The Impact of Preschool Teacher Training on STEAM Education: Professional Preparedness and Confidence

Wan-Chen CHANG
Department of Early Childhood Education, National Tsing Hua University, Taiwan
*wc_chang@mx.nthu.edu.tw

Abstract: This study aims to explore the impact of teacher training in the field of STEAM education on preschool teachers' preparedness and confidence. The participants of this study were nine education and childcare professionals from a public preschool in northern Taiwan. A small-scale workshop was conducted to train the teachers, covering topics such as an overview of STEAM education, STEAM learning for preschoolers, teaching methods, and curriculum design. The results revealed that prior to the training, the teachers had a high awareness of the importance and expected outcomes of STEAM education. However, they scored relatively low in terms of teaching experience and self-efficacy. After the training, the teachers showed significant improvement in their knowledge of STEAM teaching methods and environmental support. Nevertheless, their ratings for confidence and teaching efficacy remained relatively low. These findings highlight the need for further professional development and support for teachers in the field of STEAM education. The results of this study provide valuable insights and recommendations for teacher training and instructional practices in preschool settings.

Keywords: preschool teacher training, STEAM education, confidence, teaching efficacy, curriculum design

1. Introduction

Under the impetus of policies and educational trends, both parents and teachers are highly supportive of implementing STEAM education at the preschool stage. However, adults need additional knowledge and support to facilitate the execution of STEAM education (e.g., Margot & Kettler, 2019; McClure et al., 2017; Simoncini & Lasen, 2018). In particular, teachers play a crucial role in STEAM education at the preschool level (Karademir et al., 2020; Simoncini & Lasen, 2018; Monkeviciene et al., 2020; Wahyuningsih et al., 2020). This is because teachers can only successfully incorporate it into the curriculum when they fully understand the components of STEAM education (Pang & Good, 2000). However, to successfully integrate STEAM education into the curriculum, teachers need to grasp additional knowledge and skills. Therefore, it is vital to provide training and support for preschool teachers' professional development in STEAM education. This study aims to understand preschool teachers' cognition and beliefs about STEAM education, their professional needs, and challenges in STEAM education, and to explore how to provide effective professional development training and support in STEAM education. The goal is to enhance preschool teachers' professional capabilities and confidence in STEAM education, thereby promoting children's learning and development.

2. Research Method

2.1 Research participants

The participants of this study are nine teachers from five classes in a public kindergarten in northern Taiwan. The kindergarten, which adopts a thematic teaching curriculum model, selected the themes for its courses after receiving STEAM education training.

2.2 Research Instruments

2.2.1 STEAM Teaching Questionnaire for Teachers

This study will develop a questionnaire on teachers' beliefs about STEAM teaching based on previous research. Pre-tests will be administered when the teachers participate in the first phase, and post-tests will be administered after the second phase concludes. The questionnaire structure includes five major dimensions: the importance of STEAM education, teaching methods for implementing STEAM education, support for implementing STEAM education, self-efficacy, and expected outcomes. The questionnaire uses a seven-point scale, with respondents selecting an option from a continuum ranging from "strongly agree" to "strongly disagree" (7 6 5 4 3 2 1).

2.3.2 Mid-term Progress Review of Teachers' STEAM Teaching

To understand how teachers are implementing the STEAM curriculum during the semester, the researchers will have discussions and interviews with the teachers from each class during the semester to understand the challenges they face while implementing the curriculum.

3. Preliminary Data Analysis

This study analyzed the data from the teachers before the training, and the results are shown as below. Looking at the means, teachers have a positive attitude in all five dimensions. Particularly, teachers believe in the importance of STEAM teaching (M = 5.65, SD = 1.09) and have a higher average score for the expected outcomes of STEAM teaching (M = 5.58, SD = 1.06), indicating that teachers have a more positive attitude towards the learning outcomes of STEAM teaching for children. The average score for teaching experience is relatively low (M = 4.23, SD = 1.31), indicating that teachers' previous experience with STEAM teaching is quite lacking, even including a lack of experience in science inquiry teaching.

Further analysis on the importance of STEAM activities indicates that teachers believe effective STEAM education is crucial for enhancing children's hands-on capabilities and problem-solving skills (M = 6.19, SD = 0.71), as well as stimulating their curiosity and interest in everyday phenomena (M = 6.10, SD = 0.79). On the other hand, they do not place as much emphasis on enhancing children's acquisition and understanding of STEAM knowledge (M = 4.67, SD = 0.92).

In response to open-ended questions, the majority of teachers (85%) believe that the essence of STEAM education lies in using inquiry-based problems to help children develop relevant skills, such as learning by doing, logical thinking, problem identification, problem-solving, and collaborative abilities. Regarding potential future challenges, most teachers (94%) are concerned about their lack of STEAM teaching expertise, particularly in preparing teaching methods. This result aligns with the findings from the questionnaire.

After the implementation of the thematic courses, a mid-term review revealed that teachers still lack confidence in their teaching (M = 3.94, SD = 1.27). The teachers' efficacy in STEAM teaching (M = 4.29 , SD = 1.20) and encouragement for children to use scientific inquiry methods in STEAM teaching (M = 5.04, SD = 1.35) were also examined. This shows that, compared to before the training, teachers are now able to utilize more scientific inquiry methods, but there has been no significant difference in their teaching efficacy. Therefore, it is necessary for university professors to provide more explicit guidance to give them concrete goals for STEAM teaching.

4. Conclusion and Discussion

The results of this study indicate that teachers have high expectations for the implementation of STEAM education in early education stages, and they highly value the development of children's abilities. After the training courses, teachers utilized more child-centered teaching methods in STEAM courses, but their self-efficacy in teaching remained insufficient. In addition, teachers moderately utilize exploratory methods and dialogue to foster the cultivation of higher-order thinking skills, as well as reflection and self-reflection abilities (Monkeviciene et al., 2020). Therefore, professional development in STEAM domain knowledge and teaching methods are necessary for teachers in STEAM education.

Acknowledgements

The authors would like to thank National Science and Technology Council of the Republic of China, Taiwan, for financial support (NSTC 111-2410-H-007-063 -)

References

Margot, K. C., & Kettler, T. (2019). Teachers' perception of STEM integration and education: A systematic literature review. *International Journal of STEM education*, *6*(1), 1-16.

McClure, E. R., Guernsey, L., Clements, D. H., Bales, S. N., Nichols, J., Kendall-Taylor, N., & Levine, M. H. (2017). STEM starts early: Grounding science, technology, engineering, and math education in early childhood. New York: The Joan Ganz Cooney Center at Sesame Workshop.

Simoncini, K., & Lasen, M. (2018). Ideas about STEM among Australian early childhood professionals: How important is STEM in early childhood education?. *International Journal of Early Childhood*, *50*(3), 353-369.

Karademir, A., Kartal, A., & Turk, C. (2020). Science education activities in Turkey: A qualitative comparison study in preschool classrooms. *Early Childhood Education Journal, 48*(3), 285-304.

Monkeviciene, O., Autukeviciene, B., Kaminskiene, L., & Monkevicius, J. (2020). Impact of innovative STEAM education practices on teacher professional development and 3-6 year old children's competence development. *Journal of Social Studies Education Research*, *11*(4), 1-27.

Wahyuningsih, S., Nurjanah, N. E., Rasmani, U. E. E., Hafidah, R., Pudyaningtyas, A. R., & Syamsuddin, M. M. (2020). STEAM learning in early childhood education: A literature review. *International Journal of Pedagogy and Teacher Education*, *4*(1), 33-44.

Pang, J., & Good, R. (2000). A review of the integration of science and mathematics: Implications for further research. *School Science and Mathematics, 100*(2), 73–82.