STIMULATING STUDENTS FOR SCIENCE LEARNING THROUGH PROBLEM-BASED LEARNING (PBL)

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Introduction

Learning and teaching for competency-based curricula have been first introduced for grades 6 and 10 in 2007 and extended to other grades progressively every year so that all grades 6-13 use new curricula in 2010. Most students had the difficulties in understanding several new scientific concepts introduced in some units of the science curricula. Students are loaded with a lot of subject matter that could not be studied leisurely and with poor problem solving skills. There should be a better understanding for the learning to happen and for that relevant techniques must be used. Teachers fail to use strategies to help develop problem solving skills. Using problems or cases from real-life in teaching is effective for motivating students and enhancing their learning and development of skills (Akinoglu & Tandogan, 2007.) Problem-Based Learning (PBL) is an innovative educational approach that gains prominence in all levels and areas of education. PBL brings with it unique challenges to traditional assessment and evaluation as well (Karunaratne, Parker, Lundeberg, Eberhardt & Koehler, 2009.) Hence, in the present study PBL was used to help 8th graders in their science learning.

Methodology

Topics which are difficult to understand by 8th graders were collected after reading syllabuses and teacher instruction manuals and also having discussions with five teachers, three tuition masters and student groups (6-11). The second unit of the 8th grade science, "*Properties of matter and their uses*" was selected for the study. Informal talks were conducted with two teachers and 9th graders to identify problematic areas for the students under this unit. Teacher questionnaire was prepared and distributed among thirty teachers in the Kandy district who have experience in teaching new syllabus for grade eight. Problematic areas were clarified further from these responses and problems and activities were crafted based on them. A boys' school and a girls' school were selected for the study considering accessibility. Permission was sought from the respective principals and they were given request letters and consent forms. Two parallel classes of grade eight which were taught by the same teacher were selected from each school as a PBL and non-PBL group.

Diagnostic test was administered to all four classes. For the PBL group lessons were developed in the form of problems while discussing with the two teachers in the respective schools considering the issues emerged in

informal talks, teacher questionnaire and diagnostic test. They were informed about PBL and were given exemplary PBL lessons to read. Although the developed lesson plans were used only for the PBL group, concepts to be learned for each lesson were similar to both PBL and non-PBL groups. Teachers used same number of periods in both the classes. Researchers observed all lessons and made descriptive field notes. Responses of students for the given problems/assessments helped the researchers to determine the level of understanding of students. Data were analyzed by triangulating data gathered from observations, interviews and assessments. The results of the diagnostic test and achievement test were analyzed using a two sample t-test.

Results and Discussion

It was found that the students in the non-PBL groups were taught using lecture method for most of the sub-units and they were not given chances to ask questions. Teachers asked questions from few students and those questions were not related to real-life problems. These questions were asked only to check students' listening ability and knowledge. One of the non-PBL classes had no chances to observe elements or compounds during the lesson and had only one group activity to perform. In PBL classes teachers were keen in using problem-based stories and they started and presented it in interesting ways to students. Some students were very shy to come to the front and present at the beginning, but they performed well towards the end of the subunit.

Student comments showed that they were very happy in learning science through problem solving. The problems given with the stories motivated them to be curios in finding answers. One student had written, "*I like stories. After reading I want to find and explain quickly what our lesson is. Unlike others, these problems are not boring and they have pictures. They are enjoyable. For the most part, I am curious about what kind of story and topic there would be in each paper*". The PBL process has also helped them to understand and remember concepts since they found answers to problems. Another student had written, "*There is also group work every day that I can share work with other students. I take my friends' opinions in each problem and I learn new things. We both learn and have fun with this method. Most of the time I remember what I did in the group*". They had pleasure in reading different types of extra reading materials other than the textbook. A student said, "*I like different activities, experiments and pictures. Models also helped me lot to understand the lessons*". Further, the teachers stated that students have practiced to gain knowledge by themselves through PBL method by bringing several science books and articles to the class. They expressed easiness of guiding those students who show lack of understanding and slow, by this method, as peers helped them in the cooperative environment. Teachers were enthused in using PBL and tried out the method with 9th graders without help from the researcher. They expressed that they wanted to try this method for some other subunits in future.

Analysis of the diagnostic test showed that there was no difference between mean values for both groups, but analysis of achievement test showed that there was a significant difference between the PBL and non-PBL groups.

Conclusions

Real-life situations in problems helped students to learn concepts in a challenging but joyful friendly environment. It is recommended to include PBL lessons in teacher instruction manuals. Further, it is advised to use PBL in teacher training sessions and for prospective teachers at all teacher institutes.

References

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