

A Development of Design Education Program Based on Local Cultural Contents to Promote Creativity of Chinese Children

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Abstract: Various studies have been conducted to identify the concept of creativity and enhance it effectively. Many advanced countries in the field of design have already expanded the scope of design education from specialized education to universal education and utilized such design education as a curriculum for promoting the creativity. Although education industry in China has been growing rapidly with the increase in the national income, the current educational contents have been mostly focused on the subjects/contents for an entrance examination, with little consideration of creativity promotion for children. Therefore, as an effort to promote creativity of Chinese children, the current study developed a design education program utilizing Chinese cultural contents and verified its educational effectiveness in terms of creativity promotion. The program was developed in the following process: 1) exploring the program development direction through an in-depth interview with parents; 2) deriving three lesson plans through an ideation session with some experts in art education for children; and 3) selecting a final lesson plan through experts/parents evaluation and developing a final textbook. A total of 10 children were educated with the developed textbook, and their levels of creativity before and after the education were comparatively evaluated using Torrance Tests of Creative Thinking (TTCT). The study results showed that the education program developed in the current study significantly affected the children's creativity, which would contribute to promoting the children's creativity, and also, developing a new creativity education program in the future. Additionally, it is expected that the research methods employed in this study, that is, developing a creativity promotion program using some cultural/local contents, could be usefully/widely applied in various fields of education.

Keyword : Children's Creativity; Design Education; Cultural Contents|

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1. Introduction

1.1. Background and purpose of the study

In the modern industrial society, due to the upward levelling of production technology, additional values such as

design and brand, which belong to the cultural and emotional domain, rather than the value of the product itself, are taking on a greater proportion in securing market competitiveness. As the industrial structure has become more sophisticated, creative consumer groups (Cresumer) have begun to emerge who take the initiative to propose and plan new product concepts, thus increasing the role of individuals with creativity^[1]. Against this backdrop, creativity is emerging as a very important factor for both producers and consumers, and as a skill that individuals must possess in the future society. Therefore, it is believed that educational methodologies to promote creativity will become increasingly important in order to improve national competitiveness in the long term.

V. Papanek, a leading design educator, has argued that design education is effective in developing creative thinking skills if it is implemented from childhood, when both brains are growing^[2]. In addition, E.P. Torrance's (1995) study on the tendency of creativity development shows that creativity continues to grow throughout childhood^[3,4]. A number of Korean and international studies, including Oh Yoo-young (2017), have also shown that education methods that foster creativity and integrative thinking for children in early childhood are highly effective^[5]. Design-advanced countries have recognised the educational value of design education as a way to promote creativity, intellectual ability, and integrated thinking skills such as problem-solving ability at an early age, and have made continuous efforts to apply it systematically from the early childhood general education stage.

China has achieved rapid economic growth since opening up to the outside world in 1978. With the increase in national income and the improvement of living standards, the demand for advanced education has increased significantly. However, the current education industry in China is mainly composed of entrance examination-oriented subjects, and the scale of education related to creativity is very small^[6]. This is mostly due to the fact that some private education providers have obtained licences from overseas education programmes and provide services in a few large cities. The awareness of design education in China is limited to the field of professional education and has not been extended to the field of universal education, which aims to develop children's creativity. The design education system is outdated and fraught with problems such as unclear educational goals, lack of systematicity and content^[7], and there is a lack of awareness and research on design education for children.

As China's growth has slowed down in recent years, there has been an increasing emphasis on creativity as a qualitative growth engine. Therefore, in the long run, the importance of creative talents is expected to increase in order to improve national competitiveness in the future. Previous studies have shown that effective creativity education is best implemented in childhood, when the brain is still developing, and will be more time-consuming and costly in adulthood.

Therefore, the purpose of this study is to propose a design education programme to promote creativity in Chinese children and to verify the effectiveness of the programme in promoting creativity.

1.2. Method and scope of the study

This study was conducted by reviewing the literature on the main concepts of creativity and its importance. In addition, the necessity of childhood design education and the cases of countries that are implementing design education were summarised. The specific process of developing and validating an educational programme to promote creativity in Chinese children is as follows. First, in-depth face-to-face interviews were conducted with Chinese parents of elementary school children to understand their perceptions, expectations, and opinions about design education and to derive the direction of programme development. Second, three drafts of design education programmes were proposed through idea generation and organisation with a group of experts currently engaged in education. Third, the three drafts were evaluated by experts and parents in the form of face-to-face in-depth interviews, and one draft was finally selected to develop the design education programme. Fourth, we conducted

classes for children between 9 and 10 years old. To check whether the children's creativity was improved, we conducted creativity tests using the Torrance Tests of Creative Thinking (TTCT), the most commonly used and recognised measurement tool, before and after the programme. The results were then analysed by an official organisation to compare the changes in creativity index before and after the class to verify the effectiveness of the design education programme.

This study was conducted to develop and validate a design education programme to promote creativity in Chinese children, and was conducted from the perspective of design education as universal education rather than specialised design education.

2. theoretical reflections

2.1. The concept of creativity

In educational psychology, creativity is defined as 'the ability to produce something new, original, and useful' or 'the ability to think outside the traditional way of thinking, to create new relationships, or to produce non-routine ideas' ^[8]. Creativity has been emphasised as a very important trait in modern society, and countless efforts have been made to specifically identify, develop, and utilise it. However, as it is a subject that has been studied in a wide range of fields and with a variety of research models, the definition of creativity varies greatly depending on the time period and academic discipline. The modern study of creativity can be traced back to Guilford of the American Psychological Association in 1950. Early studies of creativity focused on the thought structures of people who were considered creative and the outputs they produced. In the 1970s, creativity was studied mainly in terms of cognitive aspects and problem-solving processes. In the 1980s, a view emerged that creativity should be interpreted through an outcome-orientated assessment, in contrast to process-orientated creativity, and in the modern era, an integrated interactive view, such as the 4 P's, emerged, which refers to the complex interaction of the creative person (Person), process (Process), product (Products), and environment (Press) factors. The flow of research on creativity is summarised in **Table 1** ^[9].

As shown in **Table 1**, research on creativity has varied over the ages. As a comprehensive view that penetrates through these opinions as a whole, it may be possible to extract the context of 'the idea or ability to create new value' and 'the most appropriate and effective methods and processes in the current situation'. Kim (2014) argued that human creativity is the ability to edit existing things to make them feel new in a different context, and that anyone can train creativity through training ^[10]. From this perspective, it can be said that human creativity is something that can be trained through proper education and learning. It can also be hypothesised that creativity can be expressed in different ways depending on the surrounding environment, and environmental factors are an important topic in recent research on creativity.

Therefore, when designing educational programmes to promote children's creativity, it is necessary to consider the educational environment and socio-cultural context of the target children and to find localised teaching methods that can be adapted to them.

Table 1. Definitions of different perspectives on creativity

Perspective	Scholar	Definition of creativity
Cognitive	Guilford (1959)	The power to give birth to something new and novel, i.e., to produce new thinking; considered equivalent to divergent thinking.
	Veron (1989)	The power to produce new and unique ideas, insights, inventions, or artistic output.
	Bum Mo Jung (2001)	The power of creating something new and rewarding
Personality traits	Rogers (1962)	Creativity is the emergence of an action that produces a new result, a process that is generated by the characteristics of the individual and the events, people, materials, and circumstances of his or her life history that surround him or her, and the motivation for seeking such a process is the tendency to self-realisation.
	Taylor (1988)	It is a complex psychological process that expresses productive and creative thinking, and is characterised by perseverance, an attitude of achievement, change and improvement. It is an attitude that seeks perseverance, achievement, change and improvement, and a passion that gives rise to great conviction.
	Foreground circle (2006)	The ability to create objects or ideas that are valued by society and culture for the well-being of oneself and others, as well as the ability to come up with new opinions to solve problems, is a character trait that underpins the character traits.
Troubleshooting process	Torrance (1977)	The process of recognising a problem, generating ideas to solve it, formulating and testing hypotheses, and communicating the results.
	Youngehae Kim (2001)	The mental process of generating new and useful ideas.
	Liu Zhonglin (2002)	The process of making choices based on what you already know.
Deliverables	Amabile (1983)	New and relevant ideas, actions, or deliverables.
	Weisberg (1999)	Original, positively evaluated output in the arts, sciences, and work.
	Shi Guangming (2002)	Something new, unique, and valuable that a person has produced in the course of their thinking and doing.
Interactions between individuals and their environment	Urban (1995)	Ability to mobilise insights from a given or perceived problem to create new, novel, or original output.
	Csiksentmihalyi (1996)	It emerges from the interaction of a system composed of three elements: a culture that contains symbolic rules, a person who brings newness to the symbolic domain, and a field of experts who recognise and validate that newness.
	Rose (1996)	It is a trait that every human being possesses and refers to both the ability to generate new ideas and the ability to integrate and modify previous ideas. In addition, creativity can be developed and the degree to which it is developed is determined by the given environment.
	Plucker & Beghetto (2004)	Interactions between processes and their ability to produce useful results or outputs.
	Sawyer (2006)	The emergence of what is appropriate from an individual, group, or society.

2.2. Components of creativity

As shown in the literature, there are various views on creativity and what constitutes creativity.

Guilford (1959) identified fluency, flexibility, elaboration, originality, reconfiguration, and persistence as the basis of creativity, while Torrance (1962) identified the following elements in addition to fluency, flexibility, originality, and elaboration: abstraction, openness, courage, originality, intuition, optimism, adventurousness,

engagement, and curiosity. Lubart (1994) proposed intellectual abilities, knowledge, thinking styles, personal characteristics, motivation, and environment as factors in the expression of creativity, and Urban (1995) presented a comprehensive list of these components, dividing them into cognitive and definitional aspects^[11].

In recent creativity research, an integrative approach that emphasises the interaction of the cognitive and definitional components of the above streams with environmental factors has formed the main context.

Since the creativity measurement tool used in the experiments of this study is the TTCT, the components proposed by Torrance (1962) were considered in the development of the training programme.

2.3. Torrance tests of creative thinking (TTCT)

The Torrance Tests of Creative Thinking (TTCT) or Torrance Tests of Creative Thinking is a well-known and popular creativity testing tool. Torrance defines divergent thinking as creativity, which is the ability to generate many different and new ideas. The sub-factors of divergent thinking are ‘sensitivity to problems or deficits’, ‘fluency’, ‘flexibility’, ‘originality’, and ‘elaboration’. According to Torrance, these factors play a dominant role in creative thinking, and he developed the TTCT to provide a methodology for measuring them.

The TTCT consists of two main parts: verbal and shapes. The Verbal Creativity Test assesses items such as ‘fluency’, ‘flexibility’, and ‘originality’, while the Figurative Creativity Test assesses items such as ‘fluency’, ‘originality’, ‘abstractness of ideas’, ‘elaboration’, and ‘resistance to jumping to conclusions’. The items in the verbal and pictorial creativity tests are shown in Table 2 below^[12,13].

Table 2. TTCT creativity test assessment questions

Delimiters	Question	Content
Language part	Activity 1 Ask a question	List questions that can be asked about the picture.
	Activity 2 Guess the cause	Look at the picture and make a guess about the cause of the event.
	Activity 3 Guess the outcome	Look at the picture and make a guess about the outcome of the event.
	Activity 4 Enhancing your work	Look at the conditions presented and come up with ideas to improve them.
	Activity 5 Unique uses	Come up with clever ideas using existing objects.
	Activity 6	* Previously implemented but now removed.
	Activity 7 Imagine	Look at a given situation and imagine what creepy things might happen.
Shape parts	Activity 1 Compose a figure	Use your imagination to construct a picture based on a given picture.
	Activity 2 Complete the drawing	Complete a picture based on an unfinished, incomplete shape.
	Activity 3 Draw a circle-line	Draw as many objects or pictures as possible on the given circles or lines.

The TTCT can be used to test creativity in a wide range of populations, from children to adults. The data is provided in percentile scales for each age group, making it easy to intuitively understand where a test subject’s creativity level is^[14]. The verbal and shapes sections of the TTCT have two types, A and B, and are widely used as

a tool to verify the effectiveness of educational programmes in various fields as a pretest and posttest to promote creativity.

3.Design education

3.1. The concept of design education

In education, design is broadly divided into general and specialised education according to its purpose. Since the emergence of the Bauhaus, design education has mainly developed around professional curricula to train professional designers.

Table 3. Value of design as general education^[15]

Advocates	The value of design education
Bruce Archer	Explain the justification for design education as a third domain, on par with the humanities and sciences.
Stuart Pugh	Emphasise that design integrates knowledge from both art and science.
Charles L.Owen	Problem Solving, Conceptualisation, Visualisation, Communication, etc. design education with professional training
Nigel Cross	real-world Problem Solving, Constructive Thinking, and non-Verbal thinking are essential values of design education. values of design education.
Charles Burnette	Assert that design is a general process that is not limited to any particular domain, but can be applied to any subject area.
Victor Papanek	Argues that design education can develop the ability to critique and create cultural values.
J. Norman	Asserting its role as an important medium for developing creative abilities and integrating experiences from other subjects and life experiences.

Since then, the scope of design has expanded significantly, and the roles required of designers have also changed. Design as a general education in Shenzhen aims to develop creative problem-solving skills by cultivating integrated thinking skills.

Charles Burnette argued that design is a completely generic process and that everyone does design ^[5], and Nigel Cross believes that design education can further develop the ability to develop general knowledge ^[16]. These views do not limit design to specialised education. They illustrate the view that design is a tool or discipline of universal education and can be applied in many fields to contribute to problem solving. From this perspective, design as a professional education is considered to be instrumental, while design as a general education is considered to be more intrinsic to education. Design education that is appropriate for childhood can promote emotional development in addition to aesthetic senses ^[17]. Therefore, it is necessary to seriously consider the academic status of design as a general subject.

3.2 The importance of childhood design education

Torrance's (1995) research on the developmental trends of creativity shows that creativity is a continuous growth throughout childhood ^[3]. In addition, studies by Alieldin (1979), Carroll (1979), Leven (1984), and others, influenced by Torrance's theory, have shown that children's creativity tends to increase with age during the preschool and elementary school years ^[4].

Appropriate design education in childhood can enhance children's aesthetic abilities and promote their

emotional development. Hong (2011) found that people who experienced design education in childhood are more likely to have the ability to enjoy and evaluate design as adults^[17]. Design education is effective in promoting the development of children's problem-solving skills and can enhance their ability to express themselves creatively.

3.3 Best practices in design education

Design-advanced countries have recognised the value of design education and have made efforts to incorporate design into the general curriculum. These curricula focus on early childhood and childhood, the stage when children's creativity develops, and are designed to provide direct and indirect experiences of design thinking and processes. As a representative example, the characteristics of design education in the UK, the US, and Japan are summarised in **Table 4** below.

Table 4. Design education in advanced design countries

Country	United Kingdom	United States	Japan
Programmes Name	Design and Technology	K-12	Art and Craft
When to implement	1960 year	1989 year	1989 year
Training for	5~16 years old	5~13 years old	6~12 years old
Educational purposes	Increase design literacy across the population Increase creativity.	Improve the effectiveness of task-based problem-solving skills training.	Increase creativity Improve self-directed thinking.
Teaching methods	4 stages by age Key Stage Operations	Hands-on activities based on K-12 processes	Three levels of formative activities by age
Curriculum	Experience design activities in your life	Libraries & Art Galleries and more Programmes.	Creating with interactivity

It can be seen that the educational programmes in the examples above are designed to provide children with hands-on experiences, such as formative activities and problem solving. They also strive to promote children's creativity through the process of identifying problems and approaching solutions.

4. Design education programme development

4.1.Direction of programme development

Before developing the design education programme, this study conducted in-depth interviews with parents in China to explore the development direction suitable for the local educational environment. The survey was conducted from 21 August 2019 to 31 August 2019 in Nankai District and Heping District of Tianjin City, China. The composition of the interview participants is shown in **Table 5** below.

Table 5. Overview of parents participating in in-depth interviews

Category	Age	Gender	Child age	Child gender
Parent A	37years old	women	10 years old	women
Parent B	43years old	women	10 years old	women
Parent C	40years old	women	10 years old	women
Parent D	43years old	women	10 years old	women
Parent E	41years old	women	10 years old	Female
Parent F	36years old	women	9years old	women
Parent G	36years old	women	9years old	Female
Parent H	38years old	women	9years old	women
Parent I	35years old	women	9years old	women
Parent J	37years old	women	9years old	Female

The in-depth interviews were conducted orally and lasted approximately 60 minutes. The interviews were transcribed and analysed. The interviews were conducted in a relaxed atmosphere, broadening the scope from issues related to children's education to creativity promotion and design education. This was done to prevent the researcher from dominating the interview and to build rapport and encourage more candid responses. The main questions we wanted to find out through the interviews were:

- a) What do you know about design education?
- b) What do they think about children's creativity?
- c) If there was a design education programme to promote creativity, what would they expect to see?
- d) What are the characteristics of a design education programme that is suitable for the Chinese educational environment?

The following table summarises the main points of the interviews. Similar concepts are combined into the same sentence, and the frequency of answers is indicated.

Table 6. Summary of interview results

Category	Summary of interview content	Frequency
a	I've heard of it.	4
	Never heard of it.	2
	I know a little about it.	2
	I know a lot.	1
	I know it very well.	1
b	To be able to work out what needs to be done independently and not rely on others.	3
	Children need education at each level of development.	2
	To develop their natural abilities and help them realise their full potential.	2
	The ability to think outside the box.	1
	Activities that they can enjoy, activities that allow them to express themselves.	1
	I don't know. But I think it's very important.	1

Table 6 (Continued)

Category	Summary of interview content	Frequency
c	The process of developing a child's ability to think and express themselves.	4
	To enable them to think and plan for the future.	2
	To train their creative abilities through a variety of sensory stimuli.	2
	Activities that are interesting, enjoyable and allow them to express themselves.	2
d	Traditional Chinese morals and values, inherent virtues, family commitment and respect, and other spiritual and didactic elements are necessary for living in modern Chinese society.	7
	Educational content that reflects China's unique design, art, and vast and varied traditional cultural elements.	3

Table 7. Synthesis of in-depth interviews

Category	Summary
Perceptions of child creativity	Self-direction, independence, real-world applicability, individual expression
Design Education Programme Expectations design education programmes	Imagination, confidence, self-expression, autonomy
Characteristics of creativity education in China	Traditional Chinese values (such as respect, loyalty, prudence, modesty, filial piety, etc.), Chinese cultural elements, and unique Chinese art.

4.2. Programme design

The creativity of divergent thinking as defined by Torrance is the category of creativity in this study. The programme aims to induce children to think divergently, and set the learning direction so that children can reach a conclusion by organising the given problems in their own thoughts and methods. The basic teaching method of the programme is based on the Korean 'after-school design classroom' that the Ministry of Knowledge Economy has been promoting since 2008. The teaching method is divided into three stages: understanding design, problem discovery and problem solving, and presentation and integration. The programme developed in this study reorganises these three stages into four stages of 'understanding', 'designing', 'making' and 'presenting' to design a design education programme. Based on the results of a survey of Chinese parents, the programme was designed to include elements of Chinese cultural content and the traditional Chinese values implied in it. In addition, the programme was developed in consideration of the components of creativity proposed by Torrance.

An idea generation meeting was held to propose lessons for the design education programme. The meeting group consisted of four people, including the researcher, one PhD in design currently working in Chinese education, and two teachers majoring in Western painting. The meeting was conducted in a brainstorming format, and various Chinese cultural contents and their contents were summarised. The ideas generated from the brainstorming were visualised in the form of a mind map.

Through the idea meeting process, elements of traditional Chinese culture were identified and organised into categories to summarise the values associated with the cultural elements. Among them, we selected traditional drama, traditional costumes, and traditional crafts as elements that are suitable for programmes targeting children and easy to secure diversity of expression. Through this, we proposed three lesson plans for design education programmes that include Chinese cultural elements. Each lesson proposal is shown in **Table 8** below.

Table 8. Summary of each lesson plan

Cultural Factors	Traditional Theatre
Learning Concepts	Social Skills
Learning tools	Masks, paints
Highlights	Identify your own personality to design the main character of a light play; Discover role models in classic Chinese stories; Consider how you see yourself in your peer group.
Cultural factors	Traditional Clothing
Learning Concepts	Family Ethics
Learning Tools	Paper, non-woven fabric, cloth, etc.
Highlights	Learning to design traditional clothing linked to old stories; self-reflection through stories about filial piety.
Cultural factors	Traditional ceramics
Learning Concepts	Self-esteem
Learning Tools	Clay, paint
Highlights	Cultivating pride in one's culture through ceramics, a representative cultural content of China; self-expression training through learning the basic concepts of advertising.

4.3. Evaluation and selection of programme options

In order to evaluate the preferences of the three teaching options proposed above, collect opinions on each option, and investigate improvements, a second in-depth interview survey was conducted with the same group as the first interview survey.

The second round of in-depth interviews to evaluate the programme options was conducted from 20 November 2019 to 30 November 2019. Interviews were conducted via audio and video calls, each lasting approximately 30 minutes or more. The parent groups were provided with basic reference materials for the interviews in advance, and all individual interviews were transcribed.

Table 9. Results of the survey on preferences for class offerings

Category	Suggestion 1	Suggestion 2	Suggestion 3
A	3	1	2
B	3	1	2
C	3	2	1
D	2	1	3
E	3	2	1
F	3	2	1
G	2	3	1
H	2	3	1
I	1	3	2
J	3	1	2
Preference score total	25	19	16

*The weighted scores of 3, 2, and 1 are used to provide an intuitive representation of the order of preference.

Taken together, the interview responses to each of the lesson proposals indicate that the interview group believed that each of the proposals contained cultural elements and values and had elements that would appeal to children. Parents' preferences for the three proposals are shown in Table 9 above, in the following order: "Traditional theatre" - "Traditional costumes" - "Traditional pottery".

In particular, parents showed high interest in the programme that used elements of traditional drama because it was differentiated from the existing education related to traditional drama in the form of colouring books. In addition, the process of children thinking about their own personality and creating their own character by using the character expression elements of light drama was well received. In particular, many participants felt that the lesson plan using elements of traditional drama was less difficult than the other lesson plans and would be suitable for a programme targeted at children. Many participants also wished that the learning related to linguistic expression could be a little larger. As an improvement and complement to proposal 1, many people said that they would like to see more opportunities for children to organise their thoughts and express themselves more freely, rather than learning the form of traditional theatre in depth as it is. Therefore, we designed specific lesson plans and teaching materials around the elements of traditional theatre, and developed the lesson content in a way that allows children to organise and freely express their personal feelings about the form of expression and traditional theatre rather than the in-depth content of traditional theatre.

4.4. Design education programme proposal

The design education programme using traditional theatre is composed of four sections: understanding, design, production, and presentation, with the theme of creating one's own costume as the main artifact of a traditional light theatre. The programme aimed to promote creativity and enhance understanding of their own traditional cultural arts through the process of learning about and designing traditional costume styles for light theatre.

The programme also encouraged the children to identify their own personality and design their own costumes in the form of a light play, reflecting the opinions of themselves and their peers, so that they could naturally experience self-objectification and self-reflection. The structure of each learning stage is as shown in Table 10 above.

Table 10. Organisation of learning stages in a programme

Stages of learning	Topics	Content	Preparation
Understanding (1/4)	Appreciating the faces of characters in light drama	Learn about Chinese light theatre. Learn about the facial expressions of the characters in a puppet show. Describe their feelings while looking at the facial expressions of the characters. Talk about their favourite characters.	Image material of water, a representative light pole, basic material on the expression technique of light pole make-up.
Designing (2/4)	Transpolar face Designing	Organise your thoughts about your own personality. Encourage each other to think about what your friend's personality is like. Using the expressive techniques of puppetry to design your own puppet costume.	A sketching sheet with basic shapes outlining the expressive techniques of light pole make-up.
Creating (3/4)	Creating	Try out different ways to display your own designs on a white mask.	Colourable White Mask Various materials to create different colours and textures.
Presenting (4/4)	Publishing	Share with your friends what character you represented with the masks you created. Look at and evaluate your friend's masks. Compare it to your favourite light theatre character and imagine what you would do if you lived in that character's time.	Children's favourite costumes for their favourite characters Images of costumes and masks from other countries.

4.5. Implementation and validation

As an empirical study to verify the effectiveness of the proposed design education programme in promoting creativity, a class was conducted from 13 December to 22 December 2019 for 10 elementary school students aged 9-10 years old in Tianjin, China. The group was selected from students taking entrance-level art courses at an art institute. The lessons were conducted in four sessions of 60 minutes for each course. The overall class schedule is shown in **Table 11** below.

Table 11. Design education programme class schedule

Dates	Contents
6 - 8 December 2019	TTCT test pre-assessment
13-14 December 2019	Appreciating the characters and stories of an opera
15 December 2019	Designing my own Jingkei costume
20 - 21 December 2019	Create a mask for my design
22nd December 2019	Showcasing my Jingkei costume
27th - 29th December 2019	TTCT Test Post-Assessment

Prior to the design education programme, the children were pre-assessed using the TTCT creativity test. A post-assessment was also conducted using the same method after the programme was completed to observe whether creativity had improved. Both the pre- and post-assessments were conducted using the TTCT test for verbal and shapes creativity and were assessed by an accredited organisation. The results of the pre- and post-assessments of children's creativity are shown in **Table 12**. The creativity indices for each part of the verbal and shapes tests are presented in terms of standardised scores and corresponding percentile scores.

Table 12. Comparison of TTCT creativity test assessment results – shapes

Separation		TTCT Creativity Test - Shapes section					
		Pre-assessment		Post-assessment			
		Standard score	Percentile	Standard Score		Percentile	
				Points scored	Incremental value	Points scored	Incremental value
3rd Year	A	90	25	105	+15	67	+42
	B	112	84	122	+10	97	+13
	C	89	24	119	+30	94	+70
4rd Year	D	106	70	120	+14	95	+25
	E	102	59	109	+7	77	+18
	F	102	59	106	+4	70	+11
	G	91	28	98	+7	47	+19
	H	88	21	112	+24	84	+63
	I	93	33	106	+13	71	+38
	J	101	53	112	+11	84	+31
Average		97.4	45.6	110.9	13.5	78.6	33

Table 13. Comparison of TTCT creativity test assessment results – language

Separation		TTCT Creativity Test - Shapes section					
		Pre-assessment		Post-assessment			
		Standard score	Percentile	Standard Score		Percentile	
				Points scored	Incremental value	Points scored	Incremental value
3rd Year	A	77	13	103	+26	55	+42
	B	71	7	127	+56	92	+85
	C	92	38	118	+26	84	+46
4rd Year	D	109	64	116	+7	81	+17
	E	87	31	106	+19	58	+27
	F	83	21	116	+33	81	+60
	G	80	17	127	+47	92	+75
	H	97	45	98	+1	47	+2
	I	99	49	117	+18	83	+34
	J	101	51	112	+11	74	+23
	Average	89.6	33.6	114	24.4	74.7	41.1

As shown in **Table 12** and **Table 13** above, the pre- and post-assessment results of the TTCT test confirm the effectiveness of the design education programme in this study in promoting children's creativity. The mean percentile value of the post-test improved by 33% in the shape section and 41.1% in the language section. In addition, the mean standardised scores improved by 13.5 and 24.4 points in the shape and language sections, respectively.

5. Study results

5.1. Comparison of pre- and post-test means

In order to analyse whether the design education programme presented in this study has a positive effect on promoting children's creativity, a paired t-test was conducted using SPSS Window (Ver.21) to analyse the data from the TTCT pre- and post-test. The results showed significant changes in both verbal and graphic creativity.

Table 14. Comparison of pre- and post-creativity test means

Separation		t	df	p
1	Pre-Post Geometry Standardised Scores	-5.346	9	.000***
2	Pre-Post Geometry Percentile	-5.095	9	.001**
3	Pre-Post Language Standardised Scores	-4.464	9	.002**
4	Pre-Post Verbal Percentile	-4.974	9	.001**

* = $p < 0.5$, ** = $p < 0.1$, *** = $p < 0.001$.

5.2 Comparison of pretest and posttest subfactor means

Paired t-test was used in this study. The results showed that fluency, a subfactor of linguistic creativity ($t(9) =$

-4.626, $p < .01$), flexibility ($t(9) = -5.094$, $p < .01$), and originality ($t(9) = -3.291$, $p < .01$). In the subfactors of shape creativity, there were significant changes in abstractness of the title ($t(9) = -3.213$, $p < .05$) and resistance to hasty closure ($t(9) = -2.834$, $p < .05$). On the other hand, there were no statistically significant changes in fluency ($t(9) = -.095$, $p > .05$), originality ($t(9) = -1.843$, $p > .05$), and elaboration ($t(9) = -2.000$, $p > .05$), with only modest increases in scores.

Table 15. Pre- to post-creativity test subfactor mean comparison

	Separation	t	df	p
1	Pre-Post Language Fluency	-4.626	9	.001**
2	Pre- and post-language flexibility	-5.094	9	.001**
3	Pre-post verbal originality	-3.291	9	.009**
4	Pre- to post-shape fluency	-.095	9	.927
5	Pre- and post-shape originality	-1.843	9	.098
6	Pre- and post-shape elaboration	-2.000	9	.077
7	Pre-Post Abstractness of subject matter	-3.213	9	.011*
8	Pre-Post Shapes Resistance to hasty conclusions	-2.834	9	.020*

* = $p < 0.5$, ** = $p < 0.1$, *** = $p < 0.001$.

6. Conclusion

In this study, we developed a design education programme to promote Chinese children's creativity. Based on in-depth interviews with Chinese parents, we developed a programme consisting of four stages of 'understanding, designing, making, and presenting' using elements of Chinese cultural contents such as traditional drama, and implemented the programme in Chinese elementary school children in grades 3-4. In order to verify the effectiveness of the programme in promoting creativity, the Torrance Tests of Creative Thinking (TTCT) were administered to the children before and after the programme to observe changes in the children's shapes and language creativity indexes.

By comparing the results of the pre- and post-test, we found that the children's creativity in shapes improved by 13.5 standard deviations and 33% in the mean percentile, while the children's creativity in language improved by 24.4 standard deviations and 41.1% in the mean percentile. We also conducted a paired-sample t-test on the pre- and post-test results, and found that the children's creativity improved significantly in the post-test after the programme. In the post-assessment, we found that the verbal creativity index was significantly higher than the shape creativity index. This is thought to be a result of the fact that parents' opinions on the importance of verbal expression were gathered during the design of the programme and reflected in the lessons. The children in the class were professionally trained in art and spent a lot of time on art during the day. It is assumed that the parents were aware of this and requested that their children's weaknesses be compensated for.

The results of the analyses of the sub-factors of the TTCT's verbal and pictorial creativity index are as follows.

The sub-factors fluency (63.6 per cent), flexibility (70.5 per cent) and originality (63.8 per cent) of the linguistic creativity index were all significantly improved on average in the post-assessment after the class. We also conducted a paired-sample t-test on the results of the sub-factor assessments and found that the

improvements were statistically significant. Abstractness of title (37.1%), a subfactor of the Shape Creativity Index, Resistance to jumping to conclusions (15.4%), originality (15%), sophistication (12.9%), and fluency (3.1%) all improved on average in the post-assessment. A paired-samples t-test revealed statistically significant gains in abstractness of the subject line and resistance to hasty closure. On the other hand, originality, elaboration, and fluency did not show statistically significant results, even though the indexes of the items improved. A study by Heo (2016) also analysed the results of the TTCT and found that while the overall creativity index improved, sub-factors such as fluency and originality showed little change or even a decrease in scores^[18]. The children who participated in the design education programme in this study were all enrolled in pre-school art education and had basic artistic expression skills. This may explain why they did not show significant gains in items such as fluency and elaboration related to expressive behaviour. In addition, the small sample size of 10 children in this study may have had some influence on these results.

In other words, although no significant results were found for some of the sub-factors, based on the view of creativity as a set of sub-factors, the overall improvement in the creativity index of the participating children suggests that the programme contributed to the improvement of children's creativity. As discussed in the theoretical study, creativity has a rapid growth curve in infants and young children, and it has the characteristics of timely education that requires education appropriate to the growth stage. Therefore, it is very important to provide educational opportunities to promote creativity in infants and young children. Therefore, this study developed a design education programme using Chinese cultural contents to enhance the diversity of creativity education for Chinese children and verified its effectiveness. As an example of creativity education, it is expected to contribute to the promotion of creativity in Chinese children. It is also expected to be used in various educational fields as an example of developing an educational programme using unique cultural contents.

The effectiveness of the educational programme developed in this study was verified by conducting actual classes for children. However, there is a limitation that the number of participants in the class was limited to 10 children. This can be overcome by conducting future studies with a larger number of children. Since the children in this study were receiving specialised art education for entrance examinations, it is recommended that future studies should be conducted with children in general public education institutions who have not experienced entrance examination art. In addition, it is necessary to conduct a multi-faceted comparison and validation study using various categories such as regional culture, urban and rural, and ethnic identity.

For the sake of future generations, it is important to utilise cultural content from not only China but also other countries. I hope that research on the development of educational programmes for various purposes, including the promotion of creativity, using cultural contents will be actively conducted for future generations.

Disclosure statement

The authors declare no conflict of interest.

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