TEACHING AND LEARNING MATHEMATICS USING CDiCL MAKING SENSE THROUGH COMPUTERS WITHIN TEAMWORK

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Abstract: This book is to address the shortcomings of teaching and learning mathematics and sciences in the world of polytechnic with a product called CDiCL (an acronym to Compact Disk interactive within Collaborative Learning environment) from the lense of the first author teaching three establishments of learning namely schools, Polytechnic Kota Bharu (PKB) and a university in this country within the span of 25 years. In doing so he delved on some important points like anxiety and misconceptions among teachers and lecturers delivering subjects on ICT while their students look so eager to learn anything from computers. The courseware is designed using ADDIE methodology, complete and been tested fully among 137 polytechnic certificate engineering in March 2006 in Polytechnic Kota Bharu, Kelantan (MoHE) for eight weeks only. Consultants from Deakins University, Australia Dr Heather Mays, Dr Suhaida and Dr Kassim Institut Pendidikan Guru Batu Pahat MoE and feedback from multimedia experts in 2006 2nd WSEAS International Conference in Tenerife Islands, Spain were obtained. The contents is in English as the medium of instruction in higher learning in Malaysia.

Keywords: Mathematics, computers, methodology, multimedia, teamwork

Teaching and Learning Mathematics using CDiCL

Making Sense Through Computers Within Teamwork

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Teaching and Learning Mathematics using CDiCL

Making Sense Through Computers Within Teamwork

Mohd Sazali Khalid
Helmi Adly Mohd Noor

Penerbit UTHM
2012

CDiCL.indd 3 07/11/2012 8:22:38 AM

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CDiCL.indd 4 07/11/2012 8:22:39 AM

Table of Contents

CDiCL.indd 5 07/11/2012 8:22:39 AM

Chapter 3

CDiCL.indd 6 07/11/2012 8:22:39 AM

Chapter 4

Chapter 5

CDiCL.indd 7 07/11/2012 8:22:39 AM

CDiCL.indd 8 07/11/2012 8:22:39 AM

Preface

Teaching and Learning Mathematics using CDiCL : Making sense through computers within teamwork is written to provide an understanding of what constitutes in developing mathematical understanding among students in a Malaysian polytechnic (MOHE). At this age, the students are spending a big amount of time using computers and hand phones to interact among themselves. As teachers how do we teach them mathematics while knowing that many students are using mobiles to hear to musics and watch video clips. Therefore in writing this book , some attempts were made to put theory into practice. Theoretical aspects are given so that teachers know what to expect from a generation of students who see things better from visual clues and less from text. Practical aspects , on the other hand are provided to enable readers to see the link between theory and practice and by doing so, enabling them to be effective mathematics teachers. The primary objective of this book is to help prospective teachers and practicing teachers to become more effective by applying the theories and learning of mathematics in developing cognitive, constructive and teamwork abilities among younger generation.

This book is written into five chapters :

Chapter 1: An introduction to Mathematics Education in Polytechnics Education System Malaysia. The chapter presents the background of polytechnic education system and their lecturers and students who are engaged in producing semi-professional technicians from its well-known certificate and diploma engineering courses. It highlights some problems in teaching mathematics using English as the medium of instruction.

Chapter 2: Spectrum of Issues provides more information from few sub-sections of knowledge. They are the learning theories, computers in education, misconceptions in technology, the strength of multimedia, memory, cognitive overloading from text and picture format, cooperative and collaborative learning and the influence of mother tongue language in shaping understanding of mathematical concepts among children.

CDiCL.indd 9 07/11/2012 8:22:39 AM

Chapter 3: Developing the Courseware presents three things i.e., firstly how the courseware called CDiCL was produced, secondly how it was used in the teaching and learning processes within a polytechnic education system and finally how it was integrated within teamwork among 137 participating students and four lecturers. It describes some of the interesting insights and problems learning mathematics using computers

Chapter 4: Pilot Testing presents the validity and reliability processes that had gone through a courseware called CDICL had gone through before it was applied in a mathematics classroom. It also presents the results achieved from the participating students using this courseware

Chapter 5: Discussion and Conclusion presents some interesting points like the impact of CDiCL towards learning mathematics, issues that was solved and unsolved and the contribution of collaborative learning principles as applied in CDiCL. It also highlights why the present mathematics teachers have to embrace technology as quickly as possible and what are the challenges that our generation has to face from other competitors.

CDiCL.indd 10 07/11/2012 8:22:39 AM

Acknowledgements

This study was carried out with the help of many individuals. Firstly, we would like to express our gratitude to our former Vice-Chancellor Universiti Tun Hussein Onn Malaysia (UTHM), Professor Emiritus Dato' Dr. Hj Ismail bin Hj Bakar. Secondly, Professor Dr Hajjah Maizam Alias, Professor Dr. Haji Wahid bin Razally and Associate Professor Dr. Zurinah bt. Suradi for supervising this study.

Permission was obtained from Education Planning Research Department, (MoE) and Department of Technical Education, (MoHE) in allowing CDiCL to run within two subjects B1001 Engineering Mathematics and B1003 Applications in Computers in proper time tabling set up in KBP (Kota Bharu Polytechnic).

Not forgetting direct and indirect assistance by Dato' Hj Mokhlis bin Hj Jaafar (former Head of Curriculum Division in Technical Education Department, MoHE) and Tuan Hj Che Ku Mamat (Director of Kota Bharu Polytechnic) and all his staff who were involved in this study.

Besides thousand flowers of appreciation to former Dean, Faculty of Computer Science and Information Technology (FSKTM), Professor Dr. Mustafa Mat Deris and all his faculty staff, UTHM.

Some inviduals like Mr Mohd Rohaimi bin Yusoff and Mrs Maheran Ismail from PKB, Mr Miswan Surip, Hannes Masandig, Dr Norhazana bt. Abdullah, Miss Wahidah bte Hj Bakar, Madame Noraini bt. Ibrahim, Madame Siti Mahfuzoh bt. Wasikon, all from UTHM, Datin Latifah Hanum Adnan from SMK Panglima Perang Tengku Muhammad, Kuantan and of course the continuous support of our beloved families which was very instrumental in the success of this work. Those names we did not mention here only Al-Mighty ALLAH can reward them handsomely in this world and the hereafter. Ameen.

CDiCL.indd 11 07/11/2012 8:22:39 AM

Foreword

Learning on computers is the in-thing among the younger generations. As teachers we cannot afford to deny them their right to gather skills, knowledge and thinking as much as possible even though our strength is more towards chalk and talk. From history, man can regurgitate what he learnt from his masters but that approach is losing so much ground since internet and Facebook came into our private homes.

As a result I believe this book is dedicated for that view in mind. CDiCL (Compact Disk integrated in Collaborative Learning) is among the first step taken by a veteran mathematics teacher who has taught in few establishments called schools, polytechnic and a new university UTHM, Johor. I strongly believe this book has some important things to impart to our future teachers, new lecturers and the semi-skilled workers. Dr. Sazali was right to design his work based on a brain science called Hermann Brain Dominance Model since e-learning without some sorts of solid educational philosophies could lead one dangerously into 'lost in space'. Since mathematics is very important in developing Malaysia, trying to teach our polytechnic (MOHE) student mathematics using a courseware like CDiCL integrated in collaborative learning environment looks very appropriate and moving towards the right direction.

I recommend the use of this book. Congratulations to the authors. I am sure it is the right direction towards an interesting and effective learning.

Dato' Prof Dr Mohd Noh bin Dalimin
Vice Chancellor
Universiti Tun Hussein Onn Malaysia
Batu Pahat
MAY 2012

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Introduction

School children in Malaysia is provided with free 11 compulsory years of education where English and mathematics are taught. Global economic demand dictates us to abreast technology fast in all walks of our life.

However, the present teachers are so used to chalk and talk methods and students are asked to regurgitate what they remember in their examination. Besides it seems that teaching and learning styles differ some how among teachers and the present students. On one part the teachers are too scared to use technology while on another part the children looks so confident on computer games using handphones.

With ICT tools and internet influences around them, is pen and paper assessment mode the best assessment tool to check how much our children understand things at schools or are we not trying hard enough to plan seriously which combination of teaching strategies suit this present generation better?.

Most technology gadgets embrace English as the main medium of instruction. The question is are we going to fight which medium of instruction suits us better in this country once our children had passed SPM. Or are we going to succumb to demands from the outside market to take technology seriously and carefully in our teaching and learning methods encompassing all the primary, secondary schools and polytechnic education system in Malaysia?

To let them taking technology separately from traditional education system is to call for many social ills that is happening all over us such as pornography and online crimes thus there must be a method to solve this.

This book is addressing these issue directly using polytechnic education system (MOHE) teaching and learning systems in two subjects called B1001 Engineering Mathematics and B1003 Computers in Application as the backgroundThe introduction of an interactive multimedia courseware called CDiC would not be 100 percent perfect in terms of tackling the above shortcomings but at least it proved that it can be blended successfully with

CDiCL.indd 15 07/11/2012 8:22:39 AM

group work assignments and projects in polytechnic's semesterly continuous assessment mode. The authors did not believe that these two subjects must be taught separately but due to present demand in building up competent and well literate semi-professional work force with the present affordable on going ***e***-learning system , we must try to mould their knowledge acquisition using technology directly into the students' lives as fast as possible. There is no way out!

This book would like to poke some degree of conscience among educationists, planners, stake holders , teachers and also parents ".. *which is the better teaching strategy for now in order for our future generation to take global challenges for their own survival?"*

CDiCL.indd 16 07/11/2012 8:22:39 AM

CHAPTER I

1.1 Introduction

Upon graduation from Leeds, England and Penang Teachers' College, the first school I taught was SM Tumpat, Kelantan in 1983. I was asked to teach History and Arts for a Remove Class. This school was a few minutes away from my dad's house (a police barrack) in the Tumpat's cowboy down town. When I started teaching, my late father was about to retire. In 1984, the subject I taught was Mathematics and English Language for Form One and Form Two. The classes were in the afternoon session since the school practiced two sessions from 1230 to 630 pm.

Then in 1985, I was seconded to a State Science Resource Centre (PSPN). PSPN was directly under the Kelantan State Education Department. It was 30 minutes drive from the city of Kota Bharu. There, I met Tan Sri Dr Wan Zahid bin Mohd Noordin (Kelantan State Education Director at that time, later on as Malaysia Education Director General) whereby I was asked to collaborate with Tuan Haji Idrus bin Ujang (Head Technology in Education) and Tuan Haji Ghani bin Mat (Assistant Director Maths and Science) setting up few computer clubs / centers in the districts of Kota Bharu, Bachok and Tanah Merah. I was instructed to design computer literacy courses for the secondary school teachers in Kelantan. At that time computer lessons were taken as ***e***lectronic books.

While working in PSPN, I coordinated with Mr. Peter Quek from Jurudata (Apple), a subsidiary of Sapura Holdings, Malaysia in delivering computer courses. The general perception was Mathematics and Science teachers could learn computing faster than other teachers since they had experienced computing subjects like FORTRAN in their undergraduate studies.

I also made an observation in computer clubs in which many local students love application computing especially Appleworks that offers spreadsheet, word processing and data base but they found the lesson called BASIC is

CDiCL.indd 1 07/11/2012 8:22:39 AM

CHAPTER II

This chapter has few sub-sections covering learning theories, global mathematical issues in relation to TIMSS 2003 report, computer education, courseware development, the application of collaborative learning in higher institutions and brain science taking memory, Hermann Brain Dominance Model and loading theory.

2.1 Learning Theories

In order to create anything called learning, it is important for any teacher to know some theories called behaviorist, cognitivist and constructivist.

2.1.1 Behaviourist

Piaget believes that man can learn better if they are active learners. However, he was responsible towards this rigid regime where the students cannot learn higher level of knowledge until they had mastered the lower level of knowledge and skills. In short they cannot learn multiplication tables before they master on how to add and subtract things as they go along in their primary education.

Piaget and Vygotsky in Zepp (1989) preached that there was some connection between language and the thoughts they used in learning mathematical concepts. This is because the language learnt by babies and young children in the form of speech with their parents and siblings became the basis In understanding mathematical concepts in schools and societies. In fact a language has two objectives. Learning about one self and internalized things as important thoughts in mathematics learning. This is the basis behind sense making in cooperative and collaborative learning. If a group

CDiCL.indd 13 07/11/2012 8:22:39 AM

CHAPTER III

This is a chapter on how an interactive multimedia courseware CDiCL was built. First it will cover Instructional Design using ADDIE (acronym Analysis, Design, Develop, Implement and Evaluation) concepts where Table 3.1 is used as the main guide.

3.1 Instructional Design (I.D)

Instructional Design covers two important things called content development and method of media instruction. The courseware that is going to be developed is called CDiCL – a combination of CD and Collaborative Learning. The contents are pre-algebra mathematics in KBP under a subject B101 Mathematics Engineering covered in the first semester only both for Diploma and Certificate Engineering programs in polytechnic, MoHE. See Appendix M. In order to develop this CDiCL, the theory behind Hermann Brain Dominance Model (Hermann, 1995) was adapted. Few concept papers were presented in two local conferences like 18th and 19th Malaysia Persatuan Teknologi Pendidikan in Kuala Terengganu 2005 and Langkawi 2006. This was followed by 2nd WSEAS International Conference on Educational Technology and Education in Tenerife Islands, Spain in 2006. The strategy was once this prototype had been presented in front of few local and international experts in Europe and Australia in the field of Educational Technology and Education and using some feedbacks, CDiCL could be built more confidently. Target users is MoHE polytechnic certificate engineering students. Besides a paper in 2nd ICBL (International Computer Based Learning Conference) in Florentina, Brazil under emerging technology was also written to confirm this idea.

CDiCL.indd 37 07/11/2012 8:22:41 AM

CHAPTER IV

This chapter will explain the issues of validity and reliability of the courseware called CDiCL. This covers pilot testing, experts approval and usability among KBP users. A sub-section on lesson plans was also included to help those lecturers who wanted to try CDiCL in their classrooms.

4.1 Pilot Testing

In order to determine the worthiness of the courseware it must go through alpha-and beta testing cycles. At alpha testing, 50 Diploma IT year 1 semester 1 students were asked to check on the buttons, interactivity and exploration elements available in the courseware. The feedback was firstly the difficulty in typing in the answers by using the mathematical symbols. Secondly, it would be better if multiple answers coded A, B, C and D were provided. Upon this comment, the authors upgraded the courseware and this took eight more weeks (August – September 2005) when finally the users were satisfied with the available buttons. The main author was lucky because he taught DIT 1103Mathematics IT in a computer laboratory in KUiTTHO/ UTHM Johor. The next stage was to let 10 to 15 form two students in Pasir Mas, Kelantan use the courseware. Since they were novice, it was very important to check on the English as contained in the courseware. Care must be taken so that the standard of English must be understood by the secondary schools' students including the target group Kota Bharu Polytechnic.

It was predicted that if the Pasir Mas students could follow the contents of the courseware , then the target group i.e., certificate engineering polytechnic students could be much better. This is because the target group has learnt English for the last 11 years in Malaysian education system than the Pasir Mas students. To confirm, we let the English lecturers in KBP to examine the content of the courseware. CDiCL passed the above tests from the secondary school and Head of Course Unit in KBP.

CDiCL.indd 83 07/11/2012 8:22:56 AM

CHAPTER V

Discussion and Conclusion

This chapter will discuss what was obtained during the eight week quasi-experimentation in Kota Bharu Polytechnic, Kelantan among 137 students which came from four different groups. Only two groups used CDiCL either wholly or partially (within collaborative learning environment). The other two groups were Collaborative Only and Control. It will bring the readers from the hottest to the most general issues regarding teaching and learning mathematics in a polytechnic (MoHE) using a courseware.

5.1 The hottest issues

Four important things came under the spot light :

5.1.1 Language problem

Some students were struggling to understand the content of the courseware which was in simple English. A lot of time was wasted in translating before the actual process of solving any problem can take place. Even though a special dictionary was supplied to all the participants, it was hardly used. See Appendix G.

5.1.2 Fractions and number manipulations on Computers

The students were found to do much better in fractions and number manipulations after eight consecutive weeks using CDiCL. This run well that students like to do repetitive work from the CD. It can replaced the teachers thus helping the teachers to focus on other urgent things. Topics like simplify and factorize needed more work since the method involving

CDiCL.indd 105 07/11/2012 8:22:58 AM

APPENDIX A

User Manual

This user manual will guide the user on operating the CD. This CD has two user manuals which is to help the teacher and students. The idea of this CDiCL comes from Hermann Brain Dominance Model (Hermann, 1995). It highlights that a student can learn more effectively if the facts and pictures in mathematics learning are properly put in four quadrants since our brain has two hemispheres i.e., the left hemisphere and the right hemisphere. Hermann found out that man uses his left brain for facts while his right brain suits better on pictures. This CD needs some peers' and teacher's interaction for its maximum impact.

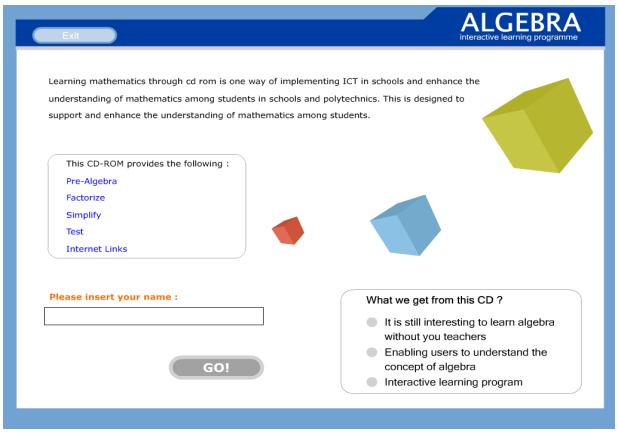
User Manual For Student

1. This CD contains the processes of learning called interactive collaborative learning for Mathematics in the Polytechnic, MoHE to enhance the understanding of mathematics among the students.

2. To use this CD, firstly you must insert this CD into the CD drive of your computer.

3. After the CD is put into the CD-drive, the CD will automatically run and played the content of the CD.

4. The first screen will be displayed after computer boot as seen below:



CDiCL.indd 129 07/11/2012 8:22:59 AM

APPENDIX B

A letter of approval from subject matter expert Mr Rohaimi Yusoff

POLITEKNIK KOTA BHARU
KM 24 Kok Lanas
16450 Ketereh, Kelantan
No. fax: 09-7888739 *E-mail:*ptkkb@po.jarring.my *Telefon:* 09-7889126/7889344/7889641

Ruj. Kami: PKB/JKM/300/02/001(49)

Tarikh : 30 Ogos 2005

Kepada mereka yang berkenaan

Saya MOHD ROHAIMI BIN YUSOF KP: 610828-03-5229 adalah merupakan bekas KETUA JABATAN MATEMATIK, SAINS DAN KOMPUTER, Politeknik Kota Bharu Kelantan (2000-2003)

Penyelidik bernama MOHD SAZALI BIN KHALID KP: 571019-03-5115 adalah pensyarah di bawah jabatan saya dari tahun 2000 – 2002. Dengan ini saya mengesahkan telah melihat dan menilai koswer MATEMATIK ALGEBRA INTERAKTIF yang dibina oleh penyelidik bernama MOHD SAZALI BIN KHALID KP: 571019-03-5115 dan mendapati bahawa kandungan koswer ini adalah bersesuaian untuk digunakan oleh pelajar-pelajar POLITEKNIK KOTA BHARU untuk subjek B 1003 Matematik di peringkat sijil dan diploma kejuruteraan bagi semester 1 dan semester 2 sahaja.

Sekian,

Selamat Maju Jaya

Saya yang menurut perintah

(MOHD ROHAIMI B. YUSOF)
Ketua Jabatan
Jabatan Kejuruteraan Mekanikal
Politeknik Kota Bharu
Kelantan Darul Daim

CDiCL.indd 138 07/11/2012 8:23:05 AM

APPENDIX C

Now a letter for Mr Farhan FTMM (Multimedia expert)

FPTek.PP.SSS.01

Jabatan Pendidikan Ikhtisas
Fakulti Pendidikan Teknikal
Kolej Universiti Teknologi Tun Hussein Onn
Parit Raja, Batu Pahat, Johor Darul Ta'zim

1. Borang ini hendaklah diisi dalam satu salinan sahaja oleh **Pelajar**.
2. Objektif dan Soalan Kajian hendaklah diserahkan bersama-sama borang ini
3. Setelah semakan KOSWER dilaksanakan serahkan borang ini kepada Penyelia utama untuk tindakan lanjut.

BORANG SEMAKAN KOSWER

Setelah menyemak dan menilai koswer ini , dengan ini saya mengesahkan bahawa;

Nama Pelajar : **MOHD SAZALI BIN KHALID**

No. Metrik : **GT025156** Kursus : **DOKTOR FALSAFAH PENDIDIKAN TEKNIK DAN VOKASIONAL**

Tajuk Kajian : **A Study On the impact of interactive multimedia Courseware with Collaborative Learning among Pre-Engineering Students in Learning Algebra.**

Di bawah bimbingan : **TN. HJ. MOHD SAZALI BIN KHALID**
(mengamanahkan) **EN MOHD FARHAN BIN MD FUDZEE mengesahkan Kandungan dan Ciri Interaktif Koswer**

telah memenuhi syarat untuk melaksanakan kajian rintis/sebenar menggunakan koswer berkenaan dengan mengambil kira pandangan dan ulasan (sekiranya ada) yang dinyatakan seperti LAMPIRAN.

Sekian, harap maklum.

.....
(Tanda Tangan)

MOHD. FARHAN B. MD. FUDZEE
Kanan Pakar Multimedia
Jabatan Sistem Maklumat
Fakulti Teknologi Maklumat Dan Multimedia
Kolej Universiti Teknologi Tun Hussein Onn

Nama : _____

Cop Jawatan : _____

Fakulti/Jabatan : _____ Tarikh : 1 FEB. 2006

CDiCL.indd 139 07/11/2012 8:23:06 AM

APPENDIX D

Surat dari Dr Suhaida Tahir

(Expert in Mathematics Education IPG Tun Hussein Onn Batu Pahat Johor)

Fakulti Pendidikan Teknikal

Universiti Tun Hussein Onn Malaysia

Borang Pengesahan Pakar

A STUDY ON THE USE OF INTERACTIVE COURSEWARE WITH COLLABORATIVE LEARNING IN MATHEMATICS ALGEBRA AMONG CERTIFICATE ENGINEERING STUDENTS IN A POLYTECHNIC, MALAYSIA

Saya Dr SUHAIDAH TAHIR No. Kad Pengenalan 600630015434 merupakan pensyarah dengan ini mengesahkan bahawa saya telah melihat dan membuat penilaian ke atas kualiti soalan-soalan di dalam kertas quiz, ujian dan CDiCL berpandukan kepada Taxonomy Bloom(1956) oleh pelajar Mohd Sazali Bin Khalid (GT025156) dan mendapati bahawa ianya tepat dan betul mengikut rubric yang digunakan oleh pelajar ini dalam aspek pembelajaran matematik dengan bantuan CDiCL dan pembelajaran kolaboratif dua hala dan berkumpulan.

Komen/ cadangan

Permudahkan item supaya mudah difahami.

Tandatangan ( )

Cop Nama dan Jawatan

DR. HJH SUHAIDAH TAHIR
Pensyarah
Jabatan Matematik
Institut Perguruan Tun Hussein Onn

Tarikh: 8.10.2008

CDiCL.indd 140 07/11/2012 8:23:08 AM

APPENDIX E

A letter from AP Dr Rosman UTM

Prof Madya Dr Rosman bin Md Yusoff
Timbalan Dekan (Keusahawanan)
Biro Inovasi dan Perundingan
Universiti Teknologi Malaysia
81310 SKUDAI
JOHOR DARUL TAKZIM

20 April 2006

Mohd Sazali bin Khalid
Fakulti Pendidikan Teknikal
Universiti Tun Hussein Onn Malaysia
86400 PARIT RAJA
JOHOR DARUL TAKZIM

Tuan

Pengesahan (validity) Borang-Borang Collaborative Learning

Merujuk kepada surat tuan bertarikh 3 Mac 2006 saya dengan ini mengesahkan borang-borang berkaitan dengan Pembelajaran Kolaboratif yang telah diadaptasikan dari buku Barkley, Cross dan Major (2005) dan dari Universiti Murdoch, Australia seperti di bawah, mempunyai tahap reliabiliti dan validiti sesuai digunakan untuk kajian tuan yang bertajuk "The effect of Collaborative Computer Aided Learning on Problem Solving Skills in Algebra among Polytechnic Students".

1. Self Individual Evaluation Form (Exhibit 1)
2. Team Evaluation Form (Exhibit 2)
3. Peer Evaluation Form (Exhibit 3)
4. Self Reflection Form
5. Weekly Peer-to-Peer Evaluation Form
6. Group Work - Collaborative Learning Process Form
7. Observation Form during team learning process in a computer laboratory (used by a technician/ Assistant Researcher)
8. Score Form in Quiz set-up
9. Summary Form in a team learning processes
10. Total Score Form (using STAD/Jigsaw/TGT method)

Sekian. Terima Kasih.

Selamat Maju Jaya

Yang benar

ROSMAN BIN MD. YUSOFF

s.k:
Prof Madya Dr Maizam Alias, Ketua Penyelia
Dekan, Fakulti Pendidikan Teknikal, Universiti Tun Hussein Onn Malaysia

CDiCL.indd 141 07/11/2012 8:23:10 AM

APPENDIX F

TEST 1

Q1. Add (3a-b) with (3b-a)
Q2. If you subtract ($x^2 + y^2$) from ($x^2 – y^2$) what will you get?
Q3. Multiply (x+y) by (-x)
Q4. Divide 2ab with (3bc)
Q5. Divide (6c) by (6)?
Q6. Factorize $6+5t-6t^2$ given that one of the factors is (3-2t)
Q7. Factorize $a^2 b^2$ – ($b^2 c^4$)
Q8. Simplify (1/x - 1/y) divided by (x-y)
Q9. Simplify 2[r-3(t-3)] -3[t-2(r+2)]?
Q10. Solve simultaneous equation given c = 3-2d and d= 12-2c

TEST 2

Q1. Add ($3a^2-b^2$) and ($3b^2 – a^2$)
Q2. Subtract (x+y) from (x-y)
Q3. Multiply (x+y) by (-2x)
Q4. Divide (a^2 - ab) by (-a)
Q5. Solve (x-y) / -1
Q6. Solve 4x+ y with – (x+3y)
Q7. Add 5x – 3y with (3x+2y)
Q8. Subtract 2p from (3p+q)
Q9. If y is three times 'x' what is y if x equals to 33
Q10. Solve for 'c' and'd' given that 2c = 6 – 4d and 2d = 24 – 4c

TEST 3

Q1. Find 'p' if (3/2 p) is -12
Q2. 15 years ago, a father was three times the age of his son and 19 years ago he was 4 times the age of his son. How old are they now?
Q3. If degree C is centigrade and degree F is fahrenheight where C = 5/9 (degree F – 32), express 0 degree Fahrenheight into centigrade?
Q4. Factorize $16^2 – 15^2$
Q5. Factorize $16 (x^2 – x – 1)^2 – (x^2-9x-2)^2$?
Q6. Simplify ((18-3) x ^{2})/5 - 7 + (6 x 3 – 1)
Q7. Divide (a/x - a^2/x^2) by (a^2 / x)
Q8. Simplify ((x^2-1)/x^3) . (x^3/ x^3+2x^2+x)
Q9. Solve $2x^2 – 2x = 24$ by factorizing
Q10. The length of a rectangular field is three times its width. The perimeter is 96 cm. Find its area

CDiCL.indd 142 07/11/2012 8:23:10 AM

APPENDIX G

KAMUS CDiC

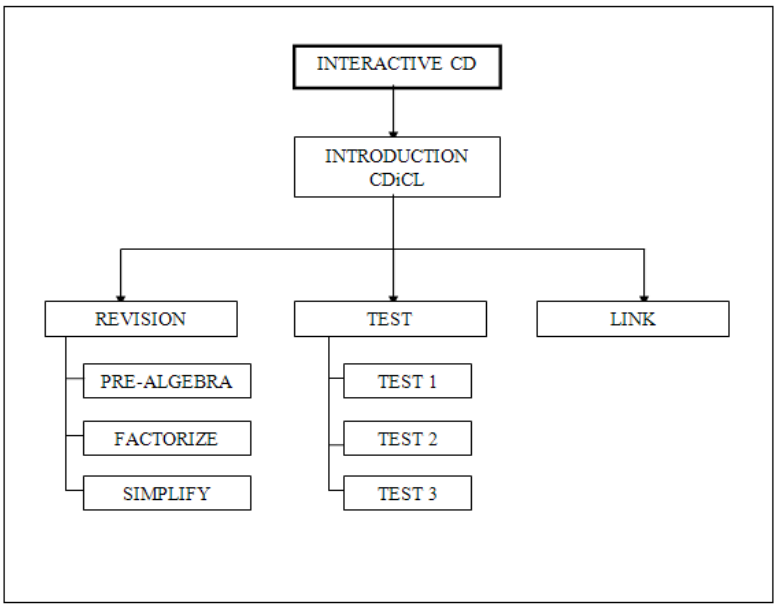
	KAMUS	**CDiCL**
1	Add	Hasil Tambah
2	advantages	kelebihan
3	algebraic fractions	pecahan-pecahan algebraic
4	apply	cuba gunakan; aplikasikan
5	approach	pndekatan
6	area	kawasan tertentu
7	Arrange the terms	Susun, pilih terma-terma yang serupa
8	associative laws	Hukum Perkaitan
9	At the end of this module you should be able to	Diakhir modul ini anda sepatutnya berupaya melakukan
10	average	purata
11	Before we begin	Sebelum kita mulakan sesuatu
12	borrow; owe something	meminjam sesuatu daripada seseorang
13	Brackets	Kurungan ( )
14	Calculate	Hitungkan ; calculator
15	Cancellation; cancel with	Hapuskan; menghapuskan sesuatu
16	Collaborative Learning	Pembelajaran secara kolaboratif; berkumpulan
17	collecting like terms	Mengumpul semua terma yang sama
18	Combine like terms	Susun benda-benda yang sama
19	Common factors	Faktor faktor Sepunya
20	compete; competiton	bersaing; saingan
21	Compute	Hitungkan
22	Conclusion	Penutup
23	constructivist designed	rekabentuk bersandarkan kepada falsafah konstruktif; pembinaan
24	convert	menukar bentuk
25	cooperate	bekerja sama
26	cubic pronumeral	x kuasa tiga
27	Denominator	penyebut di dalam sesebuah nombor pecahan
28	Difference of Two Squares	Beza Dua Kuasa Dua

CDiCL.indd 143 07/11/2012 8:23:10 AM

APPENDIX H

The depth structure controlling the flow of the contents CDiCL.

Table 5:Depth Structure



The contents for topic Pre-Algebra listed from Table 5.

CDiCL.indd 148 07/11/2012 8:23:10 AM

APPENDIX I

APPENDIX I

Reliability

Warnings

The covariance matrix is calculated and used in the analysis.

Case Processing Summary

		N	%
Cases	Valid	20	100.0
	Excluded[a]	0	.0
	Total	20	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.871	.871	3

Item Statistics

	Mean	Std. Deviation	N
Arahan Jelas	4.3500	.87509	20
Perisian Mudah	4.1000	.96791	20
Butang Lengkap	4.3000	.92338	20

Inter-Item Correlation Matrix

	Arahan Jelas	Perisian Mudah	Butang Lengkap
Arahan Jelas	1.000	.702	.645
Perisian Mudah	.702	1.000	.730
Butang Lengkap	.645	.730	1.000

The covariance matrix is calculated and used in the analysis.

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	4.250	4.100	4.350	.250	1.061	.017	3

The covariance matrix is calculated and used in the analysis.

CDiCL.indd 149 07/11/2012 8:23:12 AM

APPENDIX J

APPENDIX j

Taxonomy Bloom use in Pre Test and Post Test

(a)	Factorize	q^2-1	Must know the rules of index. Difference of Two Squares. $x^2-1=(x+1)(x-1)$	Knowledgee
(b)	Factorize	$11w^3-44w^2 = 11w^2(w-4)$	Must know Common Factors called 11 and w^2. Then factorize. Get 2 parts called Common Factors and 'the bracketed part'.	Knowledge Comprehensior Application
(c)	Simplify	$\frac{-7}{8}\div(3)\div(-2)=\frac{-7}{8}\times\frac{1}{3}\times\frac{1}{-2}=\frac{7}{48}$	Must know the process needed i.e., change (3) into $\frac{1}{3}$ and (-2) into $\frac{1}{-2}$ when doing division.	Knowledge Comprehensior Application
(d)	Calculate	a) $\frac{6(-4)-2(5-8)}{-6-3-5}$ b) $\frac{(x-z)}{(x^2-z^2)}=$ $\frac{(-2-6)}{(-2^2-6^2)}=\frac{(-8)}{(-4-36)}=\frac{-8}{-40}=\frac{1}{5}$	Must have the knowledge -.- = +; +.-= when . must know multiply 6(-4); arithmetical operation on the number line (garis nombor)	Application
(e)	If x=-2; y=-4; z=6 evaluate $\frac{(x+2y)}{(x-2y)}$	$\frac{(-2+2(-4))}{(-2-2(-4))}=\frac{(-2-8)}{(-2+8)}=\frac{-10}{6}=\frac{-5}{3}$	Must know the knowledge of multiplication operations between similar, non-similar signs +.-="-" then sort out the brackets from each numerator and denominator part, then must know division operation between different signed numbers of numerator and denominator. Organize the numbers; sort out the numbers; must know the result of different signed numbers when processing division operations.	Application, Analysis
(f)	Simplify	$\frac{1}{5}(15-4p)-\frac{1(10p+5)}{10}=3-\frac{4p}{5}-\frac{10p}{10}-1$ $\frac{10p}{10}-\frac{5}{10}=3-$ $\frac{5}{10}-\frac{4p}{5}-\frac{10p}{10}=2\frac{1}{2}-\frac{8p}{10}-\frac{10p}{10}=2\frac{1}{2}-\frac{18}{10}$	Must know how to expand brackets. Must know how to handle different signed numbers. Organize the terms called number terms and algebraic fraction numbers. Bring down 18/10= 9/5.	Analysis Synthesis
(h)	Simplify $-4m+2(m-3)$	$-4m+2m-6+2m=-4m+2m+2m-6$	Must know expansion of different signed numbers during multiplication process, sort out, organize	Analyze

CDiCL.indd 157 07/11/2012 8:23:24 AM

APPENDIX K

Structure B1001 –Matematik Kejuruteraan

(as shown to the main author 2005/06 by Head Department Mathematics, Science and Computer, KBP)

Semester 1

Item	Topik	Tempoh Masa
1	Asas nombor dan Pechahan	2 minggu
2	Penukaran sistem metrik	2 minggu
3	Aljabar	2 – 3 minggu
	Ujian Setara	1 minggu
4	Kuadratik, Penyelesaian Persamaan Serentak	2 – 3 minggu
5	Mencari rumus	2 – 3 minggu
6	Trigonometri	2 – 3 minggu
	Peperiksaan Akhir	2 minggu

Semester 2

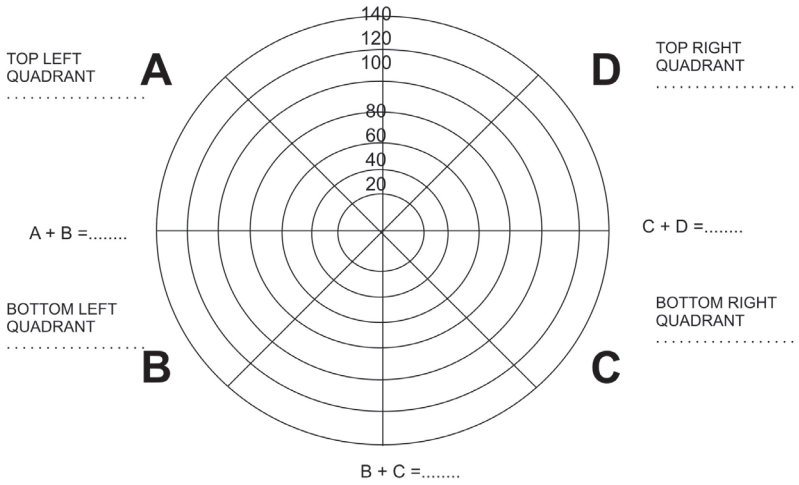
Item	Topik	Tempoh Masa
1	Mencari cerun	2 minggu
2	Had	2 minggu
3	Kalkulus – Prinsip Pertama	2 – 3 minggu
	Ujian Setara	1 minggu
4	Mencari dy/dx; d2y/dx2	2 minggu
5	Formula Kalkulus	2 minggu
6	Pengunaan, nilai maxima dan minima	2 minggu
7	Pengamiran Asas	2 minggu
	Peperiksaan Akhir	2 minggu

CDiCL.indd 159 07/11/2012 8:23:26 AM

APPENDIX L

CALCULATING POINTS IN PRODUCING MIND CONTROL PROFILE

FILL IN THE SCORE POINTS THAT EXPLAIN YOUR HOBBY INTO THE CIRCLE BELOW (ONTO THE 4 MAIN 45 DEGREES PERPENDICULAR LINES) AND EXTEND ALL THE FOUR CORNER POINTS FROM EACH QUADRANT OF THE CIRCLE TO PRODUCE EXACTLY A COMPLETE PROFILE OF YOUR MIND. COMPUTE THE TOTAL POINTS FROM EACH QUADRANT BASED ON A FORMULA. YOUR TEACHER HAVE IT.



CDiCL.indd 160 07/11/2012 8:23:27 AM

APPENDIX M

APPENDIX M

Syllabus B1001 - Mathematics Engineering Polytechnic Kota Bharu
Ministry of Higher Education

SEMESTER 1 - 30 theory/ 25 practicals

		RTA
1.0	Basic Algebra	6:3
2.0	Standard Form, Index and Logarithms	6:3
3.0	Geometry and Measurement	6:3
4.0	Coordinate Geometry and Graph	4:2
5.0	Trigonometry	8:4

Delivery strategies - Contextual Learning, student-centred approach and using Computer Based Learning (CBL)

RTA - Recommended Time Allocation
SEMESTER 2

		RTA
1.0	Complex Numbers	6:3
2.0	Differentiation	6:3
3.0	Application of differentiation	6:3
4.0	Integration	6:3
5.0	Applications of integrations	6:3

CDiCL.indd 162 07/11/2012 8:23:28 AM

APPENDIX N

Team's working on CDiCL

CDiCL.indd 163 07/11/2012 8:23:28 AM

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CDiCL.indd 166 07/11/2012 8:23:28 AM

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CDiCL.indd 167 07/11/2012 8:23:28 AM

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CDiCL.indd 168 07/11/2012 8:23:28 AM

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CDiCL.indd 169 07/11/2012 8:23:28 AM

Definition

TIMSS 2003 - Trend in Mathematics in Secondary Schools (throughout the world)
STAD – student team assessment division
STA - student team assessment
ADDIE – acronym from Analysis , Design, Develop, Implementation and Evaluation
UM - Universiti Malaya
TED, MOHE - Technical Education Department, Ministry of Higher Education
UPSI - Universiti Pendidikan Sultan Idris, Tanjung Malim
ITTHO - Institut Teknologi Tun Hussein Onn
KUiTTHO - Kolej Universiti Teknologi Tun Hussein Onn
UTHM – Universiti Tun Hussein Onn Malaysia, Johor
UKM – Universiti Kebangsaan Malaysia
UTM – Universiti Teknologi Malaysia
KBP / PKB - Polyteknik Kota Bharu
PUO – Polytechnic Ungku Omar

WSEAS Conference – World Scientific Engineering Academy Society
PTA – Parent Teachers Association
CBL – computer based learning
CL – collaborative learning
CDiCL _ compact disk incorporating collaborative learning
PPSMI - Pengajaran Pembelajaran Sains Matematik dalam Bahasa Inggeris (teaching of mathematics and science in English language)

CDiCL.indd 171 07/11/2012 8:23:29 AM

Index

CDiCL.indd 173 07/11/2012 8:23:29 AM

CDiCL.indd 174 07/11/2012 8:23:29 AM

CDiCL.indd 175 07/11/2012 8:23:29 AM

CDiCL.indd 176 07/11/2012 8:23:29 AM

CDiCL.indd 177 07/11/2012 8:23:29 AM

CDiCL.indd 178 07/11/2012 8:23:29 AM

CDiCL.indd 179 07/11/2012 8:23:29 AM

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CDiCL.indd 180 07/11/2012 8:23:29 AM

Vita

Dr Mohd Sazali Khalid was born in Kota Bharu, Kelantan on 19 October 1957. He was brought up very well in few police barracks including IPP Batu Pahat, Johor. His primary education started from Rengit Primary School, Johor in 1964, Tengku Mahmood Secondary School Besut, Terengganu and the last school he studied was in STAR, Ipoh before he furthered his study in Grantham College For Further Education, Grantham, Lincolnshire, England. He graduated with a Bachelor degree in Operations Research and Computing, 1982 in Leeds, England and Masters in Computer Education , University of Birmingham in 1995 and completed his PhD Technical and Vocational Education in UTHM, Johor in 2010.

During his teaching career in Kelantan, spanning more than 25 years, he has worked under Dr Wan Zahid bin Mohd Noordin, formerly Ketua Pengarah Pendidikan Malaysia and State Education Director, Kelantan in 1982-1986. He moved to Politeknik Kota Bharu in 1992 – 2002 before he joined Kolej Universiti Teknologi Tun Hussein Onn, Johor in April, 2002. Here he taught BIT Introduction to IT, MTT 1704 Education in IT , BIT Quantitative Methods, BIT Mathematics Operations Research, DIT Mathematics IT1 and DIT Mathematics IT 2. Now he is a senior lecturer in Fakulti Sains Komputer dan Teknologi Maklumat , UTHM, Johor. His niche area is teaching mathematics using I.T. at diploma and degree levels.

Helmy Adly Mohd Nor was born in Johor. Presently he is a tutor in FSKTM, UTHM. He obtained his Diploma IT from Polytechnic Johor Bharu. He obtained his Bachelor IT in 2007 and Masters in IT in 2010 from UTHM, Johor. He has received few important awards in multimedia and creative design both at national and international competitions. Now he is pursuing his doctoral studies in UTeM, Malacca.

CDiCL.indd 181 07/11/2012 8:23:29 AM