

USE OF PROBLEM SOLVING STRATEGIES FOR MATHEMATICS

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Introduction

Mathematics is a subject in which actual structural relationships between concepts are connected with numbers and symbols together with their applications to problems arising in the real world. Thus, the learning of Mathematics shall mean the comprehension of those concepts and apprehension of their relationships together with their symbolization, and the development of the ability to apply the resulting concepts to real situations occurring in the world. As Mathematics involves a hierarchical building up of concepts, these mathematical concepts have to be strongly reinforced by primary teachers.

Sufficient evidence from the literature is found that mathematics instruction could be improved by the use of effective teaching strategies (Kersh&Mc Donald, 1991 & Killen 1996). Problem solving is one strategy that many writers have stressed as useful in mathematics education (Baroody, 1993 & Mayer, 1997). Also, there is a growing awareness of the importance of giving pupils the opportunity to develop problem solving skills for quality schooling.

The purpose of this study is to identify the use of problem solving strategies for mathematics in a New South Wales classroom. The lessons learnt from this school might contribute to the improvement of students' achievement in upper primary mathematics; the improvement of job performance of teachers; and the enjoyment of mathematics for children and teachers.

The objectives of this study are:

- To get useful insight into teachers' conceptions of problem solving and its importance;
- To investigate the teachers' problem solving lesson activities or strategies in a multi-grade classroom;
- To identify the difficulties that the teachers are confronted with in teaching problem solving.

In view of the above objectives, the following research questions are considered to be the focus questions:

1. Do three primary teachers in one primary school of NSW understand the importance of problem solving in teaching mathematics?
2. How do they conceptualise problem-solving skills?
3. What are the difficulties that the teachers are confronted with in teaching problem solving?
4. How are the problems solving lesson activities organised in a multi-grade classroom?

This study is important as it is carried out at a time in an ever-growing technological world, when the issue of developing 'learning to learn' has become one of the basic competencies from futuristic view. Also, it has become a challenge for anyone to solve 'real' problems in

their lives. This study has implication in this issue so that the researcher could examine and identify the issues related with teaching problem solving and could recommend these findings in Sri Lankan situation.

Methodology

There are a number of different views about the sequence and relationships of activities involved in breaking down the complexity of the real world to perceive the social reality of the setting. Because of the nature of both phenomenon and process of this study, a naturalistic paradigm was considered theoretically and conceptually most appropriate in achieving the purpose of this study.

The target school of this study was a Public Primary School situated in a southern suburb of the Illawarra. This school was involved in multi-grade teaching and well-known as a demonstration school. Three full time teachers (including the principal) were employed at the school. There were 67 students of different age groups enrolled at the school. These students were grouped into three classes and were taught. All three classes employed multi-grade teaching.

In view of the characteristics of the naturalistic investigations, semi-structured interviews and observation were used in data gathering techniques in the investigation of the use of problem solving strategies in the NSW primary classes.

Semi-structured interviews were conducted with all three participants of this study. Each participant was interviewed one at a time. Each interview lasted for about 20 minutes and each was audio-recorded. As semi-structured interview is one that consists of a set of questions worked out by the interviewer in advance, this type of loosely structured interview format was of use to help respondents express their views of a phenomenon in their own terms.

A lesson consisting of real problem solving strategies was observed by the researcher as a non-participant observer. The researcher took photographs of some of the activities to see how students were involved in real world problem solving activities.

In analyzing the data, the responses to the interview questions were organized in tabular form and compared. The main 'themes' were identified and supported with observation data to give interpretation after the analysis of the data.

Discussion and conclusion

The purpose of this study was to examine the use of problem solving strategies for Mathematics in one NSW school. Analysis of semi-structured interviews with three primary teachers of the NSW primary school and non-participant observation of problem solving activities in a multi-grade classroom has revealed the following findings:

- Teachers are fully aware of the importance of problem solving in teaching mathematics.
- They have conceptualised problem solving skills in the same way as current cognitive constructivist research findings depict.
- Teachers find it possible and easy to teach problem solving in a multi-grade classroom.
- They do many of the problem solving activities in an effective and organized manner.
- They give children opportunities to choose their own learning.

- Reflection is used for creative thinking-children's reflective reports are very important in this respect.
- Teachers and children enjoy mathematics learning through problem solving by connecting them to real life situations.
- Teachers and children find cooperative learning as a means of good problem solving.
- Children are motivated to record their reflections on these problem solving efforts including which strategies they used, where they got stumped, how they felt, and what lessons they have learnt. This would help students become more aware of their own thinking processes and would prompt them to monitor these processes more carefully to become better problem solvers.
- On discussion with some children, it was found that they really enjoy these problem solving activities but find it difficult to deal with word problems. Teachers' views also supported this finding.

As this study is a first attempt to identify the issues related with the use of problem solving strategies in a multi-grade classroom in NSW, it has the potential to make recommendations on problem solving as a means of improvement in instruction in Sri Lankan schools.

In conclusion, Mathematics can be effectively learned only by involving children in experimenting, questioning, reflecting, discovering, inventing, and discussing. Problem solving activities and strategies could develop all these and develop expertise to solve 'real' problems. An awareness of the problem solving process and strategies would help teachers to become better problem solvers and to impart that knowledge to their students.

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