

CONTRIBUTION TO MATHEMATICS TEACHING AT SENIOR SECONDARY LEVEL VIA ERROR ANALYSIS OF PROBLEM SOLVING IN MATHEMATICS

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Mathematics is the language of science. Accuracy and preciseness are the two key issues of this important humanistic discipline at all levels. Therefore it should be taught to students in a clear and comprehensible manner, otherwise misconceptions would inherit into their minds deeply. Mainly due to these misconceptions, students make errors in problem solving in mathematics resulting poor achievement levels in mathematics at national level examinations. By detecting student errors in problem solving in mathematics and rectifying them, a significant contribution can be made to mathematics teaching at all levels. In this study, our experiment is limited to senior secondary level in the Trincomalee district and our aim is to categorize and to quantify student errors in solutions of mathematical problems at senior secondary level.

For this study we have selected 93 grade 11 students from five different schools and 60 grade 13 students from five different IAB schools from Trincomalee district. Another sample consists of 25 teachers who teach at senior secondary level in Trincomalee district was used to identify the areas of mathematics in which the diagnostic test has to be given. Two test materials were prepared and administered one to grade 11 with 20 open-ended questions and other to grade 13 with 25 open-ended questions. Test materials contained proofs, applications, computations, constructions in the areas of algebra, indices and logarithms, coordinate geometry, plane geometry and statistics for grade 11 and the areas of algebra, indices and logarithms, coordinate geometry, mechanics and probability for grade 13. These problem sets were administered to senior secondary level students. The errors made by students in the solutions were detected and categorized into 4 types, namely,

Category	Grade 11	Grade 13
(i) Usage of distorted theorems, definitions or rules [DT]	64%	46%
(ii) Misused data [MD]	09%	27%
(iii) Misinterpreted language [ML]	04%	10%
(iv) Technical errors [TE]	23%	17%

From the above results we note that a higher percentage of errors occur in the first category and relatively low percentage of errors occurs in the third category. Also, from our diagnostic tests we have obtained two sets of Error Location Matrices (ELM), one for grade 11 and the other for grade 13, taking the identified areas as rows and error categories as columns. These can be used as action models for errors, which will be valuable educational tools for senior secondary level mathematics teachers and researchers in mathematics education. To minimize the error percentages in the four categories, a remedial action was planned with "using errors as spring boards for inquiry" in the teaching experiment. After remedial action, chi-square test at 5% significant level indicates that there is a difference between the control group and the treatment group. "Error bar" graphs for each category show that there is a reduction of mean number of errors and the bar charts for each question indicate that there is a vast reduction (average 90%) of error percentages in the treatment group due to the remedial action.