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ABSTRACT

This study compared the effects of the nontraditional problem solving or problem-based approach and the traditional or algorithmic approach on students' critical thinking skills, conceptual knowledge in mathematics, competence in problem-solving, attitude and confidence towards mathematics and problem solving, and their learning patterns and behavior. Both approaches included the use of non-routine mathematic problems, small-group discussions, journal writing, and a free choice of appropriate problem-solving techniques in solving given problems. While the nontraditional problem-solving approach introduced concepts by using problem situations, the traditional approach introduced concepts by using problem situations, the traditional approach introduced the same concepts mainly through lecture discussions. Research-designed lessons were used to implement and assess the treatments involved.

The study used the quasi-experimental method of research and employed both qualitative and quantitative analyses. Two intact classes consisting of a total of 100 students enrolled in College Algebra I during the second semester of AY 2001-2002 in the University of San Carlos, Cebu City, were the subjects of the study. These students were classified as high ability and low ability on the basis of their IQ scores.

The students in both the experimental and control classes showed initial comparability on all the factors being compared. The performance scores improve after the students were exposed to their respective treatments.

Based on the pretest-to-posttest measures, which contained more algorithmic items, the difference in gains between the two classes was significant in favor of the control class with respect to conceptual knowledge. In terms of problem-solving abilities, the results were significant at p =.10 in favor of the experimental class. Although the results did not differentiate significantly in the critical thinking skills and the confidence and attitude towards mathematics and mathematics problem solving between the experimental and control groups, the qualitative results showed that the trend was still in favor of the experimental class.

The qualitative assessment done on the performance of each member of representative students of the respective classes indicated that the experimental group generally outperformed the control group. This was indicated by the former group's numerically higher scores and better-quality solutions and responses which manifested their critical thinking skills, conceptual knowledge, and problem-solving abilities.

Journal entries, interview protocols, and observation notes also indicated that there was a raised level of motivation and enthusiasm in solving mathematics problems among the

students of the experimental class as compared to the control class in spite of the former group's disadvantage with respect to the class schedule.

The overall assessment of the data showed these benefits obtained by the students exposes to the treatment: an indicated increase in the frequency of critical thinking skills indicators in their overall performance; a better understanding and retention of the concepts covered in the course; improved problem-solving abilities and better quality of problem-solving solutions presented; a more positive attitude and confidence towards mathematics and mathematics problem solving; and positive changes in the learning patterns and behavior of the students.

The results also show that with respect to problem-solving abilities between different ability levels and different gender types across treatments, the difference between the mean scores obtained by the male student groups of the two classes was significant at p =.10 in favor of the males from the experimental class; between the high ability groups of the two classes, the difference is very significant in favor of the experimental group. No significant difference was found between the low ability groups from the two classes: neither from the female groups of the two classes.

The nontraditional problem-solving approach in the classroom increased the students' confidence in their ability to solve problems, which in turn improved their overall performance in the course. The teacher became aware that students can show and improve their capabilities in problem-solving if allowed to solve these using their own chosen technique with the help of peers. The teacher also became more aware of the thinking process of the students, which allowed her to make connections at improving understanding of concepts using the students' point of view as jump-off point.