

The Impact of Science Teachers' Epistemological Beliefs and Metacognition on Their Use of Inquiry Based Teaching Approaches

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Abstract : Science education has recently become the top priority of government of Pakistan. Number of schemes has been initiated for the improvement of science teaching and learning at primary and secondary levels of education, most importantly training in-service science teachers on inquiry based teaching and learning to empower students and encourage creativity, critical thinking, and innovation among them. Therefore, this approach has been promoted in the recent continuous professional development trainings for the in-service teachers. However, the follow ups on trained science teachers and educators suggest that these teachers fail to implement the inquiry based teaching and learning in their classes. In addition, these trainings also fail to bring any significant change in students' science content knowledge and understanding as per the annual national level surveys conducted by government and independent agencies. Research suggests that science has been taught using scientific positivism, which supports objectivity based on experiments and mathematics. In contrary, the inquiry based teaching and learning are based on constructivism, which conflicts with the positivist epistemology of science teachers. It was, therefore, assumed that science teachers struggle to implement the inquiry based teaching approach as it conflicts with their basic epistemological beliefs. With this assumption, this research aimed to (i) understand how science teachers conceptualize the nature of science, and how this influence their understanding of learning, learners, their own roles as teachers and their teaching strategies, (ii) identify the conflict of science teachers' epistemological beliefs with the inquiry based teaching approach, and (iii) find the ways in which science teachers epistemological beliefs may be developed from positivism to constructivism, so that they may effectively use the inquiry based teaching approach in teaching science. Using qualitative case study approach, thirty six secondary and higher secondary science teachers (21 male and 15 female) were selected. Data was collected using interviewed, participatory observations (sixty lessons were observed), and twenty interviews from students for verifications of teachers' responses. The findings suggest that most of the science teacher were positivist in defining the nature of science. Most of them limit themselves to one fix answer that is provided in the books and that there is only one 'right' way to teach science. There is no room for students' or teachers' own opinion or bias when it comes to scientific concepts. Inquiry based teaching seems 'no right' to them. They find it difficult to allow students to think out of the box. However, some interesting exercises were found to be very effective in bringing the change in teachers' epistemological beliefs. These will be discussed in detail in the paper. The findings have major implications for the teachers, educators, and policymakers.

Keywords : science teachers, epistemology, metacognition, inquiry based teaching

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