

A Preliminary Study on the Influence of the Application of New Teaching Media on Children's Creativity Enhancement

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Abstract

The development and cultivation of creativity is an important trend and specific goal for education reform. This study attempts to formulate a set of teaching methods available linking to school curricula with the creativity of children effectively enhanced.

In the early research stage, through expert interviews, we can understand the connotation and teaching methods for traditional curricula to cultivate creativity. The planning for the contents of new curricula is mainly based on "design thinking". 3D printing is served as the practical technologies and the fifth graders from primary schools are recruited as experimental testees. Through practical teaching tests, it is available to understand whether the contents of curricula will influence the creativity of school children.

In the early experiment stage, school children are guided into the realm of 3D printing technology through experiential methods. During the learning processes of curricula, it is found when school children facing novel media and tools, this technology are advantaged with the function to continually attract the learning focus from school children. The formal experimental contents are mainly composed of task-based learning and they are further accompanied with new media guiding students to explore problems and materialize ideas. Finally, through expert evaluation, between new and traditional teaching courses, the difference performed by school children is compared.

As it is found from experimental results, school children show longer concentration during the learning processes when they receive new curricula. In view of the evaluated result of learning output, the performance arisen from new curricula is better than that from old curricula.

Keywords: Creativity, Creative Teaching Curricula, Design Thinking, 3D Printing

Research Background and Literature Review

The rapid evolution of information technology has prompted diversification of educational reform, and the cultivation of creativity is one of the important dimensions.

Gilford concluded in the study that creativity is not identical to intelligence; individuals may have better creativity than intelligence or better intelligence than creativity [1]. However, most of the traditional school education still attaches great importance to performance of intellectual education, and the

thinking process of learning may be easily neglected, and this results in the lack of curiosity and motivation of learning, and thus obliterating the abilities of innovation and problem solving. Therefore, cultivation of creativity is even more important.

Creativity is a multi-faced concept and also a kind of thinking ability. Many scholars at home and abroad have advocated that sensitivity, fluency, flexibility, originality and elaboration are the basic abilities of creativity [2]. However, Torrance, Parnes and de Bono et al. all believed that training of children's ability to think diffusely from childhood can gradually develop ability of creative problem solving [3] [4] [5]. On the other hand, the study also pointed out that learning ability in early childhood is the strongest, and is also continuously developed in primary school, but at this time the development is wave-like not linear. Torrance conducted a large-scale creative thinking test for students in first grade of primary school and adults. The results show that the development of thinking is not linear. There are four stagnation points during development of creativity, which are 5, 9, 13 and 17 years old [6]. The Japanese scholar Okae tested the fluency, flexibility and originality of creative thinking of students in second-sixth grades of primary schools. The results showed that creative thinking ability of the children reached the first peak in the third grade, the second peak in the fifth grade and then were gradually decreased [7]. Therefore, it is of great significance to seize the opportunity to enhance creative learning in primary schools.

Creativity education is planned teaching activities which teachers carry out through course content and also is a kind of teaching mode to stimulate and promote students' creativity in a supportive learning environment [8]. In the process of creativity education, it is also necessary to cultivate students' metacognition ability, that is, students can constantly monitor their own thinking process and adjust the application of strategies in the process of creative thinking, which can constantly reflect and refine their creative wisdom [9].

Design thinking is a people-oriented design spirit and method, which considers people's needs, behavior, and feasibility of technology or business [10]. It is a practical and creative problem-solving method to find ways to improve future results [11]. Design thinking was originally used by designers in design of new products or services. It is people-centered, which is a process of directly observing and understanding people's needs, continuous testing, feedback and correction through prototype so as to produce new products or new services.

3D Printing is the application of AM (Additive Manufacturing) technology, which converts 3D computer models into 2D layered slices and stacks the slices to a specified position, repeating the stack action until forming. 3D printing technology has the advantage in time and cost, so it has been applied to every aspect of life quickly. 3D printing technology can quickly transform abstract concepts into concrete, and further develop the operator's three-dimensional thinking ability. Therefore, efforts are made to apply this new media to education and learning and evaluate its feasibility as a creative teaching method and tool by combing the new media with the education.

To sum up, this study attempts to plan a new creative teaching course, which focuses on the concept of design thinking and implements the concept through the application of new media, and then explore the possibility of the course for the cultivation and promotion of students' creativity, thus providing a reference for teachers in actual teaching.

Research Method and Process

The research process is divided into two parts. Part 1, Literature review and expert interview. It is to understand the practice of creativity teaching in primary school courses and the evaluation mode and content of teachers on creativity, so as to serve as a reference for new course planning and results evaluation.

Part 2, the content planning of the new teaching course is based on the connotation of design thinking as the main axis, and 3D printing is the practice technology. Through the actual teaching test, whether the content of the new course affects the students' creativity performance and the effect of the new teaching media on learning can be further understood.

1. Expert interviews

Through expert interviews, it can be understood the existing teaching process and the operation mode and evaluation content of the education system. The respondents are 5 senior teachers from high grade in primary school with 10 years or more seniority.

2. Experimental Subjects and Contents

The subjects are selected from fifth grade students who are in the second peak period of brain development[7]. The main reason is that the fifth grade students who are more mature in mental development than the third grade students, and have a better grasp of new media (3D printing) related concepts, and this can reduce undesired impact of new tool intervention.

For the experimental course planning, the independent variable is teaching media can be divided into traditional media (white board, thick cardboard, clay...) and new media (3D printing). The dependent variable is the students' creativity performance. The control variable is the teacher's characteristics, teaching methods, students' quality, teaching time, media application and so on.

Before implementation of the formal teaching experiment

course, a new media (3D printing) experiential activity was held to warm up students so as to understand their attitudes and influence of new media intervention.

In the course planning of formal teaching experiment, the teaching content is compiled according to the design thinking execution steps [12] (Empathize, Define, Ideate, Prototype, Test), and the familiar campus environment is used as the topic searching field, and the AEIOU observation method [13] is introduced to guide the students to face problem core through empathy to have better understanding of the problems definition. the students are divided into several groups during the course. Finally, the achievements of the students are issued by different groups.

In the first phase of experiment, the problems are proposed by the students. In the field of teaching environment, the students independently search the potential problems in the field (their campus), and try to propose problem solving methods, and finally provide solutions through traditional media.

The second phase of the experimental course is performed one week after the first phase, all the learning process and content are the same as those in the first phase, but the solution is finally produced through the new media (3D printing).

Description of research results

1. Creativity rating scale

The scale is compiled on the basis of the evaluation content of the art course of primary schools in the "Manual of Art Education Teachers of the Ministry of Education" and the current relevant creativity scale. After completion of the scale, three primary school teachers with more than 20 years of teaching experience were invited to assist in review and correction of the scale in order to meet the actual teaching needs (as shown in Table 1).

TABLE1.

Children creativity rating scale

Children creativity rating scale

1. Originality of the works.
2. Degree of efforts of works.
3. Quantity of details presented in the works.
4. Complexity of the works
5. Imagination of contents of the works
6. Creation and interestingness of the works
7. Ability of problem solving of the works.

2. Experimental course output (I)

After the students experience the two phases of course using common media and new media, the teachers of the course in the school are invited to evaluate and comment the works produced (as shown in Tables 2 and 3) in the Creativity Rating Scale (Table 1).

TABLE 2.

The output of traditional teaching media

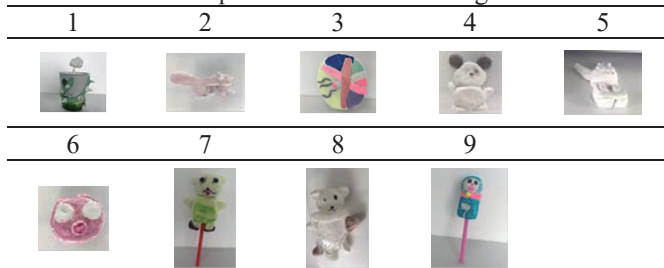
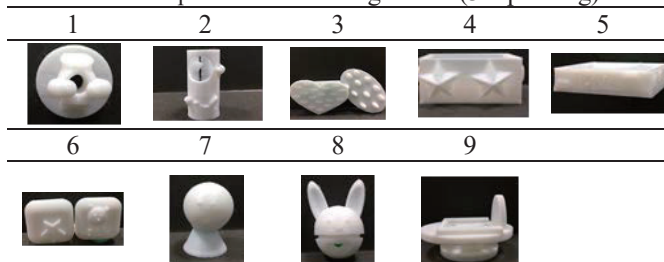


TABLE 3.

The output of new teaching media (3D printing)



The results are summarized as follows: The works produced using new media are more prominent in creativity and combined with life experience, and present higher problem-solving ability and complete and unique details; while the works produced using common media seem to be influenced by the daily life things the students often touch (cartoon, caricature, etc.), their ideas are not different from each other and the degree of detail is small. Rather, they are easily influenced by peers and follow the same ideas or concepts.

In terms of the performance of the works produced using new media, the ways to solve the problems are more diversified. It seems that the application of the new media can promote the students to increase their breadth and difference in ideas. On the contrary, the performance of the works produced using common media presents lack of patience in making and completeness due to limitation of the material, and peer discussion is less, which affects sharing and exchange of ideas.

New media use 3D modeling to promote transformation of concepts from the plane to 3D dimensions. And in the development of fluency, the detail and completeness of works is higher and can show the integrity of the works.

3. Teaching Review

After completion of the first experimental course, the contents and results are reviewed.

(1) Discussion on the problems

As experiment teaching using traditional and new media is different in the course contents and field exploration in the original planning, the evaluation of the problem-solving ability of the works is less objective. The teaching is based on groups, and some students are introverted, or group discussions may cause thinking similar topics.

(2) Correction suggestions

The theme of course task is modified to the same field. The above experiment teaching is repeated for the same children. At the same time, in order to avoid the discussion in the group, which may cause similar design ideas, in the second experimental teaching, the problem search and definition at the previous phase is still carried out in the groups, while the problem is solved and executed by individuals.

4. Experimental course output (II)

The 2nd teaching experiment of the new course is conducted 1 month after the last teaching. Also the two parts are distinguished: application of common media and new media. The creation activity is mainly based on individuals, which is different from the previous group activity. The works produced from the course is shown in Tables 4 and 5.

TABLE 4.

The output of traditional teaching media (II)

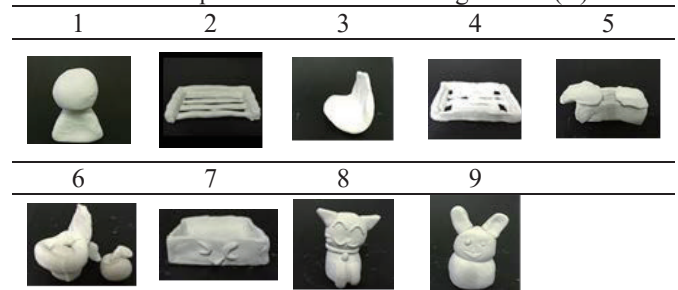
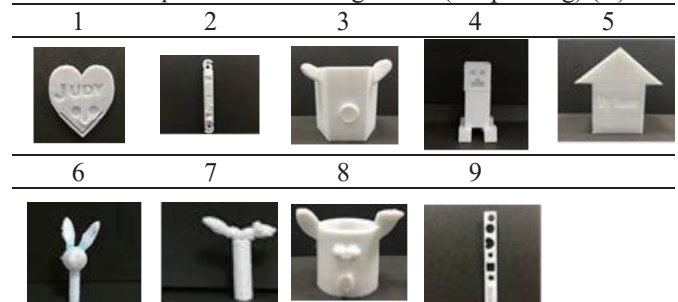


TABLE 5.

The output of new teaching media (3D printing) (II)



According to the feedback of expert rating scale, the concretization of the works using common media in this time is less than the previous phase, and functions for problem solving are more. As the design results are also affected by limitation of common materials, it is difficult to achieve the repetitive testing and remaking process in design thinking. Most of the students express themselves in spoken language and do not carry out further practice.

As for the application of new media, students have low frustration in the operation of 3D printing equipment or the use of graphics software because they have one learning experience in this experimental course. In the output of the works, their ideas are free and diversified. In learning, they are more concentrated on finishing their works and actively ask others questions they encounter.

Conclusion and Discussion

1. Conclusion

(1) Because of the new media and curiosity, the student mindfulness and learning persistence are increased. Moreover, many children express their willingness and interest in relearning after the course. Due to high completeness of the works, children can obtain higher learning achievements.

(2) The use of new media can quickly present the children's own ideas and help quickly modify presentation of concepts and creative results, and meanwhile repeated testing and correction can strengthen problem solving ability.

(3) The new media can make students discuss and share ideas with others more frequently and accept different opinions and ideas. At the same time, it can increase the student's mindfulness, and student using new media are more concentrated on their works than using common media.

(4) Due to the material properties (better strength), the new media can be applied to the field to directly test feasibility of ideas, and is helpful for feedback on the problem solving.

(5) The new media has higher value to reflect functions of the works, and shaping depends on proficiency of 3D software. Therefore, teachers shall carefully consider selection of the teaching plan.

(6) Teachers should control the teaching tempo and time in class so that students can have enough time to repeat tests and corrections.

(7) The content planning of the new course is partial to small topic-based indicator, and is different from the multi-objective learning in the semesters. Therefore, it is more suitable for after-school teaching, community activities or work camps and workshops.

2. Influence of new media application on children's creativity

(1) Improvement of children's creativity performance

In the experimental teaching course, most students imitate cartoon characters and other people's ideas to create works with common media. However, with the introduction of new media, students' creative imagination and thinking ability are gradually developed and they gradually create their own unique works. At the end of the new teaching course, the evaluation results of the teachers show most students have made progress in creativity and problem solving ability.

(2) Factors influencing children's creativity performance

During experimental teaching, it can be found that factors such as students' knowledge background and learning attitude may affect the implementation of creativity, and then affect the performance of students' works.

(2.1) Knowledge background: the students with artistic talent (for example: shaping, image representation..) have advantages in details but are more likely to be influenced by cartoon images, and most of them tend to concretize works, while the students with lower painting abilities have their own ideas due

to assistance of new media.

(2.2) Learning attitude: using the new media has improved students' interest, self-confidence, sense of achievement and other aspects. These self-abilities also relatively affect their creativity performance.

Research review and future recommendations

This study discusses the influence of introducing new teaching media on creativity course. Due to restrictions of the conditions, the teaching experiment is carried out in a single school, and the method is field teaching. As students' characteristics are diverse, the future practical teaching can be performed in multiple schools and teachers can be invited to observe and guide the practice to obtain more feedback on teaching needs, which can facilitate modification of the course contents, and innovative teaching model adjusting to teaching objectives.

Acknowledgments

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