Deductive formal proof in geometry: Implications for instructional practices

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Reasoning and proof is an important aspect in the general education curriculum in most countries. Learning formal deductive proof is the highest achievement of that aspect and learning formal proof has been acknowledged as a privilege. This opportunity is offered to all students in Sri Lanka only once. That is in geometry curriculum at senior secondary level. Deductive formal proof at that level basically contributes to the development of deductive reasoning skills leading to higher order cognitive skills such as logical thinking, problem solving and decision-making. While the importance has been acknowledged by educators, students' achievement in this area has been less than satisfactory. This under achievement in geometry has become a global issue as highlighted by major mathematics curriculum reform documents.

Researchers from cognitive psychology and mathematics education have focused on reasons underlying difficulties experienced by students in problem-solving in formal deductive geometry. Research literature on geometry problem solving reveals two broader reasons for this situation. First, a majority of students do not possess the required content knowledge. Secondly the nature of deductive proof is different to most of other mathematical problems. As these problems are non-algorithmic, content knowledge is essential, but not sufficient. As a result of this, almost all problems are unfamiliar to a majority of student students and they need greater instructional support during the solving process.

In a study to investigate the predictive indicators of geometry deductive geometry problem solving, multiple linear regression analysis was employed to analyse responses of 166 grade 11 students in Sri Lanka. In this study we found that not only higher achievement in geometry and content knowledge in geometry, but skills in problem solving also can influence the success of the problem solving in deductive geometry. On this finding, we present a model to overcome instructional barriers presently embedded in conventional strategies

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