

**COGNITIVE ANALYSIS AS A WAY TO UNDERSTAND STUDENTS'
PROBLEM-SOLVING PROCESS**

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and the solution scripts will be content analyzed. The outcomes will be a list of common errors made and their mental representations used by students according to the different topics in MAT037.

5.2 Enhanced Executive Summary

Education in Malaysia is always examination-inclined and mathematics education is still predominately a process of knowledge transmission. Teaching essentially remains a process for passing on knowledge, during which educators present and explain concepts to students who listen, take notes, possibly ask questions, and solve problems. Learning is by memorization and reproducing mechanically the learned facts to solve problems. Malaysian students took part in the Trends in International Mathematics and Science Study (TIMSS) for the years 1999, 2003, 2007 and 2011. Since the average mathematics scale scores dropped from 519 to 508 to 474 and 440, the performance of mathematics by secondary school students has declined.

For many years, a new conception that students actively construct their knowledge has come on stage. The construction process can be accomplished by students making connections, building mental schemata, and developing new mathematics based on their prior knowledge. To facilitate effective learning, educators have to understand which cognitive processes are used by students and how these processes help them to solve problems. From this perspective, analyzing student solutions and identifying errors made by students are valuable in revealing the knowledge and their mental representations, which include mathematics connections, mental schemata and their "own" mathematics or misconceptions used by students.

The objectives of the study were to identify the common errors in mathematics made by pre-diploma students taking MAT037 in UiTM Sarawak, and the mental processes corresponding to these errors developed by them. Pre-diploma students were selected because these students performed poorly in Sijil Pelajaran Malaysia (SPM). It is inevitable that they finished secondary education with many

5.3 Introduction

Nowadays, students in Malaysia no matter is primary school, secondary school, private colleges or universities and government universities are having problem or misconceptions in mathematics. Mainly, our research is to study on MDAB, pre-diploma UiTM students upon their mistakes and errors done on the concepts of mathematics through the course MAT037, Intensive Mathematics I.

5.3.1 Background

MDAB (*Mengubah Destinasi Anak Bangsa*) is a program that attempting our prime minister, Datuk Seri Najib Tun Razak since 2010. This program is officially launched by our Ex-Vice Chancellor, Y. Bhg. Prof Dato' Ir. Dr Sahol Hamid Abu Bakar. According to the article posted by The Rakyat Post on 26 August 2015, this MDAB program had given an opportunity for 32,485 Malay and Bumiputera students from lower household family to further their study in UiTM, University Teknologi MARA. There are two courses in MDAB that is pre-Diploma in Science and pre-Diploma in Commerce. MDAB is a bunch of students that most of them only having credit in SPM mathematics. So far, not much research had been done on this prospective group of students. So, this are the two points where contribute our research team to study on their students' performance in depth especially in Mathematics subject. We may like to study on the initial thoughts of the students' on the particular aspects in Mathematics problems.

5.3.2 Statement of the Problem

Educators have noticed that many students are quite able to learn the necessary formulas and apply them to solve simple problems involving a single concept, but when faced with complex problems, they fall short and show that they are far from

5.4 Brief Literature Review

This topic covers three main focus points for this study. The first one will be the initial plan of the theoretical framework, second about the several of systems and platform globally used to test and indicate students' performance and understanding on mathematics cognitively and in details. Third part is about the methods that have being used to test and evaluate the students' performance and their prior knowledge or concepts on mathematics that is through cognitive style and analysis.

Mathematics is important in our daily life as well as the development of a country's economy. Achieving high level of mathematics proficiency is direct proportional to oneself development and economy of a country (Lipnevich *et. al.*, 2016; Wang *et. al.*, 2014). A student's performance in national mathematics test is direct effect on health, wealth as well as social judgements in everyday daily life (Reyna and Brainerd, 2007; Geary, 1996). Once again it shows that mathematics is a critical subject in most of the professions such as in Business courses, Finance, Economics, Commerce, Administration, Engineering, Applied Sciences, Computer Sciences and others.

5.4.1 Errors in Several Mathematics Topics

Students making common mistakes or errors in the progress of obtaining or solving mathematics problems can happen any time and at any level of educations. Error analysis had been conducted a very long time in mathematics education (Bottge *et. al.*, 2014). Every year and at any town in this world, there are lots of researchers or educators would like to find a way to minimize students' mistake and increase their capabilities on solving on mathematics in certain areas such as arithmetic that involving the basic operations such as bracket, addition, subtraction, multiplication and division; rules and properties in fractions; solving algebraically and others. At the same time, the researchers believe that apart from students' own capability on their own understanding on mathematics, teachers also play an important role to guide them too. Self-development of interest in mathematics should be concern within two ways communications between the teachers and students