

## The Self-Efficacy and Performance Exhibited by the Elementary Pre-Service Teachers Concerning about Scientific Inquiry

Ying-Feng Wang<sup>1</sup>

National Taichung University of Education, Taiwan, Republic of China<sup>1</sup>

### Abstract

*The purposes of the study were to investigate the pre-service teacher self-efficacy and performance about inquiry based teaching and learning. In Taiwan, scientific inquiry and operation were emphasized in science teaching and learning according to the new Taiwanese National Curriculum Guideline. Eighty-two pre-service teachers taking the elementary science methods course at the National Metropolitan University participated in the study. The participants completed a sequence of inquiry-based learning activities and learned to define the variables in designing the science activities. They tried to develop the science activities through the processes of confirmation inquiry, structured inquiry, guided inquiry, and open inquiry. Both quantitative and qualitative methods were applied in this study. This instrument was consulted and validated by ten science researchers. At the end of the course, the participants did their efforts to exhibit their pedagogical content knowledge in micro-teaching and filled out the questionnaires of scientific inquiry. The questionnaires of scientific inquiry were created by the researchers to measure their interests, attitude, self-efficacy concerning about inquiry-based teaching and learning held by the pre-service teachers. Then, pre-service teachers' self-efficacies of scientific inquiry were examined and analyzed with statistical methods. Data were collected from the lesson plans, micro-teaching, and feedback from the pre-service teachers. The findings indicated that the pre-service teachers with science major played more active roles in designing, re-modifying the variables of science experiments, and provide convincing explanation to science theories than the pre-service teachers with non-science major. Most of the pre-service teachers with science major exhibited high interests in scientific inquiry learning and teaching. Their performance more easily reached the levels of guided inquiry and open inquiry. However, the pre-service teachers with non-science major used to follow the protocol and did the experiment step by step. They enjoyed science learning through confirmation inquiry and structured inquiry processes. Meanwhile, they explained science concepts with more narratives and tried to make science easily to understand than the pre-service teachers with science major did. Therefore, in order to nurture the pre-service teachers' pedagogical content knowledge about scientific inquiry, it is recommended to develop the inquiry based learning activities according to their academic background.*

**Keywords:** *Pre-service teachers, self-efficacy, scientific inquiry*

### References

- [1] Cohen, (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). New York, NY: Lawrence Erlbaum.
- [2] Bybee, R. W. (1993). *Reforming science education: Social perspectives and personal reflections*. New York, NY: Teachers College Press.
- [3] Finley, F. D. (1982). Teacher's perceptions of important and difficult science content. *Science Education*, 66(4), 531-538.
- [4] Khalaf, B. (2018). Traditional and Inquiry-Based Learning Pedagogy: A Systematic Critical Review. *International of Instruction*, 11(4):545-564
- [5] Kulgemeyer, C. & Riese, J. (2018). From professional knowledge to professional performance: The impact of CK and PCK on teaching quality in explaining situations. *Journal of Research in Science Teaching*, 55 (10), 1393-1418.
- [6] Linn, R. L. & Miller, M. D. (2005). *Measurement and assessment in teaching* (9th. Ed.). Englewood Cliffs, New Jersey: Prentice Hall.
- [7] National Science Resources Center (1997). *Science for all Children: A guide to improving elementary science education in your school district*. Washington, D. C., National Academy Press.
- [8] Pajares, F. (1996). Self-efficacy beliefs in academic setting. *Review of Educational Research*, 66(4), 543-578.
- [9] Raizen, S. A. & Michelsohn, A. M. (1994). *The future of science in elementary Schools: Educating prospective teachers*.



- [10] Schibeci, R. A. (1984). Attitudes to science: An update. *Studies in Science Education*, 11, 26-59.
- [11] Treagust, D. F., Duit, R. & Fraser, B. J. (1996). *Improving teaching and learning in science and mathematics*. New York: Teachers College Press.
- [12] Worthen, B. R., Borg, W. R., & White, K. R. (1993). *Measurement and evaluation in the schools*. New York: Longman.
- [13] Wright, T. (2017). *How to be a brilliant trainee teacher*. 2nd edition .New York: Routledge.