COMMENTARY

Pre-service Primary School Teachers' View of Nature of Science Helps Decision-making on Socio-scientific Issues

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***Abstract**: Since the 20th century, science and technology have developed rapidly, and the industrialization and modernization of countries around the world have been in full swing. In this context, the education of Socio-scientific issues (SSI) in classroom teaching in primary and secondary schools becomes particularly important. SSIs can serve as an important carrier for scientific, ethical, and moral education, an important path to develop the core competencies of individuals in the 21st century. As future teachers, pre-service primary school teachers receive good science education in the university, develop fundamental scientific literacy, and obtain a basic understanding of nature of science (NOS). Their mastery of NOS has a significant impact on their decision-making skills on SSIs. In science education for pre-service primary school teachers, more attention should be paid to improving their comprehension of NOS and critical thinking ability.*

***Keywords**: Pre-Service Primary School Teachers, Nature of Science (NOS), Socio-scientific Issue (SSI), Decision-making Skills*

SCIENCE and technology are a double-edged sword. They have played a key role in the history of human development, civilizing and modernizing human society. However, the progress of science and technology has also brought numerous environmental, ethical, and moral issues. Since the 1990s, faced with problems induced by industrialization and modernization, many countries have begun to include socio-scientific issues (SSI) in primary and secondary school science education. SSIs are controversial social issues which relate to science (Zeidler & Keefer, 2003), including genetic engineering, global warming, medical experiments on animals, etc. They are used in

science education to promote students' scientific literacy and ability to apply scientific and moral reasoning to the real-world issues. A number of studies have demonstrated that SSI education can effectively improve students' understanding of science, empathy and moral reasoning. Compared with conventional STS (Science, Technology and Society) courses, the introduction of SSIs into science education can better encourage students to reflect on the relationships between science and technology, mankind, and social development in real-world situations, and enables students to have a more comprehensive understanding of scientific knowledge and a deeper comprehension of nature of science (NOS). In general, teaching based on SSIs in primary and secondary schools helps primary and secondary school students apply and reflect on scientific knowledge in authentic science scenarios and assists in cultivating citizens with scientific literacy by providing a contextual environment for the learning of scientific knowledge. In addition, SSI education encourages students to reflect, reason, and demonstrate to develop a social conscience (morality) and critical thinking based on scientific knowledge and social issues. As a result, it fosters "functional scientific literacy" in primary and secondary school students (Zeidler et al., 2005) through analysis, reasoning, interpretation, and even self-regulation, which is also the core competence that every world citizen should have in the 21st century (Lee et al., 2012).

SSI education demands students' active participation in SSI decision-making to achieve educational goals. Therefore, decision making is a key capability SSI education intends to foster. Previous studies have shown that students' scientific knowledge, NOS concepts, individual emotions, morality and values can affect their socio-scientific decision-making (Jho et al., 2014). Teachers also need good decision-making skills to carry out SSI instruction, and such decision-making skills depends on whether they have a profound understanding of scientific knowledge and nature of science. How to transform this understanding into reasoning and decision-making skills on SSIs, and how to implement classroom teaching based on pertinent SSIs have become the challenges in pre-service teacher education and in-service teacher training.

"*Pre-Service Primary School Teachers' Application of the Features of the Nature of Science to Socio-scientific Issues*" conducted in-depth research into this topic (Saka, 2023). This article states that NOS education includes scientific epistemological beliefs and beliefs of individuals about NOS knowledge as well as some assumptions, apart from the distinctive features of scientific knowledge (Khishfe & Lederman, 2007) and argues that it is worth studying how pre-service primary school teachers apply their NOS knowledge to controversial SSIs. An exploratory qualitative research method was used to collect data from 77 pre-service primary school teachers in the third grade of college based on the learning environment of the "Science and Technology Teaching" course. Research findings showed that pre-service primary school teachers could make good use of the characteristics of NOS, the tentativeness of scientific knowledge, and the fact that science is based

on observation and experiment in socio-scientific decision-making. The use of subjectivity, creativity, and observational features of scientific knowledge by pre-service primary school teachers could improve their decision-making skills in addressing SSIs. This study provides empirical evidence for the application of NOS knowledge to decision-making on SSIs by pre-service teachers. In science training for pre-service teachers, universities should pay more attention to NOS education and reflective science education to improve their scientific literacy and critical thinking skills including socio-scientific decision-making.

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***Conflict of Interests**: None.*
***Doi:** 10.15354/sief.23.co031*