

Analysis of Maker Education Model and Cultivation of Students' Innovative Ability

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Abstract: Maker education is one of the effective supplements of traditional classroom teaching, which has the potential to promote knowledge learning, practical ability and creativity training. This paper briefly reviews the development process of the "Maker Movement" in China, explores the development of innovation ability and intelligence, summarizes the characteristics of students' cognitive development and scientific literacy in different stages of basic education, and probes into the development ways of Maker Education in basic education. The article holds that different strategies should be adopted in the elementary, junior and senior stages of Maker education according to students' cognitive development and scientific literacy, and that learning from "play" middle school and "do" middle school based on real situation may be a phased choice.

1. Introduction

Maker Education focuses on the cultivation of learners' ability to innovate, the ability to solve practical problems, and the ability to communicate and collaborate, and is widely recognized by researchers. Carrying out research on maker education is of great significance for cultivating the innovative and comprehensive talents that the society needs urgently. However, as a new thing that involves new knowledge, new fields and new technologies, Maker Education lacks the teaching concepts and teaching modes that are compatible with it. This paper briefly reviews the development process of the Tourist Movement in China, explores the development of innovation ability and intelligence, summarizes the characteristics of cognitive development and scientific literacy of students in different stages of basic education, and explores the development ways of Tourist Education in basic education^[1].

2. Learning Style Based on Students' Cognitive

The purpose of Maker Education is to promote the comprehensive development of students' intelligence, especially creative intelligence and practical intelligence, and at the same time to improve students' scientific literacy. The development of students has a certain regularity, which determines the different ways of education for different segments of the Makers. The development of school entrepreneurship education needs to consider the needs of students' cognitive development, scientific literacy and digital learning ability.

2.1 Developmental Characteristics of Students' Cognitive

Relevant research on cognitive development psychology shows that primary school students' cognition is mainly based on concrete operation, and the transition from concrete operation to formal operation begins in the senior grade of primary school, and the differentiation of learning interest begins in the third grade of primary school. Therefore, the primary school students take concrete image thinking as the main form, and gradually transit to Abstract logical thinking, which can only be carried out on the basis of direct observation and solve very simple problems.

Pupils' attention is not easy to concentrate, they are more interested in the learning process and external activities of learning; with the growth of grade, and problem-solving ability gradually improves. In terms of scientific literacy, pupils begin to learn and understand the basic knowledge of science. They have natural interest and curiosity in science and like to explore in specific things.

In terms of digital learning ability, primary school students have a lower level of digital literacy, higher demand for digital resources such as images and animation, weak ability to process and use digital text resources, poor self-control ability in the information environment, and need more attention from schools, families and society ^[2].



Figure 1 The importance of Chinese education to the cultivation of students' innovative ability in recent years

As can be seen from figure 1, the Abstract logical thinking ability of junior high school students has gradually formed. The problem-solving ability based on information processing tends to be stable. They can learn and understand the core concepts related to science. They have the ability to describe, explain and explore the surrounding world with applied scientific knowledge, and initially form a sense of social responsibility. At the junior middle school stage, students' digital learning ability has been significantly improved. They have basic digital information processing ability and can participate in more complex information-based learning activities, but their self-control ability in the information environment is weak. In the aspect of cognitive development, high school students' Abstract logical thinking tends to mature, and their career preferences are preliminarily formed:

- ◆ At this stage, the cultivation of critical thinking and analytical thinking is the key.
- ◆ In terms of scientific literacy, through the study of natural and social sciences such as physics, chemistry, biology, and history and so on, senior high school students have initially formed a comprehensive understanding of the objective world, and can carry out scientific inquiry and propose solutions to engineering problems.
- ◆ In addition, senior high school students have strong digital learning ability, can flexibly use multimedia resources for information processing and expression, social interaction and personality development needs are strong, but the ability of self-control in the information environment is still weak ^[3].

2.2 Learning Style Based on Students' Cognitive

The cognitive development law and scientific literacy characteristics of students in different stages of basic education determine the differences in learning and teaching methods, and then determine the different development paths of school entrepreneurship education in different stages, as shown in Figure 3. Generally speaking, creative education in primary school should be carried out around the learning mode of "playing middle school". Creative education in junior middle school should mainly focus on "learning by doing". Creative education in senior middle school should emphasize the learning facing real problems, namely "learning by doing".

3. Learning Style of Students' Cognitive Development

The main idea of "playing in middle school" is to emphasize that learning occurs naturally when playing. In this process, children not only acquire basic knowledge, skills and accomplishments, but also begin to form a preliminary understanding and understanding of social rules. Vygotsky believes that play plays an important role in children's development. In play, children can practice self-control, learn knowledge, develop cooperation and other socialized behaviors. "Playing" and "learning" are two naturally occurring activities in children's daily life. Children are "playing in middle school" children, their understanding of "playing" and "learning" enables them to integrate "playing" and "learning" naturally^[4].

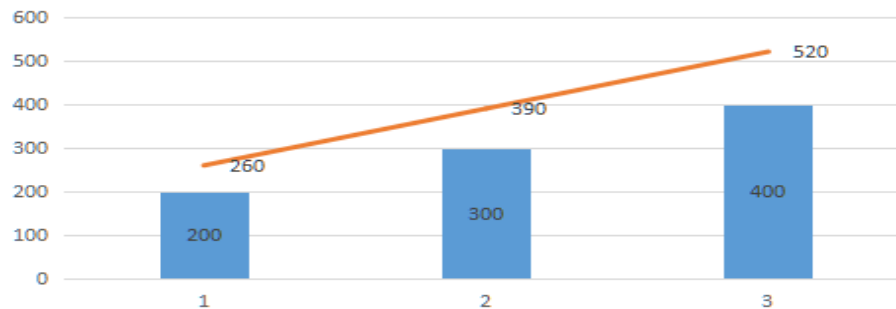


Figure 2 STEAM Hypothesis Permeability in China's Education Market

In figure 2, STEAM education in China is yearly increasingly, when carrying out Maker education, primary school students' learning style should mainly be "playing in middle school". "Learning by doing" emphasizes that education should be "geared to the practical application of social life and children's personal life", so that learners can use their existing knowledge to think and solve problems, and can solve similar problems in different situations.

The idea of "learning by doing" includes two important prototype activities: handicraft activities and scientific inquiry activities. Among them, handicraft activities attach importance to the explicit, hands-on, concrete and perceptual process of activities and the production of explicit and shaping results, such as handicrafts, paintings, models and publicity materials; while "learning by doing" based on scientific inquiry activities emphasizes the inward, reflective and rational process of thinking and exploration, and attaches importance to the generation of conceptual results through activities, such as artifacts, paintings, models and publicity materials. "Learning by doing" includes four activity cycles, namely, concrete practice, reflective observation, reflection and verification. The mode of "learning by doing" can be refined as follows: experiencing the process of inquiry, constructing basic knowledge, developing thinking and inquiry ability through observation, questioning, imagination, hands-on experiments, recording, expression and communication^[5].

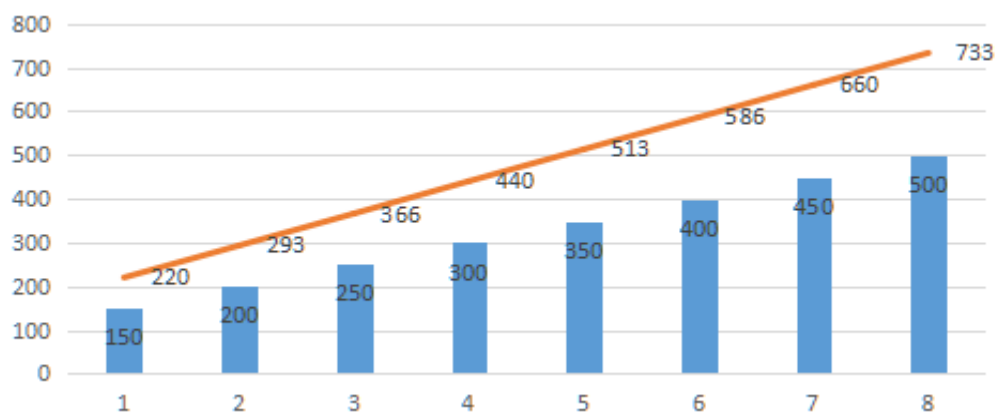


Figure 3 STEAM Education Market Scale under Different Permeability

From figure 3, we could conclude that in the high school stage, students' thinking development tends to mature, and their professional preferences will initially take shape. The original

"book-cantered" learning cannot fully meet the needs of students' development. Therefore, the learning style of senior high school students should focus on real problems and real situations, which is a form of "learning by doing". "Learning by doing" in senior high schools should emphasize the relationship between learning content and the real world and society, and learning content should be moderately open.

4. Conclusions

This paper briefly reviews the development process of Maker Education in China, probes into the development of innovation ability and intelligence, summarizes the characteristics of students' cognitive development and scientific literacy in each section of basic education, and on this basis explores the ways and paths of developing Maker Education in each section of basic education, mainly forming the following points of view:

Firstly, Maker education is one of the effective supplements of traditional classroom teaching, which has the potential to promote knowledge learning, practical ability and creativity training. Maker space construction needs to be coordinated with school environment, curriculum and teaching reform, as well as cultural construction.

Secondly, creative education should adopt different strategies according to students' cognitive development and scientific literacy in primary, junior and senior middle schools. Learning from "play" middle school and "do" middle school based on real situation may be its phased choice.

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