Engaging Students to Perceive Nature of Science Through Socioscientific Issues-Based Instruction

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Abstract

In the relation to world of change, learning science is stimulated by source of scientific knowledge and various kind of pedagogical strategies. Some issues that concerns science and social dimension are raised and critiqued in many areas. Socioscientific issues are widely distributed in terms of promotion nature of science and leads scientific literacy. In this way, environmental concerns, technological concerns, discussions about the nature of science and its socially dependent nature can be addressed. It is a natural place for discussion about social justice to occur within science. These are very important in science curriculum, defined as one of the direction of science literacy and it also is developed as a part of national science education effort. This article reviewed and discussed ways to engage students to perceive nature of science through socioscientific issues-based instruction in a professional science education community.

Keywords: Socioscientific issues, nature of science, scientific literacy

Introduction

Scientific literacy has become an internationally well-recognized contemporary educational goal. It is defined that "what the general public ought to know about science" (Durant, 1993). Also, scientific literacy is commonly implied as an appreciation of the nature, aims, and general limitations of science, coupled with some understanding of the more important scientific ideas (Jenkins, 1994). Norris and Philips (2003) concluded that the term scientific literacy has been described as (a) knowledge of the substantive content of science and the ability to distinguish from non-science; (b) understanding science and its applications; (c) knowledge of what counts as science; (d) independence in learning science; (e) ability to think scientifically; (f) ability to use scientific knowledge in problem solving; (g) knowledge needed for intelligent participation in science-based issues; (h) understanding the nature of science, including its relationship with culture; (i) appreciation of and comfort with science, including its wonder and curiosity; (j) knowledge of the risks and benefits of science; and (k) ability to think critically about science and to deal with scientific expertise.

Scientific literacy is a scientific literate person one who uses scientific knowledge and scientific way of thinking for individual and social purposes (AAAS,1990; NRC, 1996). Also, scientific literacy is placed on the literacy component in recognition of the trend towards relating scientific literacy to skills and values appropriate for a responsible citizen. Rejected is a consideration that scientific literacy is related to an emphasis on the acquisition of content and this is especially considered, noting the social bias and cultural embedding of science. The emphasis on enhancing scientific literacy is placed on an appreciation of the nature of science, the development of personal attributes and the acquisition of socioscientific skills and values (Holbrook and Rannikmae, 2009).

This point of view towards view of scientific literacy, and nature of science can be argued that engaging instructional strategies based on inclusion of socioscientific issues in science classroom, promoting scientific literacy, and awakening perception nature of science might have to be incorporated into school science curriculum.

Nature of Science and its Relation to Science Education

Today, scientific knowledge and technological products are expanded, this situation science and social controversial are stimulated and need to incorporate into school science. Learning strategies need to prepare how students learn in the era of changing world. Science educators should engage students learn how to think as scientist and also social concerns. When we have a good science teaching it can help our society to prepare good society and gain community to aware present and future. Lederman and Zeidler (1987) described nature of science as an individual's values inherent to his or her development of scientific knowledge. It is about how science proceeds, how the scientific community decides what to accept and reject, and how much faith there is in a large body of scientific knowledge and beliefs (Marks and Eilks, 2009).

The important goal of describing nature of science is for science education, science teachers need new things and creative method for addressing the various aspect of nature of science. They need training in order to effectively integrate nature of science and lead scientific literacy in the classroom (Sadler, 2002; Nuangchalerm, 2009a). It seems that the nature of science within science education schools can be considered from different perspectives: (a) it can relate to the development in science in a conceptual sense (Zoller, 2001). (b) it can be an examination of the ways in which scientists work and a consideration of the variety of scientific methods related to process skills (Tytler, 2001) (c) nature of science in a social setting and encompasses socio-scientific decision making. It is interacted with other areas such as economics, environmental, social, politics and certain moral and ethical aspects. If it is appropriate for social considerations, it is to suggest that knowledge is not fundamental to the idea of scientific literacy, then the basis of scientific literacy can be considered, as the nature of science, personal attributes and social development (Holbrook and Rannikmae, 2009).

Sadler and Zeidler (2005) advocate socioscientific issuce (SSI) in science to develop students' skills in discussion ethical issues. Socioscientific issues are defined as "controversial, socially relevant issues within science curricula" (Sadler et.al., 2006). Socioscientific issues (SSI) have come to represent important social issues and problems which are conceptually related to science in societal dimension. Whereas scientific knowledge and inquiry practices can be useful for the negotiation of science and society concerns are still moving. Issue solutions are necessarily shaped by moral, political, social and economic concerns; therefore, inquiry and negotiation of SSI require the integration of science concepts and processes with social constructs and practices.

Socioscientific Issues-Based Instruction

Science education can be affected people preparation for tomorrow, many socioscientific issues are emegered due to the result of science and technology production. These may influence individuals' scientific reasoning (Sadler and Zeidler, 2005b). Effective teaching within socioscientific issues-based instruction requires teacher resources in addition to subject-matter knowledge, complex subject-specific knowledge for teaching, and relevant to teaching identities. Science teachers may view ethical and moral dimensions of science as important (Sadler et al. 2006), but may not view them as equally important dimensions of their developing professional identity in science education (Zeidler et al. 2005). However we must also recognise the inherent challenges of using SSI in educational contexts. The virtues of using SSI in science education contexts, need classroom practitioners require more direct, evidence-based answers to the question of what students gain by engaging in socioscientific inquiry (Nuangchalerm, 2009b).

Students have faced challenges in scientific knowledge, technological creativity, environmental situation, and social concerns. In promoting scientific literacy, they suggested to learn and modify socioscientific issues toward understanding of concepts related to ecosystems dynamics. Their modifications to the activity model and suggestions for connecting them to live within personal experiences that also primarily conceptually oriented. While accounting for students' ideas, they primarily suggested doing so as a means to assess whether or not content learning goals had been met. This reflected their own dominantly rationalistic reasoning about the issue, as well as their sense of their role and limited knowledge about socioscientific and technological criteria (Nuangchalerm, 2009b).

Argumentation can transform idealized notions of science classrooms from repositories of science facts to environments that foster legitimate peripheral participation (Lave and Wenger, 1991). Students do not just learn about science or complete science activities; they become more broadly enculturated into science and come to appropriate scientific practices. While scientific practice include conceptual understanding and skills, commonly promoted in science. Exploring scientific controversies is one pedagogical approach that allow students to critically evaluate and debate competing scientific claims. As students gather, interpret, and consider evidence of multiple defensible positions, they may begin to conceptualize science as a dynamic and complex enterprise (AAAS, 1990). Student have argumentation to be limited and widely varying. Sadler and Zeidler (2005) suggest that differences in content knowledge are related to variations in the quality of informal reasoning. In this study, the students that possessed more advanced understandings of related science concepts had greater quality of reasoning.

Conclusion

Sadler (2004) suggests that while nature of science appears to play some role in informal reasoning. To assume that students' conception about nature of science follow directly from beliefs. Socioscientific issues are moral and ethical implications; therefore, the promotion of scientific literacy requires curricular attention to the moral and ethical implications of socioscientific issues. The socioscientific issues offer way to explore the nature of science, bridge student and scientific literacy, interdependence of science and society movement, and democratizing science in society.

The ideational teaching science need to response scientific literacy and fulfill nature of science, that deals with authentic socioscientific issues related to the way of life. The unit aimed to enhance active participation of the learners and encourage higher order thinking in class by applying teaching methods that reduce the unfamiliarity felt by students. This was expected through an explicit use of a variety of teaching and assessment-for-learning methods, suitable for Science for All students. Socioscientific issues-based teaching can make a connection between goal of science education and student needs and fulfill them to be full man in such higher order thinking, discussion skills, scientific argumentation, inquiry-based learning, and understanding the nature of science.

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