Review of the quality assessment and effect tracking of after-school service courses of science and technology in primary schools

Haoyu Zhu, Yuhan Xu

Hangzhou Normal University, Hangzhou310000, China

Abstract: From the global perspective, the international science and technology competition is becoming increasingly fierce. In order to meet the needs of the current social development, the after-school service of science and technology has developed in depth, but the potential problems have gradually emerged. The difference between the quality of after-school service of science and technology in primary schools and the deviation between the effect and expectation of after-school service of science and technology have increasingly become a problem that cannot be ignored in the after-school service of science and technology. This paper conducts a literature review on the quality assessment and effect tracking of after-school service courses in primary schools, and finally reviews the existing studies.

Keywords: After-school Service; Science and Technology Education; Quality Evaluation and Effect Tracking

1. Research in science and technology and education

1.1 Policy research on science and technology education

In terms of science and technology education policies, China attaches great importance to the role of education in promoting the development of science and technology, implements the strategy of "rejuvenating the country through science and education", and tries to promote scientific and technological progress through science and technology education. The researchers analyzed the direct relationship between science and technology education and national strength, and believed that science and technology education plays an important role in the realization of the great rejuvenation of the Chinese nation[1]. Education system reform and the relationship between science and technology education is one of the focus of scholars, the articles of association of the Ministry of Education Science and technology committee of China's education modernization 2023 and a series of documents issued and implemented, to promote the development of education, education information depth fusion of science and technology, science and technology education in method concept means of comprehensive innovation provides the policy guarantee.

1.2 Cognition research of science and technology education

Bartels And Rupe (2019) found that even if some teachers plan and implement courses that they consider technology content, they are still not sure what technology education is[2]. Radloff And Guzey (2016) took teachers who have received systematic theoretical learning as the main subject, and found that although such teachers can focus on the relationship or hierarchy between science, technology and students' quality development, they could not describe detailed concepts[3]. Ring et al. (2017) found that professional science teachers, despite their professional development training, still have no exact concept of science and technology education[4]. In general, teachers' cognition of science and technology education is not deep enough.

1.3 Research on science and technology education methods

Asghar (2012) pointed out that the discussion of science and technology education pedagogy includes the role of teachers in establishing a learning environment conducive to collaboration, creativity, innovation, and skill development[5]. Harron (2018) emphasized the role of design thinking in science and technology education, modeling the proposed to solve problems, students' learning needs, available opportunities in education, and designed solutions[6]. Johns and Mentzer (2016) point out that the principle of design thinking is an integral part of disciplines and interdisciplinary approaches, but there are differences in the way in which certain elements (especially conception and authen-

ticity) are established[7]。

2. Quality assessment and effect tracking system research

The quality assessment and effect tracking of science and technology education have always been a difficult problem in academia and educational practice. Based on relevant foreign studies, the quality assessment is mainly divided into three variables: teacher, curriculum integration and student.

2.1 Evaluation study with teachers as the variable

Park (2016) points out that teacher experience influences their views on science and technology education. Compared with new teachers, old teachers are more active in science and technology education. Nadelson (2013) believes that teachers' years of experience has nothing to do with their understanding or comfort of science and technology teaching[8]. In addition, teachers' enthusiasm for science and technology education will also affect their confidence and comfort level in the implementation of the curriculum. Stohlmann (2012) found that teachers with higher enthusiasm pay more attention to students' interdisciplinary learning ability, and are able to make more detailed teaching plans without knowing the time needed for students to complete each task. Van Haneghan (2015) pointed out that teachers with more teaching enthusiasm scored higher in the teaching technical knowledge related to science and technology education and the ability to achieve the goals of science and technology education[9]。

2.2 Assessment of curriculum integration as a variable

The key difficulty of the operation of science and technology education lies in that students often need to apply multiple subject skills and knowledge in the process of science and technology practice, and interdisciplinary courses focus on the integration and cooperation across fields. Bagiati And Van Haneghan (2015) believe that most teachers recognize the benefits of the cross-course nature of science and technology education and can provide valuable problem solutions for teaching[10]. Bruce-Davis (2014) noted that cross-course linkages that students establish are seen as an advantage of STEM education because they provide students with the necessary skills needed to approach and solve problems similar to those they encounter in their future careers[11]。

2.3 Evaluation study with students as the variable

Lesseig (2016) pointed out that the ultimate goal of science and technology education is to enable students to gain the perseverance and interest in solving problems[12]. Dare (2014) points out that technology education should be important on whether students can improve their designs and solutions[13]. Holstein and Keene (2013) believe that students' ability to think independently and critically determines the success of science and technology education[14]. El-Deghaidy (2017) believes that students' cooperative ability is also one of the important indicators in the evaluation of science and technology education[15]. Quality evaluation and effect analysis from the perspective of students is also an important part of the evaluation system.

3. Research review

When the above research results comprehensively analyze the quality evaluation and effect tracking of after-school primary school science and technology services, although they cover many aspects, there are still shortcomings, mainly manifested in the following two points.

First, the research mostly focuses on theoretical exploration and policy analysis, and the empirical research needs to be strengthened. Science and technology after-class service involving human capital and implementation path, but mostly stay in the theoretical level, the mechanism of in-depth analysis and the application of empirical research, lack of specific case analysis and data support, for the basic education stage of science and technology education for systematic and specialized research is necessary.

Secondly, the study of sustainability and practical operation process is difficult, and the optimization strategy needs to be innovated. Most of the quality assessment research focuses on the three variables of teachers, cross-course integration and students. Although it puts forward implementation paths and policy measures such as paying attention to students' enjoyment and participation and establishing scientific

quality view of basic education, the analysis is not in-depth enough and may face some difficulties in practical operation.

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About the author:

Haoyu Zhu (2003-), female, Hangzhou, Zhejiang, undergraduate degree, Hangzhou

Normal University, primary school education