

PROFESSIONAL DEVELOPMENT OF TEACHERS USING PROBLEM-BASED LEARNING (PBL)

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Introduction

Science teaching needs an integration of many kinds of knowledge especially a blend of content knowledge and pedagogical knowledge called Pedagogical Content Knowledge (PCK). Four components of PCK, knowledge of science curriculum, knowledge of students' understanding of science, knowledge of assessment of scientific literacy, and knowledge of instructional strategies were considered in designing professional development (PD) for Problem-based Learning (PBL) and teacher research project. Loucks-Horsely *et al.*, (2003) emphasized the importance of considering all students in a classroom and developing expertise to cater to the needs of students using research as a key principle in any professional development (PD) programme. In a single PD programme one cannot address all content issues and PCK that a teacher needs, but can help teachers learn content, translate the content into curriculum and study the most problematic aspects of their teaching, if teachers can recognize significant issues of practice to study. We believe that designing a professional development (PD) programme considering these concepts in a problem-based learning (PBL) mode (Sage, 2001), helps teachers in improving their practice of teaching science.

Methodology

The PBL teacher research programme was of 5-year duration (2004-2009), and in this study we used the third cohort of twenty-four teachers who followed summer 2007 workshop. The summer work was broken into three phases where participants received the guidance from the facilitators: i) 3 days working on science content understanding through the collaborative involvement in finding solutions to content dilemmas presented by the facilitators. ii) 4 days of unit development where participants developed a teaching unit based on their newly improved science understanding in an interactive environment. iii) 3 days analyzing episodes of teaching using PBL and developing teaching dilemmas for their action research in the coming year. Training on handling video cameras and writing research reports was also part of this phase. In all these phases, teachers worked in groups and were guided by the facilitators. In the final phase teachers implemented their unit plans developed during the summer in their classrooms and planned for improving a particular aspect of their teaching. Four to six teachers in a neighbouring community met monthly. Each teacher had an opportunity to present video clips of science teaching in their classrooms, student work and other artifacts to their group. The group worked together to identify and

research additional ways of improving practice. Teachers wrote a reflective summary on their participation as an electronic story (e-story) and presented in summer 2008 meeting.

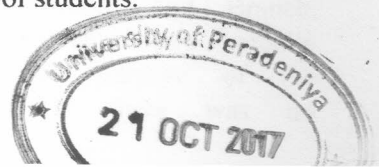
Results and Discussion

Analysis of the e-stories revealed that the teachers have chosen different aspects to improve their science teaching to help students understand science. These could be classified under four components of PCK and several interesting patterns were evident. Firstly, grade taught, strand (content studied during the workshop), and school context did not appear to correlate with PCK component studied. Secondly, knowledge of science curriculum was considered only by a group of four teachers in the same school (17%). These four teachers considered knowledge of student understanding of science and knowledge of instructional strategies in addition to knowledge of science curriculum. The collaborative effort of the four teachers led them to be satisfied with their efforts, but at the same time they wanted to continue working on the same teaching dilemmas next year. This shows how difficult it is for teachers to develop professionally in spite of the hard work and with guidance, but the important thing that we noticed is their desire to take many actions in PD. The problems that many teachers (43%) chose were related to the knowledge of student understanding of science. Problems related to knowledge of assessments were chosen only by 23 percent of teachers. Seventeen percent of teachers chose problems related to knowledge of instructional strategies. Finally and most importantly, despite

only minimum discussion and guidance about choosing teaching dilemmas, teachers chose issues of practice directly related to active student learning. For example, no teachers chose management issues or ways of delivering information as the focus of their study. Further choices made by them were successful in making changes in their classrooms. The non-threatening environment in the summer workshops helped build healthy relationships with the participants and with the colleagues and they extended these relationships for their PD. Some teachers went beyond our expectations. They not only made a change in their teaching but also helped others in making a pedagogical shift for student understanding.

Conclusions

With guidance teachers could be made to develop their Pedagogical Content Knowledge (PCK) to help them in taking innovative actions that lead for student understanding of science. From the findings it is evident that unless teachers have experience in PBL it is difficult for a teacher to use PBL in their classroom contexts. Flexibility and choice given to teachers in any professional development program may be able to yield fruitful results. The classroom contexts of the participant teachers in the study were very diverse, but were able to use PBL techniques in many different ways to help student learning science concepts. Hence, it is adaptable to many different classroom contexts around the globe with special modifications to suit the needs of students.



Considering problems in the classrooms as opportunities and teaming up help to build up a generation with the capacities for

creative thinking for economic growth and to the well-being of individuals, communities and societies.

References

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