用於幼兒園科學美感主題課程實踐之研究

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摘要

本研究採行動研究法，探討杜威美感經驗理論運用於幼兒園科學美感主題課程之實踐與成效。本研究由研究者擔任課程諮詢者，兩位幼兒園老師擔任協同教師。研究參與者為幼兒園大班的五歲幼兒，共 24 位。本研究的資料蒐集包括：教室觀察、訪談、幼兒學習評量、幼兒學習單與藝術作品、教學省思札記、課程討論紀錄。研究結果如下：(一)研究者帶領幼兒園教師運用杜威美感經驗理論設計幼兒園主題課程「小菜農」，教師引導幼兒運用他們的五感觀察蔬菜，試著以他們的想法來進行科學活動，運用多元藝術媒材創作與主題相關的作品，並欣賞他們在科學與藝術的成果。(二)本次的科學美感主題課程對幼兒科學認知能力與美感能有顯著影響，同時也提高多數幼兒對科學學習的興趣。(三)本研究的幼兒教師在科學教學中遭遇些許困難，然而透過資料搜尋並與他人討論而解決困境。(四)透過本次行動研究，幼兒教師增進其科學教學專業及統整課程設計與教學的能力。本研究有助於我們了解幼兒教師將美感結合於幼兒園科學主題課程之實踐，可作為幼兒科學教育之參考。

關鍵字：科學與美感、杜威美感經驗、幼兒主題課程、行動研究

**A Study on the Application of Dewey's Aesthetic Experience in the
Implementation of a Science Aesthetic Thematic Curriculum in a Preschool**

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Abstract

Using action research, the purpose of this study is to explore the implementation and effect of applying Dewey's aesthetic experience in a science aesthetic thematic curriculum in a preschool in Taiwan. The author served as a curriculum consultant, and two preschool teachers served as co-teachers. The participants were 24 young children in the class of age 5. Data sources included classroom observations, interviews, children's assessment, children's worksheets and artwork, teaching reflection notes, and curriculum discussion notes. The results were as follows. (1) The author led the preschool teachers to apply Dewey's idea of aesthetic experience to organize a thematic curriculum focused on the science theme "Young Vegetable Farmers." The preschool teachers guided the children to apply their five senses to observe the vegetables, try their ideas in doing science, apply various artistic materials to create artworks related to the theme, and appreciate the products of science and art. (2) The science aesthetic thematic curriculum had significant positive influences on the children's science cognitive abilities and aesthetic abilities. Most children also raised their interest in science learning. (3) The preschool teachers had certain difficulties in science teaching and they tried to overcome some difficulties by looking for information and discussing with others. (4) Through action research, the preschool teachers improved their science teaching profession and their abilities in integrated curriculum design and instruction. This study provides us with a lens to examine how preschool teachers integrate aesthetics into a science thematic curriculum in a preschool classroom. It also provides a reference for early childhood science education.

Keywords: science and aesthetics, Dewey's aesthetic experience, early childhood thematic curriculum, action research

Introduction

Aesthetic education can be integrated into students' everyday lives and into different learning areas in schools. The application of aesthetic education in science education has also been valued (Hadzigeorgiou, 2016). The aesthetics of science can be reflected in natural science objects, scientific experiments, scientific theories, and the spirit of scientific inquiry (Lin, Jen, & Lee, 2007; Wang, 1994). Some researchers have found that the integration of aesthetics helps students to develop their scientific literacy, motivation in science learning, etc. (e.g., Girod & Wong, 2001; Girod, Twyman, & Wojcikiewicz, 2010; Jakobson & Wickman, 2008; Lin, Hong, Chen, & Chou, 2011; Pugh & Girod, 2007). However, most of these studies focused on students at elementary school level and above, instead of on early schooling.

Dewey (1934/1980) argued for aesthetic experience in everyday lives. He believed that aesthetic experience is *an* experience that has pattern and structure and consists of doing and undergoing in relationship. The current *Early Childhood Education and Care Curriculum Framework* in Taiwan (Ministry of Education, 2016) advocates evoking preschool teachers' and young children's awareness to have their aesthetic experience through doing and undergoing, which echoes Dewey's aesthetic experience. Therefore, this study aims to explore the application of Dewey's aesthetic experience to the implementation of a science thematic curriculum in a preschool in Taiwan.

In order to help preschool teachers to apply Dewey's idea of aesthetic experience in science teaching and to benefit young children's learning, I conducted action research in collaboration with preschool teachers to implement a science aesthetic thematic curriculum in a preschool. The purpose of this study was to explore the implementation and effect of applying Dewey's aesthetic experience to a science thematic curriculum in a preschool in Taiwan. The research questions are as follows.

1. How do the preschool teachers apply Dewey's idea of aesthetic experience to implement the science aesthetic thematic curriculum?
2. What is the influence of the science aesthetic thematic curriculum on young children's science cognitive abilities, aesthetic abilities, and their interest in science learning?

3. What difficulties do the preschool teachers encounter in their curriculum design and teaching? How do they solve the problems?
4. What professional development do the preschool teachers promote in their teaching?

Literature Review

Dewey's Aesthetic Experience

For Dewey, every experience comes from the interaction between a live creature and some aspect of the world. *An* experience has the generic traits: completeness, uniqueness, and emotions (Jackson, 1998). Aesthetic experience is *an* experience that has pattern and structure. It consists of the features as transforming impulsions into expression, unifying emotions to reconstruction, as well as doing and undergoing toward connection (Dewey, 1934/1980).

Dewey's aesthetic experience can be integrated into everyday life. He considers the practical arts in the daily school life. In the University of Chicago Laboratory School he directed, the curriculum was implemented through the practical arts of cooking, gardening, weaving, and carpentry, especially in the lower grades. His idea of practical arts then influences the trend of curriculum integration, which focuses on the relationship between subjects and experiential learning in life.

Dewey believed that aesthetics of science inquiry is to create more new ideas and action. His theory of aesthetics has also influenced the pedagogy in science education (Hadzigeorgiou, 2016). For instance, Girod and Wong (2001) advocate the application of Dewey's theory of aesthetic experience in science teaching and learning. In this context, the central curricular elements involve students' ideas and experience. In the learning process, teachers encourage students to anticipate possibilities and desire to try out their ideas. They play the role of helping students to see the possibilities and potentials for scientific ideas to re-shape and re-vitalize the world. They also emphasize truth and beauty as ideas to be verified in the world. Consequently, teachers can encourage students to try their scientific ideas to re-see and reconstruct the world. Students actively verify their ideas and invite their peers to participate in the process of verification. Moreover, they can apply their science knowledge in everyday lives (Girod & Wong, 2001; Pugh & Girod, 2007).

In the design of early childhood science aesthetic thematic curricula, I propose that teachers apply Dewey's idea of aesthetic experience and integrate the aesthetics of natural science into thematic curricula as a holistic learning. Teachers can guide children to observe and appreciate the beauty of natural science, encourage children to use their imagination and try their ideas to create something or make experiments, as well as expressing their ideas of the mystery of science.

Research on the Application of Aesthetics in Science Teaching and Learning

There is an increasing number of studies focusing on the application of aesthetic theories in science education, especially the use of Dewey's aesthetic theory (e.g., Girod, 2001; Girod, Rau, & Schepige, 2003; Girod, Twyman, & Wojcikiewicz, 2010; Lin, 2009, 2010; Lin et al., 2011; Pugh & Girod, 2007) and natural aesthetics (e.g., Yang, 2012; 2014). Most of the researchers conducted quasi-experimental studies to investigate the effects of applying aesthetic understanding in science classes (e.g., Girod, 2001; Girod, Rau, & Schepige, 2003; Girod et al., 2010; Girod, Twyman, & Wojcikiewicz, 2010; Lin et al., 2011). These results showed that teaching for aesthetic understanding had positive effects on the treatment group students' aesthetic understanding or their application of science knowledge. While some researchers conducted case study methods to explore students' learning in the science class of teaching for aesthetic understanding (Girod & Wong, 2001), some researchers conducted action research to explore the practice of integrating natural aesthetics into science classes (Yang, 2012; 2014). These studies also showed that the application of aesthetics in science teaching can help students to appreciate the beauty of science, enhance their abilities to apply science knowledge, or raise their interest in science learning.

As shown above, the application of aesthetic theories in science education was helpful to students in developing their abilities to appreciate aesthetics of science and apply science knowledge, or enhancing their science awareness and interests in science learning. Most researchers conducted quasi-experimental studies to investigate the effects of the application of aesthetic theories in science classes; however, some researchers conducted case study or action research to explore the process of teaching and learning. Moreover, most of the research subjects focused on students at elementary school level and above, instead of on early schooling. Therefore, I conducted this action research with preschool teachers to implement a preschool science aesthetic thematic

curriculum based on Dewey's idea of aesthetic experience. It was expected that the action research cycle would help the preschool teachers to improve their science teaching profession, as well as enhancing the children's aesthetic abilities, science cognitive abilities, and interest in science learning.

Methodology

Action research is a process that enables teachers to improve their practice and profession as well as students' learning (Sagor, 1992). This study applied the idea of collaboration among an expert and in-service teachers (Grundy, 1988). In order to help preschool teachers to apply Dewey's idea of aesthetic experience in science teaching and to benefit young children's learning, I applied action research methods and collaborated with two preschool teachers to implement a science aesthetic thematic curriculum in a preschool class. The research design is as follows.

Sites and Participants

Nature Preschool (pseudonym) is a private preschool, which is famous for its science and natural environment in the countryside in Chiayi County in Taiwan. I invited Mr. Hong (pseudonym), the funder of Nature Preschool, and his preschool teachers to participate in this study. The participants were 24 young children in the class of age 5, including 16 boys and 8 girls.

Researcher Team Members in Collaboration

I served as a curriculum consultant, and two preschool teachers served as co-teachers. Ms. Hu (pseudonym), the main teacher, is a young teacher aged 30. She had 10 years of teaching experience and a Bachelor degree in early childhood education and care. Ms. Fang (pseudonym), aged 50, was an experienced preschool teacher who had 30 years of teaching experience and a Bachelor degree in early childhood education.

In order to help the preschool teachers to apply Dewey's aesthetic experience in curriculum development, I organized workshops on Dewey's aesthetic experience, science thematic curriculum, and action research for all the preschool teachers in August 2017. Furthermore, I organized the thematic curriculum web and 68 learning activities for the kindergarten class, which integrated the six learning domains of cognition, aesthetics, language, body motion and health, social studies, and emotion (Ministry of Education, 2012, 2016). I further invited Ms. Hu and Ms. Fang to discuss the

curriculum content and problems in September, 2017. We then began to implement the thematic curriculum in October, 2017. I assisted the two teachers and observed their teaching in class once a week. The teachers and I reflected on the teaching, and discussed and modified the learning activities every week. However, some activities were added or canceled by the teachers or children in the process of curriculum implementation. We spent 4 months completing a total of 46 learning activities. The thematic curriculum web is shown in the appendix. The action research cycle of planning, action, observing, and reflecting was employed in this study.

Additionally, I invited the preschool founder, Mr. Hong, and Dr. Meng-Fei Cheng, who specialized in science education, to examine some science activities in the curriculum. Three student assistants also helped me to collect and analyze the data in the process of research.

Data Collection

This study was conducted in the academic year of 2017. Ethics approval was obtained from the preschool and children's parents. Data sources included (a) 46 observations of classroom activities; (b) semi-structured and open-ended interviews with the teachers and children; (c) teaching reflection notes (by teachers and researcher); (d) notes on curriculum discussion (by teachers and researcher); (e) children's assessments on science cognitive abilities and aesthetic abilities; and (f) children's worksheets and artwork. The observations were photographed, videotaped, or sound-recorded. The formal interviews were recorded and transcribed.

Measurement

In order to get a better understanding of the effects of a science thematic curriculum on children, the children's science cognitive ability assessment and aesthetic ability assessment were employed in this study. The assessment was on a 4-point rating scale. Higher scores indicate a stronger degree of cognitive/aesthetic ability. The content of science cognitive ability assessment was based on the three dimensions of cognitive abilities in the cognitive domain in the *Curriculum Framework* (MOE, 2012). The assessment consisted of three parts, including four items relating to the dimension of gathering information, six relating to the dimension of organizing information, and two relating to the dimension of solving problems. The content of aesthetic ability assessment was based on the three dimensions of aesthetic abilities in the aesthetic domain in the *Curriculum*

Framework (MOE, 2012) and the content of aesthetics of science (Lin et al., 2007). The assessment consisted of three parts, including four items relating to the dimension of perceiving and exploring, six relating to the dimension of performing and creating, and four relating to the dimension of responding and appreciating. The children applied arts and scientific materials in the learning of the aesthetic domain.

As for content validity, one professor in early childhood education and one preschool educator examined the assessments and provided feedback. The internal consistency reliability for the science cognitive ability assessment, measured by Cronbach's alpha, was .865, and for the aesthetic ability assessment, it was .908.

Data Analysis

The major data were qualitative data, which were analyzed by coding and categorizing. Some issues emerged in the process, such as the teachers' problems of guiding children to solve problems in science. The quantitative data of science cognitive ability assessment and aesthetic ability assessment were analyzed using the SPSS 18.0 program. A paired samples *t* test was conducted to compare the scores of the children's science cognitive abilities and aesthetic abilities in the pre- and post-test. The internal consistency reliability for the science cognitive ability assessment, measured by Cronbach's alpha, was .865, and for the aesthetic ability assessment, it was .908.

The data were triangulated by methodological triangulation (e.g., observation and interview) and data source triangulation (e.g., observation records, interview transcripts, and children's assessment). The preschool teachers, Ms. Hu and Ms. Fang, were invited to do member checking, such as checking the interview transcripts and the research report. All the participants' names are pseudonyms.

Results

The Application of Dewey's aesthetic experience to the Science Aesthetic Thematic Curriculum

Since the young children had experience of planting, I led the preschool teachers, Ms. Hu and Ms. Fang, to apply Dewey's aesthetic experience and organize a thematic curriculum on the theme "Young Vegetable Farmers." We applied four important ways based on Dewey's idea of aesthetic experience. I discuss them as follows.

Guiding the children to apply their five senses to observe vegetables. The preschool teachers believed that it is important to guide the children to apply their five senses of sight, hearing, touch, smell, and taste, to observe the vegetables. They guided the children to apply their senses of sight, touch, and smell to observe the growing vegetables and shared their observations and recorded them in the diary. For example, in “Taking Care of Vegetables 3,” child 5 observed his tomato plant. He saw and measured the height of the plant. He further smelt and touched the leaves. After the observation, Ms. Hu guided the children to share their observations of growing vegetables and to record them in the diary (Observation 13, 20171103).

The preschool teachers also guided the children to see, touch, smell, and taste the raw and cooked vegetables and to share their feelings. For example, in “Vegetable Classification,” Ms. Hu displayed different kinds of vegetables and invited the children to see, touch, and smell the vegetables. She further invited them to share their observations (Observation 3, 20171006). In “Cabbage Cooking,” the children smelt and tasted the cabbage soup after their harvest of cabbage. Ms. Fang further guided the children to share their feelings about the soup (Observation 22, 20171124).

Guiding the children to try their ideas in doing science. Although the preschool teachers were used to guiding the children to follow the teachers’ ideas to do something, I designed some activities to help them to guide the children to try out their own new ideas and solve the problems in the process of vegetable planting. For example, in “Picking Tomatoes,” the teachers guided the children to share their thoughts and try their ideas to solve the problems of picking the tomatoes. Child 7 stood on a chair to pick the tomatoes in a high position. Child 8 used the weeding hook to pick the tomato hidden in the netting (Observation 45, 20180131).

Guiding the children to create artworks related to Young Vegetable Farmers. The teachers guided the children to apply various artistic materials to create artworks related to the theme, including the artworks of visual arts, music, and drama. For example, in “Vegetable Stamping,” the teachers guided the children to make pictures with different vegetable stamps and different water colors (Observation 3, 20171006). In “Prop Production,” the teachers guided the children to observe different beans and to try different beans to make their shakers (Observation 30, 20171214). In

“Drama for Young Vegetable Farmers,” the children shook their bean shakers to accompany the song in the Young Vegetable Farmers play (Observation 31, 20171215).

Guiding the children to appreciate the products of science and art. The preschool teachers guided the children to appreciate the products of science and art, such as their vegetable produce, including cabbage, white radish, and tomatoes, as well as their artworks of visual arts, music, and drama. For example, in “White Radish Harvest,” the children enjoyed pulling out their white radish and happily shared their produce. Some children appreciated that they got such a big white radish and it smelt salty and like the sea (Observation 38, 20180111). As another example, in “Vegetable Stamping,” Ms. Hu invited the children to appreciate and share their vegetable stamp pictures. Child 5 explained that he made a picture of “My Scooter” and used slices of bitter melon to stamp the wheels of the scooter (Observation 3, 20171006).

Young Children’s Science Cognitive Abilities, Aesthetic Abilities, and Interest in Science Learning

Young children’s science cognitive abilities. The results presented in Table 1 show the significant differences in the children’s science cognitive abilities ($t=-6.999, p<.001$). The mean score for science cognitive abilities in the post-test ($M=2.656, SD=.505$) was higher than that in the pre-test ($M=2.058, SD=.443$). In the dimension of gathering the information, there was also a significant difference ($t=-5.511, p<.001$), with the mean score in the post-test ($M=2.906, SD=.570$) higher than that in the pre-test ($M=2.365, SD=.423$). In the dimension of organizing the information, there was another significant difference ($t=-6.994, p<.001$), with the mean score in the post-test ($M=2.375, SD=.480$) higher than that in the pre-test ($M=1.910, SD=.453$). Likewise, in the dimension of solving the problems, there was a significant difference ($t=-5.619, p<.001$), with the mean score in the post-test ($M=2.688, SD=.673$) higher than that in the pre-test ($M=1.899, SD=.551$). In summary, the science aesthetic thematic curriculum had a significant positive influence on the children’s science cognitive abilities.

Table 1. Analysis of the Mean Scores of Pre- and Post-tests of Science Cognitive Abilities (N=24)

Aspects	Test	<i>M</i>	<i>SD</i>	<i>t</i>
Gathering the Information	Pretest	2.365	.423	-5.511***
	Posttest	2.906	.570	
Organizing the Information	Pretest	1.910	.453	-6.994***
	Posttest	2.375	.480	
Solving the Problems	Pretest	1.899	.551	-5.619***
	Posttest	2.688	.673	
Total	Pretest	2.058	.443	-6.999***
	Posttest	2.656	.505	

*** $p < .001$

Young children's aesthetic abilities. The results presented in Table 2 show the significant differences in the children's aesthetic abilities ($t = -4.787$, $p < .001$). The mean score for aesthetic abilities in the post-test ($M = 2.843$, $SD = .527$) was higher than that in the pre-test ($M = 2.404$, $SD = .368$). In the dimension of exploring and perceiving, there was also a significant difference ($t = -2.868$, $p < .05$), with the mean score in the post-test ($M = 2.708$, $SD = .624$) higher than that in the pre-test ($M = 2.375$, $SD = .430$). In the dimension of performing and creating, there was another significant difference ($t = -4.577$, $p < .001$), with the mean score in the post-test ($M = 3.174$, $SD = .465$) higher than that in the pre-test ($M = 2.743$, $SD = .163$). Likewise, in the aspect of responding and appreciating, there was a significant difference ($t = -3.564$, $p < .005$), with the mean score in the post-test ($M = 2.646$, $SD = .729$) higher than that in the pre-test ($M = 2.094$, $SD = .663$). In summary, the science aesthetic thematic curriculum had a significant positive influence on the children's aesthetic abilities.

Table 2. Analysis of the Mean Scores of Pre- and Post-tests of Aesthetic Abilities (N=24)

Aspects	Test	<i>M</i>	<i>SD</i>	<i>t</i>
Exploring & Perceiving	Pretest	2.375	.430	-2.868*
	Posttest	2.708	.624	
Performing & Creating	Pretest	2.743	.163	-4.577***
	Posttest	3.174	.465	
Responding & Appreciating	Pretest	2.094	.663	-3.564**
	Posttest	2.646	.729	
Total	Pretest	2.404	.368	-4.787***
	Posttest	2.843	.527	

* $p < .05$ ** $p < .005$ *** $p < .001$

Young children's interest in science learning. Most of the children showed interest in their science learning. For example, the children's responses on learning sheet 7 showed that 23 children liked this science aesthetic thematic curriculum; 22 agreed that these science activities helped them like science more. Additionally, it showed that 19 enjoyed the vegetable cooking and story listening about vegetables; 17 enjoyed the vegetable harvest; and 16 enjoyed taking care of the vegetables (Children's learning sheet 7, 20180129).

Preschool Teachers' Difficulties and Problem Solving in Teaching

Lack of science content knowledge in certain areas. The preschool teachers found that they did not have enough science content knowledge of vegetable planting; therefore, they had to look for more information, discuss the problems with each other, and even ask the expert, Mr. Huang, for help. They taught and learned about science simultaneously.

Ms. Hu answered, "I don't have enough knowledge of vegetable planting. Therefore, I have to look for more information... In addition, I asked the expert, Mr. Huang, questions. I also discussed the problems with my co-teacher, Ms. Fang." Ms. Fang followed by saying, "Yes, I also have to look for information... We have to teach (science) and learn (science) at the same time. (Interview 2, 20180129)

Problems guiding the children to observe the grown vegetables. The preschool teachers found that they had problems guiding the children to observe and record the grown vegetables. For instance, it was too difficult for the children to count all the leaves on the grown vegetables. We discussed the problem and suggested that the children count and record the number of tomato buds, instead of the leaves when the tomatoes grew so high

The children have to make more and more records in the vegetable diaries... The teachers and I agreed that the children counted and recorded the number of tomato buds, instead of the leaves when the tomato plant blossoms. (Teaching reflection note 14, 20171106)

Preschool Teachers' Professional Development in Science Teaching and Curriculum Design

Teachers' improvement in science teaching profession. Through this action research, the teachers improved their cognitive ability in the process, such as discovering the problems, gathering the information, organizing the information, and solving the problems by discussing with others. As Ms. Hu said, "I don't have enough knowledge of vegetable planting. Therefore, I have to look for more information...and organize it. It helps me discover the problems and learn more about science...Additionally, I asked the expert, Mr. Huang, questions. I also discussed the problems with my co-teacher, Ms. Fang" (Interview 2, 20180129).

The teachers also learned to apply the aesthetic teaching skill in teaching a science aesthetic thematic curriculum, especially the use of senses in teaching. As Ms. Hu explained, "Because we chose this theme... I guided the children to apply their five senses to know and to explore different things...In aesthetic teaching, it is important for children to practice their five senses... and observe their surroundings" (Interview 2, 20180129).

Teachers' improvement in integrated curriculum design and instruction. In the curriculum design, the preschool teachers followed the thematic curriculum web and *Curriculum Framework* and discussed the details of the learning activities with me each week. Some activities were merged, canceled, or rearranged in the process. Ms. Hu and Ms. Fang found that they improved their skills of curriculum webbing, such as leading the children to brainstorm and to classify their ideas.

Ms. Fang said, "I think I learned to discuss the theme with the children... design the thematic curriculum web and classify children's ideas." Ms. Hu followed by saying, "I also learned more

about curriculum web design...One teacher leads the children to brainstorm, and the other assists writing children's ideas on the board... Then the teachers and children classify their ideas... and plan the activities..." (Interview 2, 20180129).

In addition, the teachers learned to apply picture books in the science thematic curriculum. Most children enjoyed their storytelling. There were 19 children who expressed that they enjoyed listening to the stories about vegetables (Learning Sheet 7, 20180129). The teachers also felt confident in their teaching. They were glad to see the children's improvement in learning. As Ms. Fang responded, "We did inspire children's expression and ideas. Look at Hsing. How great she is" (Interview 2, 20180129).

Discussion and Conclusion

Using action research, this study aims to explore the implementation and effect of applying Dewey's aesthetic experience in a science aesthetic thematic curriculum in a preschool in Taiwan. The major results were as follows. (1) The author led the preschool teachers to apply Dewey's idea of aesthetic experience to organize a thematic curriculum focused on the science theme "Young Vegetable Farmers." The preschool teachers guided the children to apply their five senses to observe the growth of vegetables, to try their ideas in doing science, to apply various artistic materials to create artworks related to the theme, and to appreciate the products of science and art. (2) The science aesthetic thematic curriculum had significant positive influences on the children's science cognitive abilities and aesthetic abilities. Most children also raised their interest in science learning. (3) Although the preschool teachers had certain difficulties in the science teaching, they tried to overcome some difficulties by looking for information and discussing with others. (4) Through an action research cycle, the preschool teachers improved their science teaching profession and their abilities in integrated curriculum design and instruction.

According to Dewey's idea of aesthetic experience in science inquiry, it is important for teachers to guide students to create new ideas and put them into action (Girod & Wong, 2001; Hadzigeorgiou, 2016). However, the preschool teachers in this study had some problems guiding the children to try their ideas in doing science. It is because the preschool teachers were used to guiding the children to follow the teachers' ideas to do something. I designed some activities to help

them guide the children to try out their own new ideas and solve the problems in the process of vegetable planting. It took some time for the teachers to change their old teaching style and adjust to a new way of thinking and teaching.

This study showed that the integration of aesthetics in a science thematic curriculum had positive influence on children's science cognitive abilities and aesthetic abilities. Some studies also showed the similar results (Girod et al., 2003; Yang, 2012; Lin et al., 2011). Consequently, preschool teachers are encouraged to apply Dewey's idea of aesthetic experience to implement science aesthetic thematic curricula based on children's life experiences and the *Curriculum Framework* (Ministry of Education, 2012, 2016).

In early childhood science education, it is useful to invite a science expert to provide scientific information and resources in science teaching and learning. Since preschool teachers tend not to be confident in science teaching, they are encouraged to invite science experts to preschools to enrich their science teaching, bring children to visit some scientific fields, and utilize the local resources in science (Chen, 2016).

There are recommendations for early childhood educators and future research in early childhood science education. For early childhood educators, first, teachers can encourage young children to express their ideas and try their ideas in science more often. Second, the children showed lower mean scores in organizing information and problem solving in the science cognitive abilities in this study, and therefore, it is important for teachers to provide more opportunities for children to organize the information and to solve problems in science. For future research, first, researchers can conduct action research with preschool teachers to improve their science teaching. They can select different topics as science aesthetic thematic curricula. Second, since the use of picture books is helpful to science and aesthetic teaching, future researchers can investigate the effect of science picture books on children's science cognitive abilities.

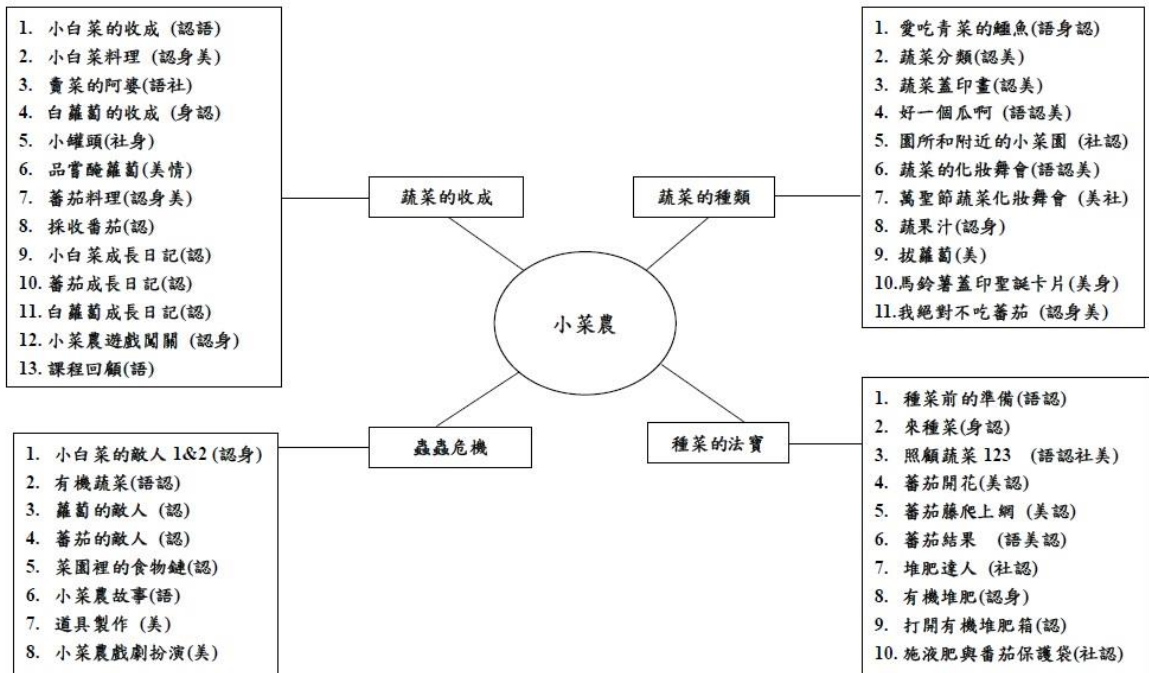
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Appendix

Thematic Curriculum Web



計畫編號	MOST 106 - 2511 - S - 343 - 001		
計畫名稱	杜威美感經驗理論運用於幼兒園科學美感主題課程實踐之研究		
出國人員姓名	陳玉婷	服務機構及職稱	南華大學幼兒教育系專任副教授
會議時間	2018年7月10日至 2018年7月12日	會議地點	日本東京
會議名稱	(中文) 2018年第四屆教育、心理學與社會國際研討會 (英文) The 4th International Conference on Education, Psychology, and Social Sciences (2018 ICEPS)		
發表題目	(中文) 杜威美感經驗理論運用於幼兒園科學主題課程實踐之協同行動研究 (英文) The Application of Dewey's Aesthetic Experience in the Implementation of a Science Thematic Curriculum in a Preschool: Collaborative Action Research		

一、 參加會議經過

本次研討會為期三天，從七月十日開始，至七月十二日結束。以下為本人參加會議的經過。

第一天研討會的下午有一場教育論文口頭發表會，共六篇教育相關論文發表，以中小學教育或高等教育研究為主。第二天的專題演講有兩場，第一場為澳洲教授Dr. Thanh Pham 主講的“Conceptualizing Forms of Capitals in Managing Employability of International Students”，第二場為菲律賓教授Dr. Karen Miranda-Fernandez主講的“Sustainable Tourism and Events Management: An International Perspective”。當天共有三場教育論文口頭發表會，每場各有六篇教育論文發表，發表人以台灣學者居多。此外當日也有三場海報論文發表會，發表的論文範圍涵蓋甚廣，包含幼兒教育至高等教育。第三天為研討會最後一天，早上和下午共有四場教育論文口頭發表會，每場各有四至六篇的教育相關論文發表，當天也有一場海報論文發表會。

我的論文發表於第三天的第三場次口頭論文發表會，該場次共有四篇論文進行發表，包括：第一篇“Study of the CPS Supervision Model to Enhance Teacher Competences of English Major Student Teachers”，第二篇“Efforts towards Creating an International Baccalaureate Student Friendly Japanese National University”，第三篇“The Effects of Physical Fitness Running Test on Students' Learning Performance in Taiwan”，以及一篇我所發表的“The Application of Dewey's Aesthetic Experience in the Implementation of a Science Thematic Curriculum in a Preschool: Collaborative Action Research”。本場次發表的論文範圍涵蓋甚廣，包含幼兒教育至高等教育，前兩篇分別為泰國學者、日本學者所發表，後兩篇則為台灣學者進行發表，並由主持人帶領大家進行每篇論文的問答與討論。

二、 與會心得

本次研討會的論文發表中，與會的聽眾對於我的論文讚賞有佳，有些聽眾認為我的研究深具行動研究精神，對現場教學實務有很大的幫助。同時，我也說明本次研究是由科技部研究計畫所補助，因此花費比較多的時間與精神執行本研究。而來自台灣的台南大學教育系博士班研究生對於我將美感教育融入幼兒科學教育的議題感到十分有興趣，同時，他們也告訴我，他們在歐用生教授的課堂上學習教育美學，與我所執行的美感教育研究很有共鳴，只是我的研究場域是在幼兒園，與他們常接觸的中

小學領域有些不一樣。因此部分博士生也將我所報告的論文研究PPT拍照留存，學習我的優點。發表完後，大家也合影留念，留下美好的回憶！

本次研討會有博士班研究生發表，也有大學教授發表，雖然論文範圍較廣而沒有聚焦在科學教育，但我還是在本次研討會中學習許多，收穫滿滿。同時我也成功地跟和與會聽眾分享台灣幼兒科學教育研究的一部分。本次研討會的舉辦單位很用心準備各項設備、餐飲與接待服務，讓參與者有賓至如歸的感覺，留下美好的印象。而我也將盡快把英文的研討會論文修改為英文的期刊論文，進行發表。在此，我由衷感謝科技部給予我這次參與國際研討會的機會，期待下次國際研討會的來臨。

三、發表論文全文或摘要

(以下僅提供摘要，論文正在進行修改、投稿期刊中)

The Application of Dewey's Aesthetic Experience in the Implementation of a Science Thematic Curriculum in a Preschool: Collaborative Action Research

By Yu-Ting Chen

Associate Professor, Department of Early Childhood Education, Nanhua University, Taiwan

Abstract

Aesthetic education can be integrated into students' everyday lives and into different learning areas. The application of aesthetic education in science education is also valued in schools. Using collaborative action research, the purpose of this study is to explore the implementation and effect of applying Dewey's aesthetic experience in a science thematic curriculum in a preschool in Taiwan. The author served as a curriculum consultant, and two preschool teachers served as co-teachers. The participants were 24 young children in the class of age 5. Data sources included classroom observations, interviews with teachers and children, children's worksheets and artwork, children's assessment, teaching reflection notes, and curriculum discussion notes. The major results were as follows. (1) The author led the preschool teachers to apply Dewey's idea of aesthetic experience to organize a thematic curriculum focused on the science theme "Young Vegetable Farmers." In the process of planting, the preschool teachers guided the children to apply their five senses to observe the vegetables and to try their ideas in doing science. They also guided the children to apply various artistic materials to create artworks related to the theme. They further guided them to appreciate the products of science and art. (2) The science thematic curriculum had significant positive influences on the children's science cognitive abilities and aesthetic abilities. Most children also raised their interest in science learning. (3) Through an action research cycle of plan, action, observation, and reflection, the preschool teachers improved their science teaching profession and their abilities in integrated curriculum design and instruction. This study provides us with a lens to examine how preschool teachers integrate aesthetics into a science thematic curriculum in a preschool classroom. Recommendations and implications for early childhood science education will be discussed in the paper.

Keywords: science and aesthetics, Dewey's aesthetic experience, early childhood thematic curriculum, collaborative action research

四、建議

這是我第二次參加高等教育協會所舉辦的國際研討會，我發現參與學者以台灣學者和亞太地區學者佔多數，也有一些是由台灣地區的大學教授帶領博士班研究生進行口頭論文發表，或是碩士班研究生進行海報論文發表。期待未來我也可以帶領南華大學幼兒教育系碩士班學生至海外進行論文發表，也可藉此打開本校在國際上的知名度。

五、攜回資料名稱及內容

本次研討會攜回的資料主要為研討會大會手冊，內容含三天研討會議程表、兩篇專題演講內容、以及口頭論文和海報論文發表介紹與摘要等。

六、其他

無！

106年度專題研究計畫成果彙整表

計畫主持人：陳玉婷			計畫編號：106-2511-S-343-001-				
計畫名稱：杜威美感經驗理論運用於幼兒園科學美感主題課程實踐之研究							
成果項目			量化	單位	質化 (說明：各成果項目請附佐證資料或細項說明，如期刊名稱、年份、卷期、起訖頁數、證號...等)		
國內	學術性論文	期刊論文		0	篇		
		研討會論文		0			
		專書		0	本		
		專書論文		0	章		
		技術報告		0	篇		
		其他		0	篇		
	智慧財產權及成果	專利權	發明專利	申請中	0	件	
				已獲得	0		
			新型/設計專利		0		
		商標權		0			
		營業秘密		0			
		積體電路電路布局權		0			
		著作權		0			
		品種權		0			
	技術移轉	其他		0			
		件數		0	件		
	收入		0	千元			
	國外	學術性論文	期刊論文		0	篇	
			研討會論文		1		Chen, Y. (2018). The Application of Dewey's Aesthetic Experience in the Implementation of a Science Thematic Curriculum in a Preschool: Collaborative Action Research. Paper presented in the 2018 International Conference on Education, Psychology, and Society, Tokyo, Japan.
			專書		0		本
專書論文			0	章			
技術報告			0	篇			
其他			0	篇			
智慧財產權及成果		專利權	發明專利	申請中	0	件	
				已獲得	0		
	新型/設計專利		0				

		商標權	0			
		營業秘密	0			
		積體電路電路布局權	0			
		著作權	0			
		品種權	0			
		其他	0			
	技術移轉	件數	0	件		
		收入	0	千元		
參與計畫人力	本國籍	大專生	2	人次	本研究聘任的大學部兼任助理有兩位，第一位為南華大學幼兒教育系曾珮瑄同學，負責主要的助理工作，第二位為李佳伊同學，協助助理工作。	
		碩士生	0			
		博士生	1		本研究聘任一位博士班學生-曾玉芬同學擔任臨時工，協助部分研究分析。	
		博士後研究員	0			
		專任助理	0			
	非本國籍	大專生	0			
		碩士生	0			
		博士生	0			
		博士後研究員	0			
		專任助理	0			
其他成果 (無法以量化表達之成果如辦理學術活動、獲得獎項、重要國際合作、研究成果國際影響力及其他協助產業技術發展之具體效益事項等，請以文字敘述填列。)						
	成果項目	量化	名稱或內容性質簡述			
科教國 公司 計畫 加填 項目	測驗工具(含質性與量性)		2	1. 幼兒科學認知能力量表 2. 幼兒美感能力量表		
	課程/模組		1	幼兒科學美感主題課程--小菜農		
	電腦及網路系統或工具		0			
	教材		1	幼兒科學美感主題課程"小菜農"教材(如:上課PPT, 學習單等)		
	舉辦之活動/競賽		1	小菜農闖關遊戲暨親子活動		
	研討會/工作坊		0			
	電子報、網站		0			
	計畫成果推廣之參與(閱聽)人數		0			

科技部補助專題研究計畫成果自評表

請就研究內容與原計畫相符程度、達成預期目標情況、研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性）、是否適合在學術期刊發表或申請專利、主要發現（簡要敘述成果是否具有政策應用參考價值及具影響公共利益之重大發現）或其他有關價值等，作一綜合評估。

1. 請就研究內容與原計畫相符程度、達成預期目標情況作一綜合評估

達成目標

未達成目標（請說明，以100字為限）

實驗失敗

因故實驗中斷

其他原因

說明：

2. 研究成果在學術期刊發表或申請專利等情形（請於其他欄註明專利及技轉之證號、合約、申請及洽談等詳細資訊）

論文： 已發表 未發表之文稿 撰寫中 無

專利： 已獲得 申請中 無

技轉： 已技轉 洽談中 無

其他：（以200字為限）

目前已撰寫兩篇期刊論文，投稿審查中。

3. 請依學術成就、技術創新、社會影響等方面，評估研究成果之學術或應用價值（簡要敘述成果所代表之意義、價值、影響或進一步發展之可能性，以500字為限）

本研究採行動研究法，探討杜威美感經驗理論運用於幼兒園科學美感主題課程實施與成效。本研究透過行動歷程改善教學，提升幼教師科學教學專業，及幼兒美感能力、科學認知能力、科學學習興趣。研究者與幼教師分享課程成果，並將研究成果發表於國際研討會及國際期刊論文，作為幼兒科學與美感教育研究及課程與教學之參考。

4. 主要發現

本研究具有政策應用參考價值： 否 是，建議提供機關
（勾選「是」者，請列舉建議可提供施政參考之業務主管機關）

本研究具影響公共利益之重大發現： 否 是

說明：（以150字為限）

本研究呈現幼兒園教師運用杜威美感經驗理論於幼兒科學美感主題課程之教學實踐。本課程對幼兒科學認知能力與美感能有顯著影響，同時也提高多數幼兒對科學學習的興趣。透過本次行動研究，幼兒教師解決教學困難，並增進科學教學專業及統整課程設計與教學的能力。本研究可作為推展幼兒科學教育與美感教育之參考依據。