MDAB PROJECT: AN ASSESSMENT OF THE PREPARATORY COURSES FOR MATHEMATICS IN UITM

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BY:

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NURUL AKMAL BIN MD NASIR
MOHD ADLAN BIN RAMLY

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Surat Kami : 100-UiTM (NC 37/7)
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Professor Dr Parmjit Singh
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SELANGOR DARUL EHSAN

Y. Bhg. Professor,

PROJEK KHAS (VCSP) MENGUBAH DESTINASI ANAK BANGSA (MDAB) UNTUK KURSUS MATEMATIK

Dengan segala hormatnya, perkara tersebut di atas adalah di rujuk

2. Berdasarkan kepakaran tuan di dalam bidang **Pendidikan Matematik**, pihak university dengan sukacitanya ingin melantik Professor sebagai Ketua Project VCSP bagi Program MDAB untuk melaksanakan Projek Khas seperti berikut:-

i) Menilai dan mengenalpasti kekuatan dan kelemahan pelajar dalam pembelajaran matematik dalam Program MDAB.

ii) Menyemak dan menilai kurikulum untuk kursus Matematik bagi program Pra Sains dan Pra Perdagagan untuk pelajar MDAB.

ii) Mengenalpasti strategi sesuai untuk mempertingkatkan kaedah pengajaran yang efektif bagi program di atas

3. Dengan itu, pihak Canselori bersetuju meluluskan geran sebanyak RM30,000 untuk menjayakan Projek VCSP ini. Sehubungan ini, Y. Bhg. Professor diminta merujuk kepada Penolong Naib Canselor di Research Management Institute (RMI) demi tujuan perolehan geran penyelidikan ini.

4. Pihak university berharap agar Professor akan menjalankan kajian ini dengan penuh komitmen demi meningkatkan keberkesanan penggunaan Bahasa Inggeris di kalangan pelajar dalam Program MDAB

Sekian, terima kasih.

Yang benar,

DATO' SRI PROF IR DR SAHOL HAMID ABU BAKAR FASc
Naib Canselor

UNIVERSITI TEKNOLOGI MARA

Surat Kami : 600-RMI/DANA 5/3/VCSP (6/2013)
Tarikh : 04 Disember 2013

Profesor Dr. Parmjit Singh
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Kampus Seksyen 17
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YBhg. Profesor

KELULUSAN PERMOHONAN DANA KECEMERLANGAN (VCSP) 12/2013

Tajuk Projek	:	*MDAB Project: An Assessment of the Preparatory Courses for Mathematics in UiTM*
Kod Projek	:	600-RMI/DANA 5/3/VCSP (6/2013)
Tempoh	:	01 Januari 2014 – 30 Jun 2014
Jumlah Peruntukan	:	RM 30,000.00
Ketua Projek	:	Profesor Dr. Parmjit Singh

Dengan hormatnya perkara di atas adalah dirujuk.

2. Sukacita dimaklumkan pihak Universiti telah meluluskan permohonan kertas cadangan YBhg. Profesor untuk dibiaya di bawah Dana Kecemerlangan VCSP (Projek Khas Naib Canselor).

3. Bagi pihak Universiti, Institut Pengurusan Penyelidikan (RMI) mengucapkan tahniah kepada YBhg. Profesor kerana kejayaan ini dan diharapkan usaha ini dapat memangkin kemajuan Universiti Teknologi MARA khususnya kepentingan semua.

4. Pihak YBhg. Profesor adalah diminta untuk mengisi borang setuju terima projek penyelidikan dalam tempoh dua (2) minggu bagi tujuan kemaskini maklumat. Borang-borang penyelidikan Dana Kecemerlangan VCSP boleh dimuat turun di laman sesawang RMI (*http://rmi.uitm.edu.my/formtodownload.html*). Bersama ini disertakan tatacara ringkas pengurusan projek penyelidikan untuk rujukan dan perhatian YBhg. Profesor.

Sekian, harap maklum.

"SELAMAT MENJALANKAN PENYELIDIKAN DENGAN JAYANYA"

Yang benar

PROFESOR DATO' DR ABU BAKAR ABDUL MAJEED
Penolong Naib Canselor (Penyelidikan)

: Dilampirkan

Penolong Naib Canselor (Penyelidikan) : 603-5544 2094/2095
Bahagian Penyelidikan : 603-5544 2097/2091/2098/2101/5521 1462/1468
Bahagian Perundingan : 603-5544 2100/2787/2092/2093
Bahagian Inovasi : 603-5544 2750/2749/2748
Bahagian Penerbitan : 603-5544 1423/2785
Bahagian Sokongan ICT : 603-5544 2097/2104/5521 1465
Bahagian Sains : 603-5544 2098/5521 1463
Pejabat Am : 603-5544 2097/5521 1838/5543 7907
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3. Acknowledgements

Highest gratitude and thanks to all who are involved directly or indirectly who have gaiven their all to ensure the success and completion of this research.

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Secondly, our humble gratitude to the Research Management Institute (RMI) of Universiti Teknologi MARA for guiding and providing us support all the way towards the completion of this research.

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Finally, a large amount of gratitude to all researchers, research assistants, the Faculty of Education, Prof. Dr. Mohd Mustafa Mohd Ghazali, the Dean of the Faculty of Education and everyone who had greatly contributed to the completion of this research. A BIG THANK YOU and May God bless all of you.

4. Enhanced Research Title and Objectives

Original Title as Proposed:
MDAB Project: An Assessment of the Preparatory Courses for Mathematics in UiTM

Improved/Enhanced Title:
MDAB Project: An Assessment of the Preparatory Courses for Mathematics in UiTM

Original Objectives as Proposed:

a) to determine the level of readiness of students and instructors in the learning and teaching of Mathematics preparatory courses for their Diploma program.
b) to identify the adequacy of the preparatory course support given by the respective departments in implementing the Mathematic courses

Improved/Enhanced Objectives:

c) to determine the level of readiness of students and instructors in the learning and teaching of Mathematics preparatory courses for their Diploma program.
d) to identify the adequacy of the preparatory course support given by the respective departments in implementing the Mathematic courses.

5. Report

5.1 Proposed Executive Summary

Program Mengubah Destini Anak Bangsa (MDAB) is a funded program set up by Universiti Teknologi MARA (UiTM) to benefit underprivileged students with opportunities to further their studies at pre-diploma level. The funding for this program was established since July 2010 and currently it carries out three (3) pre-diploma courses, which are Pre-Commerce, Pre-Accountancy and Pre-Science at sixteen (16) UiTM branches nationwide. The crux of these selected students is those whose academic qualifications do not meet the minimum requirements to qualify for existing pre-university courses in Malaysia. This program inevitably provides these less fortunate students with education opportunities that they would never have received elsewhere.

However, the findings from the data provided based on the selected students examination results portray a major concern regarding the high failure rates of the math course MAT112 across three campuses (based on the given data from these campuses). For example, data from the Perak campus indicates that for the December 2012 – April 2013 intake, the failure rate for MAT112 was 53.95 (41 out of 76 failed). The data provided for the UiTM Sarawak campus (Jun – Nov 2012) indicates a similar result with a high failure rate of 50.34% (73 out of 145 failed). Meanwhile, the findings from UiTM Dungun also indicated similar results where the failure rate was 35.7% (94 out of 263). These results are of major concern as they impede the objective of this noble program, undertaken by our Vice Chancelor.

Utilising a mix method approach, firstly, this study intends to investigate the root causes that contributed to these students high failure rate. Secondly, to assess the overall effectiveness of the Mathematics program provided for these students, we will seek to examine the issues and concerns faced by both students and instructors alike. Hopefully by noting the concerns over these issues, various steps or measures can be taken to enhance the development of this program. Thus, the results of this study would, in one way or another, contribute to the further enhancement of this program for these less fortunate students, enabling their access to various education opportunities that they would never have received elsewhere.

5.2 Enhanced Executive Summary

Ever since its inception in July 2010 Program Mengubah Destini Anak Bangsa (MDAB), a program funded and conceptualized by Universiti Teknologi MARA (UiTM) under the leadership of Tan Sri Ir. Prof. Dr. Sahul had benefited underprivileged students with opportunities to further their studies at pre-diploma level. and the program had become a true calling for UiTM's original and ultimate goal of fabricating social mobilization for the bumiputera who are economically and academically underprivileged. In its current modus operandi, it carries out three (3) pre-diploma courses, which are Pre-Commerce, Pre-Accountancy and Pre-Science at sixteen (16) UiTM branches across Malaysia. The crux of these selected students is those whose academic qualifications do not meet the minimum requirements to qualify for existing pre-university courses in Malaysia, but may have shed some potential growth. This program inevitably provides these less fortunate students with education opportunities that they would never have received elsewhere.

The seminal focus of this research is to study and investigate the mathematics curricula that is currently utilized for the MDAB program to enhance the development of students' mathematical (algebraic) thinking. We believe that understanding on the current practise will increase our knowledge and our ability to handle the issues related to the development of students' mathematical thinking which would be ultimately reflected in the diploma programs. Of distinct interest will be the way the curricula prepare students to make smooth transitions from arithmetic to mathematics (algebraic thinking) from pre diploma to diploma level. To support these MDAB students' development of mathematical mastery, we need to help them make this smooth transition (between arithmetic and algebraic thinking) and appreciate the usefulness of mathematics in solving various problems. In view of this, the intricate and comprehensive process of assessing the effectiveness of this mathematics program from the angle of students' performance in exams, froming a given test, eliciting instructors' and students' feedback, reviewing of the content of the program itself and suggesting changes in the preparatory practices of teaching and learning Mathematic are the salient tasks that this research aimed to undertake, all in the ultimate goal of supporting and facilitating instructional improvement.

This three-phase study employed both the quantitative and qualitative approaches to assess the aforementioned variables. The first phase involved obtaining data from Mathematics Achievement Test that provided a comprehensive and thorough

depiction of the students' capabilities in the said tests. It also involved the application of interview analysis procedure that provided information with respect to the difficulties and root causes that inhibit these students learning of mathematics, primarily focusing on students' failure to answer Mathematics tasks satisfactorily. The second phase analyses students' and instructors' perceived views on the overall implementation of this MDAB program as a complementary data that would be more organic and humane. We examined the issues and concerns faced by both students and instructors alike via survey and interview protocols. Thirdly, we analyze the MDAB mathematics exams papers, since its inception in July 2010- Mac 2014, in terms of their specifications and content.

5.3 Introduction

Background

Resonating UiTM's truest and purest purpose, the MDAB programme was established to provide educational opportunities for the qualified poor Malays and the Bumiputeras from rural areas as well as urban areas, whose parents' monthly income is found to be less than RM2,000. Upon the completion of a six-month preparatory course, MDAB students will be offered opportunities to further their education in UiTM diploma programs or enrol for other skills courses depending on their results. Due to its high impact and social transformative nature, the implementation of this program had caused various stakeholders to be waiting anxiously for favourable and fruitful results. The main anticipation from these faithful stakeholders is to witness these selected students completing the MDAB programme so that they can progress and perhaps further their studies at a diploma, degree or even post graduate level indicating a successful social engineering

Such task of allowing social mobility through educational process however requires fundamental critical skills or learning contents to be honed among the students. One of the core subjects that serve such goal for this preparatory course in this program is Mathematics, and being a core subject, it is essential that students have a good foundation in it. Mathematics courses are highly essential because it is required for students who want to major in the areas of Business, Marketing, Finance, Commerce, Biology and many other areas science and humanities alike. The significance of the Mathematics course is also doubled in the MDAB context as the vast majority of diploma courses this program offers upon its completion require Mathematics. Thus,

students who under perform in Mathematics tend to forfeit many future career opportunities that they could have obtained, insistently having to turn their backs on more than half the job market. It is for these reasons that the importance of Mathematics for potential future careers could not be emphasized better.

The economic and financial impact of this MDAB program is not to be taken lightly. Given the current condition where scarcity of budgets, allocations from government agencies, foundations, and other sources of funding (e.g. Sime Darby, Bank Islam), it is highly imperative for the MDAB program to deliver what is promised to the stakeholders and investors. Subsequently, as the teaching force of the university, it is our responsibility to be able to provide this assurance. As such, we need to take a critical look at the program for our own purpose, to learn where it is working well and what changes we may need to make in order to optimize the results.

This study intends to evaluate the Mathematics courses in the MDAB program that will help to answer the fundamental (but highly intricate) question "Is this Mathematics program working?" Its aim is to find evidence of changes in students and instructors' behavior and, if there are changes, show that they result directly from participants' experience in the program, not from external factors.

A more important implication is to look beyond ask the next question of, "What are the issues and concerns faced by students and instructors after 2 years of its implementation?" In times of change, different reactions are considered normal. The creative tension that comes with the changes will lead to new ways of doing things. This scenario contributes to significant issues in the classroom and also to the achievement of students in mathematics. Ultimately, this study intends to investigate not only the effectiveness of MDAB since its implementation in 2010/11, but more importantly, it seeks to examine the issues and concerns faced by both students and instructors alike. Hopefully by noting the concerns over these issues, various steps or measures can be taken to enhance the development of this program. Thus, the results of this study would in one way or another, contribute to the further enhancement of this project for these less fortunate students with education opportunities that they would never have received elsewhere.

Problem Statement

The high failure rate of MDAB students in the Mathematics courses as shown from the examination results is of a major concern for the stakeholders. Since various faculties (or committees) have taken measures in preparing students for this program, one should ask, with the support system provided, are the students with limited Mathematics and English proficiency ready to grasp the basic skills and cognitive academic proficiency during their six months preparatory program? Secondly, the success of the implementation of this MDAB program depends a lot on the people who have the role of implementing this noble program, in this case the instructors and students which culminate to the question, "What is the level of instructors and students' readiness and commitment towards the implementation of this program?" Thirdly, the latest examination results revealed a high trend of passes in mathematics where majority obtained high grades in it. Because such result is such a drastic change, the need to investigate this upturn of the results both from the student's perspective and the content analysis of the exam papers itself arises predominantly. These aspects will be given due attention. Hopefully, by addressing these issues, various steps or measures can be taken to enhance the development of this program.

Objectives of study

a) to determine the level of readiness of students and instructors in the learning and teaching of Mathematics preparatory courses for their Diploma program

b) to identify the adequacy of the preparatory course support given by the respective departments in implementing the Mathematic courses.

5.4 Brief Literature Review

For decades past, it has been Malaysia's vision to be a developed nation by the year 2020. Referred to by Tun Dr, Mahathir as Vision 2020, the dream envisions a truly developed Malaysia that rivals other global leading nations in economics, industry, science and technology. Such vision however, is a very mechanically futuristic one, and hence requiring the learning of mathematics and science to play an important role in developing the thinking skills of individuals. Henry Pollack (1987), a noted industrial mathematician, summarized the mathematical expectations for new employees in industry, quarter of a century ago: "Understanding of the underlying mathematical features of a problem; The ability to set up problems with the appropriate operations; knowledge of a variety of techniques to approach and work on problems". Although this statement was elucidated 27 years ago, it is still of relevance in Malaysian context, especially towards our drive to be a develop nation. The key to producing more scientists and mathematicians is improving mathematics and science preparatory programmes at colleges, thus bolstering the number of students in science and technological pipeline. Advocating such utopian ideals however requires constant evaluation of mathematics and science preparedness as it is necessary to establish current levels of science and mathematics education and set benchmarks for future students based on such evaluation. In view of this, it is necessary to evaluate programs at colleges, based on students' readiness, instructors readiness and content analysis of course materials, to achieve the desired results.

One of the major aims of mathematical learning is the development of mathematical thinking. The common misconception is that "doing mathematics" is the same as getting involved in "mathematical thinking". This misconception stems from the pedantic mathematics education in Malaysian school systems that highlight the mastery of mathematics through rote memorization of formulaic structures. The consequential impact is negatively felt when such approach is no longer viable and usable in a higher level of tertiary education. As the focus of the education shifts from imitation and impractical exercise to critical production and innovation, more authentic and creative manner of solving problems are needed by professional mathematicians in resolving real life problems be it theoretical, mechanical, industrial or philosophical. These observations seem to point that there is a disparity between school mathematics, where success is guaranteed in conformist formulaic approach, and true mathematical thinking that requires "thinking outside-the-box", which would be more valuable to university students and professionals. Rallying to such argument, there is a widespread

agreement that mathematics should be taught as a thinking activity (Devlin, 2012; Ubuz, 2011; Chapman, 2011; Burton, 1984). What is even more important to ask is whether this development of mathematical thinking taking place in the current Malaysian education settings, especially at college level?

It is important to discuss about school mathematics, as the transition from school mathematics to college mathematics is always a crucial matter especially in determining the quality of college students' experiences in constructing their knowledge based on their prior learning in school. The current notion of school mathematics is based almost exclusively on formal mathematical procedures and concepts that, of their nature, are very remote from the conceptual world of the students who are to learn them (Heefer, 2013; Parmjit, 2012; Noraini & Parmjit, 2006). For an instance, Heeffer (2013) reported that students could use symbolism on algebra rules and not understand why the rules worked. A study by Parmjit (2006) on college students similarly found that the grades obtained in the examination mathematics did not indicate their mathematical knowledge in problem solving and majority of college freshmen have learnt how to do numerical computation at the expense of learning how to think and to unpack their mathematical content knowledge. Although instructors desire to promote critical thinking in the classroom and provide assessments that are likewise at a higher level, the truth is that most formative and summative assessment and classroom activities are at lower cognitive demand levels (Janet, et. al., 2012). In a study by ACT (2013), it was reported only 44% of 2013 U.S. high school graduates are ready for college-level mathematics. If these students are to be helped in developing the math skills that will enable them to enter STEM (science, technology, engineering, and mathematics) fields and allow the U.S. to remain competitive globally, colleges need to change some of their instructional strategies (Molina, 2014). Most certainly, this scenario is identically prevalent in Malaysian Higher Education settings.

For Malaysian students, the transition from high school mathematics to college level mathematics is often volatile, confusing and demanding. Even if they do well in school mathematics, most students are knocked off course for a while by the paradigm shift in emphasis from the secondary school mathematics that focuses on mastering procedures to the "mathematical thinking" characteristic of university mathematics (Devlin, 2012). Though the majority survive the transition, many others do not, which usually leads the students to leave mathematics for some other major (possibly outside the sciences or other mathematically-dependent subjects). Knowing such problem, to

help incoming students make this difficult shift, colleges and universities often have a "transition course" or a preparatory course like the MDAB program.

The spectrum of studying the transition from school mathematics to college mathematics is infinitely wide. Nevertheless, the primary concerns can be refined into a more feasible perspective. From the discussion above on the transition of school mathematics to college mathematics, there is a widespread agreement that mathematics should be taught as a thinking activity (Devlin, 2012; Ubuz, 2011; Chapman, 2011; Treffinger, 2008; Wiggins, 1988; Burton, 1984). Consequently, the emphasis in instruction should be shifted from learning the rules for operations to understanding of mathematical concepts. One possible solution is to encourage the transition by providing students with "problem solving tools" that would allow them to be accommodative to changing needs (Treffinger, 2008) Another salient approach is the one that encourages the students to ponder deeply about the mechanics and process of the mathematical thinking upon completing problem solving exercises, which would usually fabricate cognitive tools that the students could use fluidly in various random circumstances (Wiggins, 1998). To operationalize this development, instructors should shift their approach from the traditional computation and routine based one to a conceptual one. The former method involves teaching of rules and procedures rather than the conceptual thinking of mathematics. Development of conceptual mathematical thinking could be developed by getting students to think about mathematics and representing topics in ways other than procedures. Doing this requires that we, as instructors, obtain information concerning students' thinking activities, their efforts at understanding, and their conceptual difficulties. The prime focus of this research is to enhance the preparatory courses of mathematics for the Pre-Diploma program. We tend to investigate students level of readiness, difficulties, issues and concerns faced by students (and instructors) and the adequacy of the preparatory course in terms of its content. It is of paramount importance to evaluatye the curriculum because this will ensure that all students will achieve a level of mastery of mathematics that will serve them well in diploma (and later stages) and for those who have interest and ability, to pursue mathematics at the highest level.

5.5 Methodology

This three-phase study employed both the quantitative and qualitative approaches to investigate the effectiveness of the MDAB Mathematics preparatory program and examine the issues and concerns faced by both students and instructors alike since its implementation in 2010/11

Research design.

Essentially, this research is constructed in three phases, each with its own unique theoretical foundation that would support the amoleration of the next phase.

The first phase of this research is ecelctic, in the sense that it utilizes both the quantitative and qualitative approach, involved the administration of the Mathematics Achievement Test and interviews with students. In one hand, the achievement test is aimed to determine the students' Mathematics achievements in relation to the mathematics content comprehension for their preparatory diploma program. On the other hand, the interview analysis assisted in the identification of the causes that brought about the students' failure to answer the mathematical tasks from the achievement test.

For the second phase, a descriptive design was employed via questionnaires administered to both students and instructors in seeking their perceived views on the implementation of this MDAB program. Interviews were also held with selected students and instructors to give their views on issues and concerns on the overall running of this MDAB project in a much more personal and organic manner. The data from the interview is hoped to either reinforce or challege the data obtained from the questionnaire.

For the third phase of the study, procedural document analysis was employed. The document analysed were the mathematics modules used in classroom teaching, the content of the exam questions and results obtained by students in this MDAB program from April 2010 to Mac 2014. Among the concern is to see whether there is a disparity between the students' and instructors' opinion on the program, and the modules and content used.

Samples and population.

This study was conducted at three branch campuses of UiTM Lendu (Melaka), UiTM Jengka (Pahang) and Uitm Kuala Pilah (Negeri Sembilan), which were randomly selected out of 14 UiTM campuses offering this MDAB programs.

Subjects for the First Phase of the Study

The first phase of the study was applicable to all the students in all the three campuses involved in this study. In total, three hundred and seventy students comprising both the Science program and commerce program were selected as the test subjects. Table 5.1 below shows the distribution of the subjects that participated in this study in accordance to the location of the campuses.

Table 5.1 Distribution of Subjects and Campuses

Location	Number of Subject	Percent
Malacca (Lendu)	130	35.1
Pahang (Jengka)	200	54.1
Negeri Sembilan (Kuala Pilah)	40	10.8
Total	370	100

Out of the three hundred subjects, twenty-one students, seven from each campus, were then selected based on the incorrect response obtained from the first phase of the study. These students were selected based on purposive sampling, as such manner of identification was necessary to fulfil the requirements in identifying difficulties faced by student's in solving problems in the achievement test. A semi-structured interview was also conducted for approximately 30 minutes with each of the student where the underlying error factors and difficulties were identified.

Subjects for the Second Phase of the Study

For this phase, all the three hundred and seventy students that participated in the achievement test were also administered a survey in seeking their perceived views on the implementation of this MDAB program. This was followed with interviews with both students and instructors involved in this program. The students involved were the

twenty one students involved in phase one, with seven representatives from each campus. In addition, all the instructors involved in this MDAB program, from the three campuses (UiTM Kuala Pilah, UiTM Jengka and UiTM Lendu), participated in the interviews.

Data for the Third Phase of the Study

For this phase of study, document analysis procedures were utilized for the purpose of understanding the workings of the MDAB program as it is written on paper. Some of the analytical concerns include two poignantly specific elements: a) the trend of examination results from 2010 to 2014 and b) the content of the modules used in teaching these program from 2010 to 2014. Data of the exam result from 2010 to 2014 was obtain from UiTM's Inforec system and analysis was done in determining the trends of results based on A's, B's , C's and failures across all 14 campuses involved in this MDAB program. Then, a thorough analysis of the aforementioned examination results was computed for the three campuses involved in this study namely UiTM Kuala Pilah, UiTM Jengka and UiTM Lendu. Another document analysis procedure involves the analysis of the three modules that had been developed for the usage of classroom teaching since the inception of this program since 2010. Assessment of its content, duration of its content delivery, types of exam questions in exams were also analyse.

Research Instrumentation

Two sets of instrument, namely Mathematics Achievement Test and two sets of questionnaire (each for students and instructors) were used to gather data for the quantitative component of this study. The following section briefly explains the nature and workings of the instruments.

Mathematics Achievement Test

The purpose of the Mathematics Achievement Test was to assess students' fundamental understanding of mathematics. Its main goal was to provide key information concerning students' functioning in the area of word problems, numerical problems and higher order thinking problems in the area of pre-algebra, algebra and college algebra. The preconceived notions of students' abilities in this Mathematics content were taken into consideration in developing this instrument where each

question was constructed within the zone of potential conception of each students and it was constructed under the premise of PMR and SPM level questions.

There were all together 30 items in the test and the responses were grouped into categories according to the criterion behaviour exhibited. A numerical value was assigned to each of these criterion behaviour. Students' responses were categorized on a scale of 1 to 3 marks (based on the level of difficulty) and the scoring was based on the solution/steps employed. The scoring rubric is shown in table 3.2 below:

Table 5.2 Scoring rubric for mathematics achievement test

Marks	Scoring Rubric						
1 Mark	0	½	1				
2 Marks	0	½	1	1½	2		
3 Marks	0	½	1	1½	2	2½	3

Mathematics Achievement Test: Content Specification

In essence. the test question booklet (Achievement test) that was administered to the students, consisted of 30 written mathematical tasks written in English. These questions were adapted based on the PMR and SPM Malaysian Mathematics Curriculum Specification. The fundamental categories specification of items in the test are Pre Algebra, Algebra and College Algebra (refer table 5.3). The detail item specifications for the test are as shown in Table 5.4.

Table 5.3 Categories

Criteria	Count	% Count	Total Marks	% Marks
Pre Algebra Problem	19	63%	40	63%
Algebra Problem	7	23%	14	22%
College Algebra Problem	4	13%	9	14%

These questions followed closely the PMR and SPM Mathematics Paper formats and incorporated adequate spaces following every question for the students to show their workings and solutions (Refer to Appendix 1).

Out of the 30 questions constructed, 17 of them are PMR level questions and 13 are SPM level questions with a grand total maximum score of 63. The questions could also be denominated according to its mathematical categories in which 16 questions (53%) comprise numerical problems while 14 (47%) comprise word problems. Within these questions, 4 questions (13%) were identified as higher order thinking items.

Table 5.4 Item Specifications

Criteria	Count	% Count	Total Marks	% Marks
No of Word Problems	14	47%	31	49%
No of Numeric Problems	16	53%	32	51%
No of PMR level Problems	17	57%	30	48%
No of SPM level Problems	13	43%	33	52%
No of HOTS Problems	4	13%	12	19%
No of Non-HOTS Problems	26	87%	51	81%

With the average of 3 minutes per question allocated, the time duration for the test was set to one hour thirty minutes where the students were expected to answer all thirty questions.

The division of maximum marks for every question are as shown in table 3.4. Seven items were assigned with a maximum of 3 marks each; nineteen items with a maximum of two marks each, while four items carried 1 mark each.

Questionnaire Specifications

A questionnaire was also administered to both students and instructors in assessing their perceived views on the implementation of this MDAB program, focusing specifically on the mathematics.

The questionnaire consists of 6 parts. It comprises:

Part A: Demographic Data

Part B: Students/Instructors attitude towards MDAB program .

Part C: Attitude towards learning mathematics

Part D: Content of course

Part E: Students/Instructors perception towards the module and course materials

Part F: Instructors teaching methodology

The question in the questionnaire was based on a ten-point semantic scale and students took approximately 10 minutes to complete the questionnaire.

This questionnaire was constructed by the research team to address the research problem of the study and measures of validity and reliability was undertaken to ensure its trustworthiness in measuring what it purports to measure.

5.6 Results and Discussion

The findings of the study are divided into four sections, namely Section A, Section B, Section C and Section D. In accordance to the aforementioned research methodology, the sections detail the findings namely from a) Mathematics Achievement Test; b) Questionnaire to measure students and instructors perceived views; c) Qualitative analysis from interviews with students; and d) document analysis of the past year results and test items analysis based on the examination papers since 2010.

Section A

Research Question 1

What is the level of MDAB student's achievement in the Mathematics Achievement Test (MAT)?

Table 6.1a Students achievement in the Mathematics Achievement Test

	N	Min	Max	Mean	Std. Deviation
Test Score	370	.00	43.00	12.96	7.96

Max Score: 63

Table 6.1a shows that the mean score obtained by the students in the Mathematics Achievement Test is 12.96 with a Standard deviation of 7.96 from a maximum score of 63. This indicate that these students have a low level of achievement (or ability) in mathematics.

To further show the trend of mathemtics performances by the test subjects. the distribution of these samples according to the achievement is tabulated in Table 6.1b below. The table illustrates that 80.5% (n = 298) of these students are in the lower achievers category as compared to scarcely 3.8% (n = 14) and 15.7% (n = 50) in the high and low achievers categories respectively.

Table 6.1b Achievement category based on Mathematics Achievement Test

Category	Frequency	Percentage (%)
Low achievers	298	80.5
Intermediate Achievers	50	15.7
High Achievers	14	3.8
Scale:0 – 19 : Weak	20 – 30 : Intermediate	31 – 43 : Good

This data indicates that based on the test constructed by this research to measure their basic mathematics skills, more that 95% of the students involved in this study has a low level of achievement in mathematics.

Research Question 2

What is the level of MDAB student's achievement in the Numeric and Non-Numeric (word problems) section of Mathematics Achievement Test?

Table 6.2 Achievement score in numerical problems and word problems

	N	Min	Max	Mean	Std. Dev
Numerical Problems Score	370	.00	27.00	9.89	5.27
Word problems Score	370	.00	21.00	3.08	3.74
Percentage of Numerical Problems Score	370	.00	84.38	30.90	16.47
Percentage of Word Problems Score	370	.00	67.74	9.92	12.05

Max Numeric score: 32

Max Word problem score: 31

When the mathematical content is broken down into the components of numeric and non-numeric (words problems) questions, the data seems to echo the findings in research question 1. Table 6.2 depicts that the mean score for the numerical problems and word problems in the Mathematics Achievement Test are 9.89 (SD = 5.27) and 3.08 (SD = 3.74) respectively. In comparison with the maximum possible scores of 32 and 31 respectively for each, we can conclude that these students faced great difficulty in mathematics especially dealing in word problems as compared to numerical problems.

Research Question 3

What is the level of MDAB student's achievement based on the PMR and SPM questions in the Mathematics Achievement Test?

Table 6.3 Achievement based on PMR and SPM level questions

	N	Min	Max	Mean	Std. Deviation
PMR Level Questions Score	370	.00	27.50	9.03	5.64
SPM Level Questions Score	370	.00	17.50	3.94	2.98
Percentage of PMR Questions Score	370	.00	91.67	30.09	18.78
Percentage of SPM Questions Score	370	.00	53.03	11.93	9.04

Max PMR Score: 30

Max SPM Score: 33

Nevertheless, the low achievements of the samples are not comprehensively flat and could be further denominated when analysis is done based on the level of questions asked. Table 6.3 indicates that students in this study obtain a low mean score of 3.94 (SD = 2.98) in the SPM level questions as compared to the mean of 9.03 (SD = 5.64) in PMR level questions. This indicates that although the students generally score low in the test, they particularly faced difficulty with SPM level questions as compared to the PMR level questions.

Research Question 4

What is the level of MDAB student's achievement based on the Higher Order Thinking problems in the Mathematics Achievement Test?

Table 6.4 Students Achievement in the Higher order Thinking Problems

	N	Minimum	Maximum	Mean	Std. Deviation
HOTS Questions Score	370	.00	6.00	.48	1.11
Percentage of HOTS Questions Score	370	.00	50.00	4.00	9.22

Max Score: 12

It is also imperative to see whether the students would have adequate capabilities in answering higher order thinking problems that are much more relevant to university level mathematics. Table 6.4 shows that students obtain an extremely low score (Mean = .48 and SD = 1.11) in the four problems of higher order thinking in the Mathematics Achievement Test. This indicates that these students were not able to deal with problems of higher order thinking.

Research Question 5

What is the level of MDAB student's achievement in the Mathematics Achievement Test among the campuses of UiTM Malacca (Lendu), UiTM Pahang (Jengka) and UiTM Negeri Sembilan (Kuala Pilah)?

Table 6.5 Students mathematics achievement across the three campuses

	N	Mean	Std. Deviation	Minimum	Maximum
Melaka	130	12.08	7.35	.00	37.00
Jengka	200	12.46	7.68	1.00	39.00
Kuala Pilah	40	18.33	9.31	5.00	43.00
Total	370	12.65	7.95	.00	43.00

Another varibale that should be given attention is the differences of achievements for students in different campuses which may indicate disparity of teaching quality or students' general disposition in academic studies. Based on the three campuses involved in this study, table 6.5 shows that highest mean score in the mathematics Achievement Test is obtain by students in Kuala Pilah campus (mean = 18.33 and SD = 9.31) , followed by Jengka Campus (Mean = 12.46 and SD = 7.68) and Malacca Campus (mean = 12.08 and SD = 7.35).