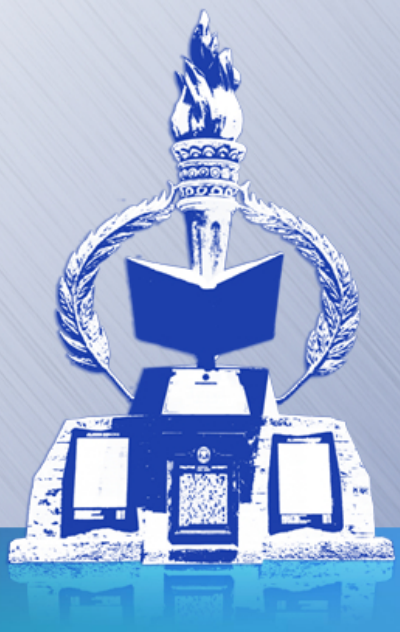
October 2013

Development and Evaluation of Computer-Aided Instructional (CAI) Material for Solving the Unknown Variables in Linear Equations and Systems of Linear Equations

Arnold C. Distor
Philippine Normal University



Philippine Normal University
National Center for Teacher Education

Development and Evaluation of Computer-Aided Instructional (CAI) Material for Solving the Unknown Variables in Linear Equations and Systems of Linear Equations

A Seminar Paper

Presented to the

College of Graduate Studies and

Teacher Education Research

PHILIPPINE NORMAL UNIVERSITY

Taft Avenue, Manila

In Partial Fulfillment of the Requirements for the degree in

Master of Arts in Teaching Mathematics

ARNOLD C. DISTOR

October 2013

APPROVAL SHEET

This seminar paper, entitled "Development and Evaluation of Computer-Aided Instructional (CAI) Material for Solving the Unknown Variables in Linear Equations and Systems of Linear Equations" prepared and submitted by Arnold C. Distor in partial fulfillment of the course requirements for the degree in Master of Arts in Teaching Mathematics has been examined is found to be acceptable in content and form, and is recommended for acceptance.

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Dr. Zenaida Q. Reyes
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Dear **Dr. Reyes**:

Greetings!

This is to certify that the seminar paper titled "Development and Evaluation of Computer-Aided Instructional(CAI)Material for Solving the Unknown Variables in Linear Equations and Systems of Linear Equations" has been edited for English Language.
Only the following sections have been edited.

- Title page
- Acknowledgments
- Abstract
- Introduction
- Definition of Terms
- Related Literature
- Research Methodology
- Presentation, Analysis and Interpretation of Data
- Conclusion
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Respectfully yours,

Prof. Rosalyn G. Mirasol, M.A.
UST-CTHM English Language Professor

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DR. GINA O. GONONG
Director, Graduate Research Office
Philippine Normal University

Dear **Dr. Gonong**:

Greetings!

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UST-CTHM English Language Professor

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To my beloved Parents, Orlando M. Distor and Rosario C. Distor, for their utmost support and advise by keeping me in mind that being poor

is not a hindrance to success. Their undaunted courage and conviction will always inspire me, and I hope to continue, in my own small way, the noble mission to which they gave their lives. It is to them that I dedicate this work.

It is a pleasure to pay tribute to the Administration of Philippine Normal University for giving me this opportunity to pursue my studies in Master of Arts in Teaching. My loyalty to Alma Mater will remain the same as I always keep in mind the Vision and Mission of the University.

Also, to the people in the Mathematics Department most especially to Ms. Rose P. Espinosa, for their generous hearts by allowing me to use the educational equipment and books.

Thank you for the mathematics, computer and student evaluators for their contribution and their active willingness to participate in this research study.

I am grateful too that there are a vast number of resource materials available that I was able to refer to, in order to make meaning of what Computer-Aided Instruction is all about. These resource materials include a number of reading materials gathered from journals, magazines, newspapers, reference books, seminars, theses, and on line websites.

Above all, I want to thank God for giving me wisdom during those hardworking days in my Master of Arts in Teaching studies, Seminar Paper and Defense.

DEDICATION

To the freshmen high school students

To the mathematics and computer teachers

To the friends of the researcher

To the co-faculty members of the researcher

To the family of the researcher

Above all, to Almighty God and Blessed Virgin Mary

ABSTRACT

Title	:	Development and Evaluation of Computer-Aided Instructional (CAI) Material for Solving the Unknown Variables in Linear Equations and Systems of Linear Equations
Researcher	:	Arnold C. Distor
Degree	:	Master of Arts in Teaching
Specialization	:	Mathematics
Keys Concepts	:	Linear Equations in Basic Algebra
Adviser	:	Dr. Gladys C. Nivera

This study aimed to develop and to evaluate a computer-aided instructional (CAI) material for solving the unknown variables in linear equations and system of linear equations.

The research used the descriptive-developmental design and followed the four stages, namely: planning, development, evaluation and revision.

The mathematics teachers evaluated the developed CAI material in terms of objective, content and presentation, while the computer teachers evaluated the CAI material in terms of technical quality and instructional design. On the other hand, student-respondents evaluated the CAI material in terms of presentation.

The results of the evaluation of the material in terms of objectives, context, presentation, technical quality and instructional design showed

that the CAI material is suitable as a supplementary material for freshmen students and a tool in teaching linear equations and system of linear equations by the mathematics teachers. The mathematics teachers agreed that the CAI material stated clearly its objectives based on the actual needs of the freshmen high school students. The computer teachers found the developed CAI material to be adequate for its purpose.

The presentation of the lessons made the students actively involved. The delivery of the lessons helped the students to group the important concepts. The students agreed that they became a part of the concept and activity in the development of the CAI material.

Furthermore, the developed CAI material will help maintain the professional development of the teachers and increase the school teaching resources.

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CHAPTER I

THE PROBLEM AND ITS BACKGROUND

Introduction

Technology integration is the use of computers effectively and efficiently in the general content areas such as Mathematics, Science, Reading and Social Studies to allow students to learn and to apply computer skills and technology in meaningful ways. However, integrating technology in mathematics teaching goes far beyond using computers to supplement a lesson in mathematics.

When teachers effectively integrate technology into their classroom practices, learners are empowered to be actively engaged in their learning. Yalama and Aydin (2004) suggest that students who are instructed with technology are more likely to retain information and develop a deeper understanding of concepts. The reality is that while computers are most often employed to supplement traditional classroom instruction, these through have not been fully integrated into classroom learning activities. Teachers in the government and private districts are now becoming aware of their differences in terms of technology use in classroom instruction. They oftentimes debate on the effectiveness of the

traditional method of teaching and the current trend which is the use of technology in the classroom.

Krysa (1998) says that today's technology, if used differently, could bring advances that would improve mathematics education dramatically. Average performing students would benefit more and restraints on bright students would be dissolved.

Many studies about how computers are utilized in schools reveal that although there have been many successes involving effective implementation of computer technology, a more sobering reality exists. Krysa (1998) shows in her surveys that computers are not fulfilling their potential to effect significant changes in education, computers are under-utilized and are not being implemented in very effective or creative ways. However, teachers agree on the potential that lies in computer technology to effect significant changes in education; however, the full potential of the computer is not being exploited.

Algebra is a language of patterns and relationships through which much of mathematics is communicated. It is a tool which people can use to model real situations and answer questions about them. It is also a way of operating with concepts at an abstract level and then applying them, often leading to the development of generalizations and insights beyond

the original context. (New Jersey Mathematics Curriculum Framework, Standard 13, Algebra, 2005)

The algebra that is appropriate for all students in the 1st century moves away from a focus on manipulating symbols to include a greater emphasis on conceptual understanding, on algebra as a means of representation, and on algebraic methods as problem-solving tools. It is important to write that changes in emphasis are a result of changes in technology and the challenges that students' needs bring.

It is for this reason that this study is conducted to effect creative and meaningful ways for the learners to better understand concepts in Algebra. Specifically, this study aims to develop CAI material that will help students enrolled in Algebra.

Conceptual Framework

Technology becomes the trend for many students in improving academic achievement and for many teachers in developing educational program in all levels (McKethan, Everhart, & Sanders, 2001)Computers were first used as tools for teaching in 1950 when appropriate programs were first elaborated.

Students are generally attracted to computers. Computer phobic students appear less frequently than math-phobic ones. Furthermore, it

can be observed that students are eager to participate in classroom activities in computer-intensive classes. On the other hand, it was found out that when teaching a computer-intensive class the students may become quite proficient in the use of computers and mathematical software. (Kehagias and Vlachos, 1999)

The unending development in technology has been acknowledged as an additional teaching tool. Computer aided Instruction (CAI), combined with traditional methods, was more helpful to students in reaching their educational-training goals (Kinzie, Sallivan, & Berdel, 1992). According to Rasmussen and Davidson (1996), one of the most significant advantages of CAI is the potential to individualize instruction so as to meet the particular needs of student.

Moreover, the use of text audio, and graphics in the presenting lessons in Mathematics lends teaching by computer an interesting and effective learning tool. This allows students to become more interested in learning lessons in Mathematics.

Most of the students in Algebra are facing difficulties in understanding lesson. In a classroom situation where the math teachers who really mastered the concepts in solving problems in Algebra sometimes cannot find ways to perfectly deliver the thoughts that the teachers wanted to imply to the students. With this in mind, teachers need

to be aware of the use of CAI material as means of improvement and development of their teaching strategies.

Computer aided Instructional material facilitates learning better amidst the problems of today's generation such as overcrowding and educational overloading.

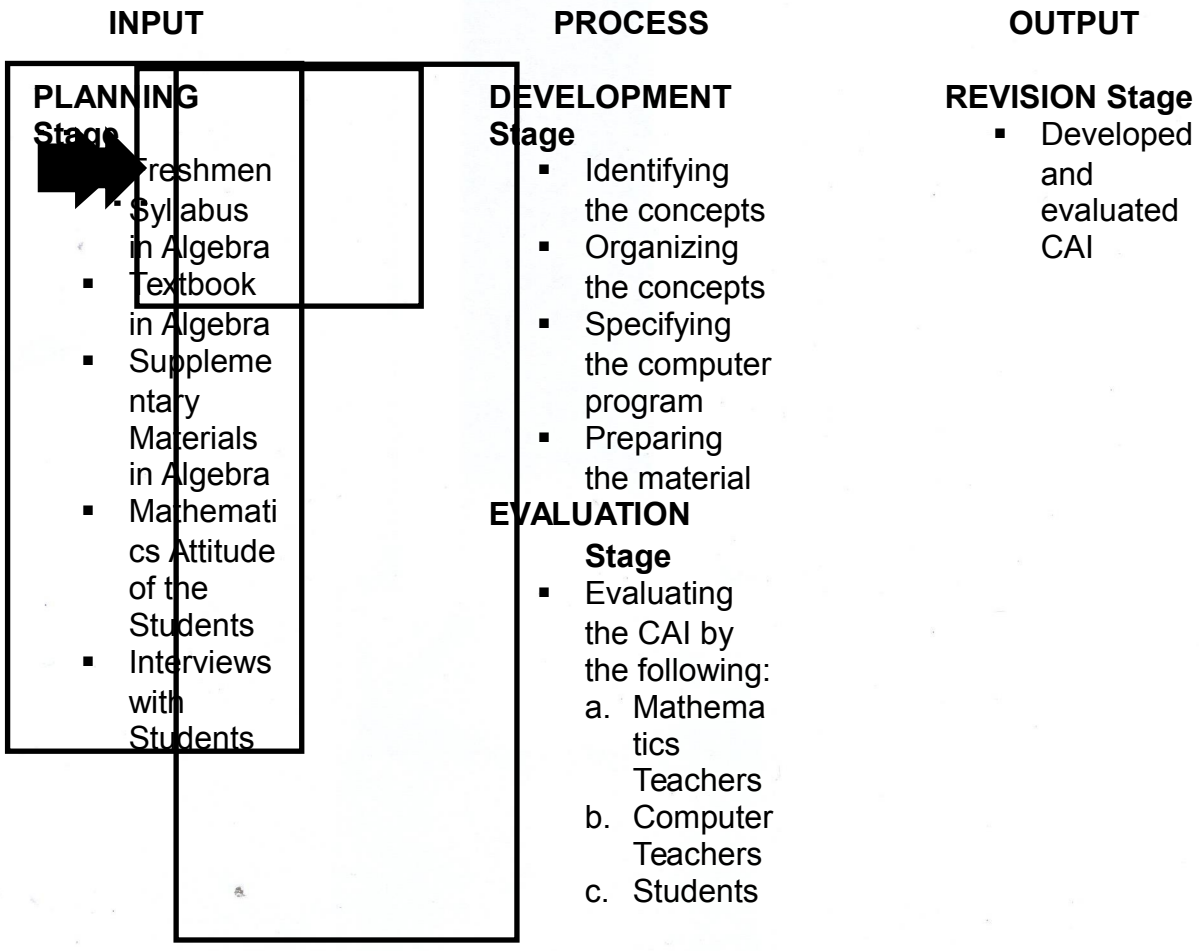

Figure 1 Courseware Development Model

Figure 1 shows the courseware development model used in this study.

This model presents the system cycle consisting of a number of stages in the developmental process. Stages in this model are the key elements in the structured system analysis and design which includes planning, development, evaluation and revision stages (Willis, 1993).

The **INPUT** shows the Planning Stage which includes the materials analyzed and used by the researcher to identify the topic from the syllabus, textbook and supplementary materials for Freshmen Algebra. The results of the students' mathematics attitude were also considered. Interviews with the students were also conducted to identify the specific needs of the students.

The **PROCESS** features the Development Stage which includes the identified and organized concept in finding the unknown values of x and y variables in linear equations. The Evaluation Stage which includes the objectives, content, presentation quality, technical quality and instructional design. The Revision Stage which includes the evaluation results gathered from pilot testing of the computer-aided instructional material and checklists. The data gathered were used by the researcher to improve the developed computer-aided instructional material. The researcher provided the student-respondents with guided drill that increased the interest of the students in using the computer-aided instructional material.

The **OUTPUT** reveals the final outcome of the study which includes the developed and evaluated CAI based on the evaluation results.

This Courseware Development Model was formulated to secure a valid system in the development of a tested material whose main purpose is to meet the teachers' demand and help the students in learning a concept in linear equations and systems of linear equations.

Statement of Purpose

The main purpose of the study was to develop and evaluate a computer-aided instructional (CAI) material for Algebra. Specifically, it aimed to do the following:

1. Describe the mathematics attitude of the freshmen high school students.
2. Identify the needs and problems of the freshmen high school students in solving linear equations and systems of linear equations.
3. Develop a Computer-Aided Instructional (CAI) material for linear equations and systems of linear equations.
4. Evaluate the developed Computer-Aided Instructional (CAI) material in terms of:

    2.1. Mathematics Teachers

        a. Objective

        b. Content

        c. Presentation

2.2. Computer Teachers

a. Technical Quality

b. Instructional Design

5. Evaluate the developed Computer-Aided Instructional (CAI) material to student-respondents for evaluation of its presentation.

Significance of the Study

The results of this study would be beneficial to the following:

For the students, they would have the chance to independently construct their own understanding about certain topics which is major principle of the constructivist theory. This principle states that the learners or students have the chance to create their own way of understanding using their past and present experiences. This structure can enhance the students' computer skills as they can maximize these skills to learn and innovate for more learning.

For the teachers, they would have the chance to improve their teaching styles and strategies while gradually shifting from using the traditional medium of instruction. In this way, teachers will become globally competitive.

For the school administrators, they would recommend the CAI material for all mathematics teachers and adapt technology in all school

instructions. Likewise, they can provide baseline information for further materials to be developed.

Scope and Limitation of the study

This research study includes the concept of linear equations and systems of linear equations in Algebra which was the basis for the researcher to develop a computer-aided instructional material. Likewise, the material was developed and evaluated by the mathematics and computer teachers, and freshmen students based on the objectives given in the survey form. The mathematics teachers evaluated the developed CAI material in terms of objective, content and presentation, while the computer teachers evaluated the CAI material in terms of technical quality and Instructional design. On the other hand, student-respondents evaluated the CAI material in terms of presentation.

Similarly, this research study discusses the issues concerning the factors that affect the use and implementation of technology of the teachers in teaching. The study includes a need to supplement the learning and understanding of the freshmen students in linear equations and systems of linear equations using the developed CAI material.

Lastly, the respondents of this study are limited only to fifty (50) freshmen students. The respondents evaluated the free software as a computer-aided Instructional for Algebra. The topic is delimited to the computation of values of one and two variables in linear equations and systems of linear equations.

Definition of Terms

Attitude. It is a positive or negative evaluation of an individual of a person, object, behavior or event. (Plotnik,2005). In this study, students' attitude towards mathematics and technology was measured by the adapted questionnaire.

Computer-aided Instruction (CAI). It includes the use of computers to teach academic skills. It includes computer modeling and computer tutors (Collet-Klingenberg,2009). It is a self-learning technique, usually offline/online, involving interaction of the student in Mathematics with programmed instructional materials. In this study, CAI material is a tool for students to check the manually done computed unknown variables in Linear Equations and Systems of Linear Equations.

Evaluation Checklist. It contains a list of items or specific criteria created by the research or adapted from other resource for the purpose of evaluating the content of one material.

Information Technology (IT). It is defined as the hardware and software used to implement the following applications in the school: drill/practice, tutorials, simulations/games, word processing, painting/drawing, music composition, spreadsheets/graphics/statistics, electronic book.

Instructional Design. It refers to the quality of instruction as an objective in measuring the capability of the students to learn the CAI material (Mergel,1998).

Linear Equations. It is the first degree of the term in the equation (Gotauco, 2008). In this study, linear equations are presented as algebraic equations in which each term is a constant or the product of constant and (the first power of) a single variable.

Mathematics Attitude Questionnaire. In this study, this questionnaire is used to address the mathematics perception of the freshmen students in terms of the students past learning experiences, future use and integration of mathematics in other subject areas.

Performance. It refers to the individualized or grouped actions of the students in a certain task assigned by the teacher or computer program (Driscoll, 2000).

Systems of Linear Equations. It is a system with two or more linear equations (Alferez, 2004). In this study, it focuses on solving systems of linear equations containing two equations in two variables.

Technical Quality. It refers to the objective in measuring the quality of the visual effects and courseware used Alcala, et.al, (2010).

CHAPTER 2

REVIEW OF RELATED LITERATURE AND STUDIES

This chapter discusses the related literature, and foreign and local studies involving the learning of Algebra in the Philippines and the innovations by the teachers in teaching Algebra using the computer-aided instructional.

The Use of Technology in Teaching

Pens and pencils are far from obsolete, but forward-thinking educators are finding other interactive tools to grab their students' attention. School programs are built around teaching how to create video games. Teachers are using Guitar Hero, geo-caching (high-tech scavenger hunt), Google maps for teaching literature, ePals and LiveMocha to learn global languages with native speakers, Voki to create avatars of characters in stories, and Skype to communicate with peers from all over the world (Barseghian, 2011).

Barseghian, (2011) cited that creating media is another noteworthy tech-driven initiative in education. Students are exposed with varied social

media today. This is a great opportunity for them to be connected with the world.

Barseghian, (2011) specified that tech-savvy teachers are threading media-making tools into the curriculum with free tools, like comic strip-creation site ToonDo, Microsoft Photo Story 3 for slide shows, SoundSlides for audio slide shows, Microsoft Movie Maker, and VoiceThread to string together images, videos, and documents, to name just a few. He added that the students in high school and college are using digital portfolios to showcase the trajectory of their work on websites that link to their assignments, achievements, and course of study, using photos, graphics, spreadsheets and web pages. The University of Santo Tomas utilizes an academic tool called Electronic Learning Access Program (eLEAP) where the students and teachers can access the lessons and conduct live discussions related to respective courses.

Advantages and Disadvantages of Using CAI in Math Education

Arnold (2000) stated that information that helps teach or encourages interaction can be presented on computers in the form of text or in multimedia formats, which include photographs, videos, animation, speech, and music.

Computers can also help students visualize objects that are difficult or impossible to view. Computers can be used to display human anatomy, molecular structures, or complex geometrical objects. Exploration and manipulation of simulated environments can be accomplished with CAI-ranging from virtual laboratory experiments that may be too difficult, expensive, or dangerous to perform in a school environment to complex virtual worlds like those used in airplane flight simulators. CAI tools, such as word processors, spreadsheets, and databases, collect, organize, analyze, and transmit information. They also facilitate communication among students, between students and instructors, and beyond the classroom sessions.

In today's classroom, (Klaus, 1998) mentioned that teachers are pressed to make every minute count. If the teacher and students are not experienced with technology in the classroom, valuable time is often wasted on technical troubles. In addition, the teacher faces the difficulty of having a class full of students who are all at different skill levels. In many schools, most students will have a computer and Internet access, but schools that are located in impoverished areas may have a large portion of their student body with little to no computer experience. While it is important to educate these children in technology, it must be done at a

pace that meets every individual's needs or more learning time will be wasted.

In the advent of technology today, Klaus (1998) in her online article said that classroom teachers are using technology in the classroom more frequently than ever before. According to the National School Boards Association, students who are exposed to a high volume of technology perform as well as expected on standardized test; however, technology can potentially do students a disservice if used inappropriately. When teaching using technology, instructors must be aware of the potential hindrances technology can bring to the learning process.

Klaus, (1998) mentioned that in some classrooms technology is overused. This can lead to a variety of problems. Many students learn best by physically and mentally interacting with what they are studying. If most of the teaching is done using a computer, these students' needs are not being met. Technology should be used to supplement the classroom curriculum, but should not be used as the sole source of learning. He cited that one problem that many classroom teachers face is that students often use computers primarily for entertainment. Because of this, many students associate computers and technology with merely playing games and the like. Though some teachers can use computers to their advantage, if this

issue is not properly addressed, some students may get distracted and perform low in academic challenges.

Factors affecting the effective success of CAI

To maximize the use of CAI in the classroom, Krysa, (1998) listed eight factors that would lead to the successful teaching and learning process:

Time Factor. The time factor surrounding the implementation process is viewed by teachers as being a major barrier in the using computers. Stallard (1998) stated that teachers are reluctant to embrace technology because of its potential to shorten learning time for students. Stallard contended that teachers face a number of potential interruptions during the typical hour-long class and that, consequently, the actual time spent teaching and learning is shortened significantly. Hence, if the implementation of computer technology involves a "potential interruption" to teaching and learning time, teachers may avoid using the technology.

Bennett (1996) included a list of other conditional factors that make demands on teachers' time and affect individual teachers' decisions regarding implementing computers in the classroom. The teachers who have taught with computers agree that at least initially most uses of

computers make teaching more challenging. Individualized lessons, matching software to curriculum, scheduling student computer time, monitoring use, providing assistance, and troubleshooting are all add burdens to the teacher's time. The net effect is increased demand on teacher's time and creativity where very few teachers have adequate time for planning and preparing the use of technology.

Roszell (1995) cited a study by Pelgrum and Plomp (2001) whose worldwide study of computers in education identified 29 conditions that affected the implementation and use of IT [Instructional Technology] in education. This study found that one of the most frequently occurring and significant conditions affecting teachers' willingness to embrace computer technology in instruction was the lack of available preparation time for teachers to develop lessons that used computers.

Availability of Hardware. Ginsberg and McCormack (1998) conducted a survey of 1163 teachers to discern what barriers teachers encounter in using computers. The responses to their survey indicated that the availability of computer hardware was the most serious barrier affecting implementation. Regarding hardware, teachers in both highly and less effective schools reported "serious" to "very serious" concern with "too few computers" and "too few printers." Teachers in less effective schools also

reported concerns about "computers being too limited". Moreever, Middleton, Flores and Knaupp (1997) viewed the hardware factor as an accessibility barrier. They contend that computer labs are an effective strategy for reducing the student-to-computer ratio in schools.

However, the competition between teachers for lacks of time in the computer laboratory may result in some teachers giving up on scheduling time in the computer lab and thereby ceasing to implement computers in instruction. They also contend that the accessibility to computer hardware may also be dictated by the subject being taught.

In some instances, the physical location of computers and the students needing access to them will act as a barrier to teachers implementing the technology.

A problem is that real scientific activities and hands-on mathematics are difficult to carry out in a computer laboratory. Most such activities require more room and equipment than staff members can haul into and out of a room not dedicated to such activities.

The most important issue, according to Middleton (1998), involves limitations of computer labs and issues of scheduling computer time.

He argued that computers need to be situated in classrooms where they can be easily accessed by students and used in a meaningful and pragmatic way. This prevents true integration of the computer in the

instructional process. When large numbers of computers are in a room separate from classrooms, many students get hands-on experience occasionally, but no one gets to use the computer in a truly authentic way that is, the way a scientist or mathematician might use it to solve a difficult, time consuming problem.

Software Issues. Newhouse's evaluation of computer-saturated learning environments in part considers issues concerning teachers' implementation strategies for computers in the classroom (1997).

One factor that is identified by teacher respondents in Newhouse's study is the lack of availability and access to software that is subject content appropriate. This factor is perceived by teachers as being a serious barrier that has a negative effect on the use computers in their classrooms.

Primary to the implementation of the software is its assessment in terms of its use and appropriateness in the context of specific learning outcomes. Ginsberg and McCormack (1998) listed a number of teacher issues and potential barriers to implementation that are software resource related like matching courseware to curriculum evaluation, quality control acquisition, setting priorities security, placement appropriate use. Similar

software issues that act as barriers to successful implementation can be found in Ginsberg & McCormack (1997) and Morton (1994).

Attitudes of Administrators. Individual teacher initiative accounts for much of the implementation of computer technology in schools. Lack of support by administrators is identified as a significant barrier toward implementation of computers in classrooms (Morton, 1994).

Lockard (1997) argued that successful implementation of computers can only occur if administrators offer teachers support and leadership. Persky (as cited in Brand, 1998) states that in addition to administrators developing a philosophy to guide the implementation of computer technology, they can support the technological professional development of teachers by establishing flexible schedules so teachers can practice what they have learned (or to continue their learning); encouraging and facilitating team teaching and peer coaching allowing teachers to visit each other's classrooms to observe computer technology integration; and scheduling regular meetings among teachers using technology to plan and evaluate instruction.

Pedagogical Factors. Galligan (1997) emphasized the role of individual teachers in application of computers and how teachers can affect the

educational appropriateness of the technology. He also claimed that “It is their teachers' choices of how, when, where, why and by whom computers are used that determine whether or not the technological pull is educationally beneficial.”

The versatility in the ways computers can be employed for instructional purposes is varied, sometimes within the context of the software itself. Galligan (1997) "Effective teachers" are teachers who make effective choices about why they are facilitating any particular computer-based learning experience.

Becker (1994) provided a number of variables that complicate the pedagogy of implementing the computer in instruction: although computer availability is important, the most important factors determining whether teachers use computers effectively are planning time and teacher attitudes, style and background. Drury (1995) stated that changes surrounding pedagogy are necessary if teachers are to be successful in implementing technology to support learning. He stated that the "lack of sound pedagogical basis for integration of technology within the school has led to a narrow and unimaginative usage".

Becker (1997) also argued that teachers and schools focus the use of computers on classes such as "computer studies" rather than in other subject areas and thus "most study is of the technology rather than with

the technology". He contended that this practice has the "effect of marginalising" computers in education. Drury (1995) predicted a change in pedagogy and teacher role. The emphasis in our classrooms will shift increasingly from the product of learning to the process of learning and good teachers will be regarded as those who instil in students the skills required to navigate successfully through an information rich world.

Galligan (1997) expressed a similar view about teacher roles and the pedagogy of computer technology. The outcomes of computer use at the classroom level are shaped by the theoretical framework and beliefs of individual teachers; the range of their pedagogical repertoire; and their sensitivity and responsiveness to the structure, potential and limitations of particular software programs.

Teacher Attitudes. Teacher attitudes toward computer technology may be a significant factor in the implementation of computers in education. Griswold (1984) expressed a concern that computer literate individuals will "reap greater benefits than their counterparts who lack that knowledge." Their concern is that the development of computer literate individuals is dependent on computer literate teachers who have "in general demonstrated a resistance to learning about computers".

A study by Newhouse (1995) found that some teachers do not believe that computers have "a useful educational objective" and that they are "nonessential and supplemental to their teaching and classrooms."

Personal Familiarity with Computers. A study by Morton (1994) drawn some important conclusions surrounding teachers' personal familiarity with computers and how lack of personal familiarity and experience may act as a barrier. The acquisition of computer expertise and skills is generally left to teacher initiative high levels of anxiety in using computers is experienced by teachers wanting to use computers and have few role models to follow teachers view the use of computers as promoting learning in students teachers are aware that increasing the frequency of computer use will lead to changes in pedagogy teachers are critical of lack of computer resources to implement change administrators have created a major barrier to implementation because they are focused on learning about the computer instead of using the computer for learning.

Van Lengen (1996) found that for the most part all teachers are willing to implement lessons using the computer but "the problem was that many teachers were either infrequent users or they didn't know how to use them". Compounding this problem is the need for infrequent teacher users to have structured opportunities to develop and practice computer skills.

Newhouse (1995) identified teachers' lack of computer literacy as being an obstacle to their using computers in classrooms. Newhouse draws a conclusion about the number of years of experience that computers teachers have and the impact it makes on the implementation process. Most teachers need two or three additional years of experience using computers to become significant users of computers in classrooms, teachers need up to five years solid experience in using computers to become proficient at integrating the computers in the curriculum. Newhouse's findings are shared by Roszell (1995).

The most commonly identified factor, in the literature affecting IT use by teachers was their level of knowledge and skill in using computers.

Teacher Training. Seidmen (1996) conducted a study into issues surrounding teacher training and its relationship with the successful implementation of computers. Along with the statistical analysis, Seidmen found that the handwritten comments by teacher respondents "overwhelmingly expressed a need for teacher training on basic computer skills".

Seidmen (1996) also stated that teacher training should not be limited to teachers who teach computer subjects. Seidmen refered to the trend of educators to train all teachers on the use of computers. This need

for teacher training is explained by the fact that most of the presently hired teachers received little or no training in their formal education.

It could also be a reflection of the need to update teachers' knowledge in the world of fast moving technology of communication. Teachers' training on the educational use of computers gains special importance when considering integrating the computer into regular curriculum. Teachers need to know how to use computers first before they can integrate them.

He also stated that subject matter teachers are reluctant to consider the implementation of computers in teaching. The relatively cautious position of the subject matter teachers is perhaps due first to their limited experience with software and hardware, and second to the uneasiness about changing their habits and techniques as some of them expressed in their written comments.

Mintz (1996) echoed Seidmen's view that teachers are unprepared to use computers in their classrooms and they "lack support and educational guidance". Mintz pointed to professional development and training as a solution to successful implementation. The next crucial step is the professional development for teacher that will provide them with materials, strategies and new understanding to meet the learning goals.

Teachers need continuing in-service programs as technology changes where more effective uses of technology are developed and conduct a research for a better understanding of how children learn. The teacher is central to the implementation of computers in the classroom. Essential to teacher training is drawing a link between pedagogy and technology Bennett 1996).

The present economy we are in is one “powered by technology, fueled by information and driven by knowledge” (Tinio, 2010). What it implies then for the education sector is that there is a need to understand how the limits of learning could be stretched out to accommodate the benefits of technology and make individuals well ready to face the demands of their future workplace. To make this possible, Tinio(2010) suggested that “schools must promote learning to learn.”

Motivating students to learn becomes much easier when the environment is learner-centered. And it is through use of information and communication technologies (ICTs) in teaching that this kind of environment may be best created. Because ICTs enable learning to be active, collaborative, creative, integrative, and evaluative (Tinio, 2010), learning naturally becomes an experience to enjoy rather than a task to bear.

Local Studies

Dioquino (2000) studied the effect of a developed interactive CAI which involves solving word problems in Algebra. The study made use of experimental design known as the pre-test and post-test control group. The result of the study proved that the developed material possessed the characteristics of a very good computer based courseware. It was found out that the students performed better in solving word problems that those who did not use the material.

Abante (2006) found out in his study " The Effectiveness of Simulation and Computer Assisted Instruction (CAI) on the Performance of Students under Regimental Training on Selected Topics in Physics" that the students performed better in the post-test than the pre-test based on the increase of the mean difference of the scores of the two tests. This indicated that the students as respondents performed better after the lecture discussion using CAI material in mathematics.

However, studies of Vista, Tan and Yaranon (2009), found that computer has also disadvantages. In their research they found that many students spent more time playing rather than researching and doing other academic works. This results to computer addiction. From these students, huge percentage of them is male. This shows that male students are more prone to be affected by computer disadvantages.

Garcia (2004) had also made a research about the effect of CAI in freshmen students of Asis National High School. He conducted this to find out whether CAI can also be used in algebraic expressions. The study made use of true-experimental research design. The result of the study proved that CAI can also be used in teaching algebraic expression to the students.

Zapata (2004) suggested the use of the three stages, namely: preparation, development and evaluation to develop a CAI material in mathematics. He added that the developed CAI material can serve as a supplementary material in teaching techniques. He also revealed that the teachers evaluated the material higher than the students.

The research goal is to inform the students about what computer can really do to them, how it can affect them and what it is that affects them. The researchers proved that the research made is really true and precise because they are also once addicted in using these so called computers.

Foreign Studies

Collis (1985) suggested that attitudes toward computers may also be dependent upon students' attitudes towards other factors, for example gender. In her study, Collis found that in general, females view their

gender as less competent than males in terms of working with computers. He also found that while females believe that most females are not as competent as their male peers, they simultaneously believe that they personally are as competent. Jones (1983) conducted a study of 9th grade students in order to see whether there were true gender differences in students' competency with computers.

Empirically concluding whether computer-aided instructional programs improve student performance in math is the obvious first step in formulating policy. While there are conflicting findings on this question, the majority of current research lacks randomized control study designs to account for factors like individual teacher effects and student ability that might be correlated with the use of computers in the classroom and student outcomes.

A meaningful policy discussion requires understanding the underlying reasons why a reform works. On this point, even among the studies that include a randomized evaluation of computer-aided instructional programs, few examine the mechanisms explaining why such technology either helps or hinders achievement. Ragosta, Holland, and Jamison (1982) and Banerjee (2007) both found beneficial effects of computer-aided instructional programs in math, but neither offers evidence

on why these effects occur. While several hypotheses explaining the benefits of computer-aided instructional programs exist including increased student engagement and motivation, and providing students with a greater level of individualized instruction there is no supporting empirical evidence.

Barrow, Markman, and Rouse (2008) examined the effect of "I Can Learn" a popular pre-algebra/algebra computer-aided instructional program in three US urban schools districts suffering similar problems of underachievement and teacher recruitment.

Ragosta, Holland, and Jamison (1982) Banerjee (2007), and Wang, Wang, and Ye (2002) found out that computer-aided instructional programs can have a significant impact on student achievement levels in mathematics performance. However, effective policy implementation requires more than suggestive evidentiary support; policymakers must also have some understanding of how and under what circumstances the proposed reform works.

Barrow, Markman, and Rouse (2008) created models that include a classroom characteristic of interest, such as the average attendance in the prior year, the class size, or the heterogeneity in mathematics achievement, the data show greater effects for students in large,

heterogeneous classes with poor attendance rates. Since these classroom characteristics would normally be disruptive and suggest a potential advantage to more individualized instruction, these findings support the theory that one of the primary benefits of a computer-aided instructional program is an increase in the amount of quality, individual instruction time each student receives.

Linden (2012) conducted two researches on the impact of computer-aided instructional. In one study, computer-aided instructional led to a significant decrease in skills; in another to a significant increase. On balance, Linden says that the evidence has shown positive, if muted, increases in reading and math skills from computer aided instructional, but that it is difficult to generalize since existing studies vary dramatically in the programs they test, the students they assess, the teaching environments and other highly variable factors.

These results may cause many teachers unions to celebrate, as they suggest that instruction really matters, especially for struggling students. Computers cannot replace instructional time, even in India, where teacher and student absenteeism is high.

Linden's second study measured the impact of computer-aided instructional in English language learning. In this second study, Indian public schools were given tablet computers similar to the LeapFrog. The tablets had an English language application that children could follow at their own pace. Some schools also received flashcard activities that the teachers did with the children.

Linden's results again varied depending on the skill level of the child. All three cohorts showed average improvements. But the best performing students did much better using the tablet computers at their own pace, and gained nothing from the flashcard activities. In contrast, the less successful students saw the greatest benefit from doing flashcard activities led by the teacher, and gained nothing from the tablets. Again, for the lowest performers teachers really matter.

Synthesis

In this research study, the researcher found the same advantages that contribute to the students in learning mathematics.

Teachers in mathematics can deliver the information and encourage interaction with the students through computers in the form of text or in multimedia formats, which include photographs, videos,

animation, speech, and music which simply called the computer-aided instructional material.

CAI tools, such as word processors, spreadsheets, and databases, collect, organize, analyze, and transmit necessary information. They also facilitate communication among students, between students and teachers, and beyond the classroom sessions or in other words individualized learning by each student.

Klaus (1998) said in her online article that classroom teachers are using CAI material in the classroom more frequently than ever before. Students who are exposed to a high volume of CAI material or technology perform as well as expected on standardized test, however technology can potentially do students a disservice if used inappropriately.

One problem that many classroom teachers face is that students often use computers primarily for games. Because of this, many students associate computers and technology with game playing. Though some teachers can use this to their advantage, if this issue is not properly addressed, some students may get distracted and stopped from working quickly. This is when the teachers should remind frequently and patiently supervise the students in dealing and working with CAI material. When teaching using CAI material, instructors must be aware of the potential hindrances it can bring to the learning process especially to the students.

While it is important to educate these students through CAI material or technology, it must be done at a pace that meets every individual's needs otherwise more learning time will be wasted.

CAI material and technology should be used to supplement the classroom curriculum, but should not be used as the sole source of learning. Teachers should remember that CAI material is only a tool for students' learning and teachers' teaching.

CHAPTER 3

RESEARCH METHODOLOGY

This chapter discusses the research design, respondents, instruments, data gathering procedure, procedure in CAI material development and the statistical treatment used in this study.

Research Design

The researcher utilized the descriptive-developmental design. According to Sanchez (1998), descriptive research includes all studies that purport to present facts concerning the nature and status of anything which one may wish to study. Furthermore, this is also a developmental study because it developed a CAI material for linear equations.

The research design followed the four stages namely: planning, development, evaluation and revision.

Books and supplementary materials being used by the freshmen high school students in algebra, and the syllabus for freshmen algebra were used in the planning.

The identified concepts from the book and syllabus in algebra became part of the preparation for the CAI material leading to its development. The developed CAI material was evaluated by three

selected groups of evaluators namely: mathematics teachers, computer teachers and student-respondents. Finally, results of evaluation were considered for further development of the CAI material.

Research Participants

Two Mathematics teachers and two Computer teachers from three departments in UST participated in the study. They evaluated the developed CAI material in terms of objectives, context, presentation, technical quality and instructional design. This allows the material to match the need of the students.

In addition, 50 freshmen high school students with no specific differences in terms of academic and behavioral capacity evaluated the study in terms presentation. The age of the freshmen students range from 12 to 13 years old. They were the primary sources from which the researcher sought useful information to achieve the objectives in this study. One of the sources of information was the result of the mathematics attitude questionnaire given to 50 freshmen high school students.

The researcher set the following qualifications that ensured accurate and valid evaluation of the CAI material. The Mathematics teacher respondents should be a graduate of Bachelor of Science in Education major in Mathematics. They also must be a licensed

professional with a minimum of 2 years of experience as a classroom Mathematics teacher. They must also be computer literate.

The Computer teacher respondents should be a graduate of Bachelor of Science in Education major in Computer Education. They also must be a licensed professional with a minimum 5 years of experience as a classroom Computer teacher. They must also be equipped with computer program manipulation.

The researcher used the convenience sampling method in selecting the students as respondents.

Research Instrument

The research instrument used to evaluate the CAI material in this study was an adapted Evaluation Checklist from the study of Zapata in 2004. It consisted of five major components namely: the objectives, context, presentation, technical quality and instructional design. The Evaluation Checklist was revised by the researcher. It was initially validated and tried-out among two (2) mathematics teachers, two (2) computer teachers and two (high school students). A rubric way made to objectively evaluate the evaluation checklist.

The researcher finally performed the final evaluation of the CAI material. The evaluation checklist of Mathematics teachers consisted of

three major components with seventeen items namely: objectives with six items, context with five items, and with six items from the presentation.

The evaluation checklist of Computer teachers consisted of three major components with sixteen items namely: technical quality with six items, and with six items from the instructional design.

On the other hand, students-respondents evaluated the CAI material through its presentation quality with six items. They assessed the material's presentation based on how it was done in class.

The Likert Scale evaluation checklist was utilized by the respondents:

1	2	3	4	5
Poor	Needs Improvement	Good	Very Good	Excellent

The averages for evaluation on the checklist were computed and interpreted using the following scale:

Table 1

Scale for Interpreting Results for

Checklists Evaluation

Ratings	Acceptability
4.51 – 5.00	Excellent
3.51 – 4.50	Very Good
2.51 – 3.50	Good
1.51 – 2.50	Needs Improvement
1.00 – 1.50	Poor

A survey was also conducted to identify the attitude of the student-respondents about mathematics.

Another Likert Scale for mathematics attitude was utilized by the respondents:

1	2	3	4	5
Strongly Disagree	Disagree	Fair	Agree	Strongly Agree

The average for mathematics attitude was computed and interpreted using the following scale:

Table 2

Scale for Interpreting Results

Ratings	Acceptability

4.51 – 5.00	Strongly Agree
3.51 – 4.50	Agree
2.51 – 3.50	Fair
1.51 – 2.50	Disagree
1.00 – 1.50	Strongly Disagree

Procedures in the Development of CAI Material

This part discusses the methods that the researcher followed in developing the CAI material. It is divided into four stages namely: planning, development, evaluation and revision.

Planning Stage

Starting with the planning stage which includes students' attitude in mathematics, needs analysis, gathering requirements and of multimedia and non- multimedia resources, this stage focuses on determining all the prerequisites in developing the CAI material. This way the researcher established all the resources that are essential in the fulfillment of the material.

In the needs analysis, the researcher opted to define the compatible computer instruction for the freshmen students observing their learning habits.

Development Stage

Development stage includes the following sub-stages: development evaluation and testing. In this stage, the researcher developed a CAI material which was tested and revised to achieve the more appropriate material for the said respondents.

In this stage, the researcher made the storyboard. This process included the plan for the use of JavaScript and Notepad for computer programming.

Evaluation Stage

After creating a CAI material, it was subjected to the evaluation of the Mathematics teacher respondents, the Computer teacher respondents and the student respondents using the evaluation checklist adapted from the study of Zapata in 2004. Adjustments were made accordingly after the said evaluation.

Revision Stage

After evaluating the temporary CAI material, the respondents' comments and suggestions including the evaluation checklist were considered by the researcher for revision and improvement of the tentative CAI material.

Data Gathering Procedure

This research followed this procedure:

First, the researcher referred to the freshmen syllabus, textbook and supplementary in Mathematics to determine the appropriate topic to be covered. The results of the mathematics attitude survey and interviews with the students were also considered in identifying the need and problems of the freshmen students. The researcher started to design the CAI material using JavaScript and Notepad, and aligned the material to the identified need of the students.

Second, the researcher disseminated the request letters to the Mathematics and Computer teachers.

Lastly, revision and improvement the tentative CAI material based on the comments, suggestions, and evaluation by the teacher respondents.

Statistical Treatment

In presenting, interpreting and analyzing the data gathered by the researcher, certain statistical tools and techniques were used.

The researcher carefully tallied the scores through frequency counting of the responses made by the teacher and student respondents

for every item in each major component in the evaluation checklist for CAI material.

The mean of each evaluation checklist with seventeen (17) items for Mathematics teacher and sixteen (16) items for Computer teacher and six (6) student-respondents was computed. The results were analyzed and interpreted.

CHAPTER 4

PRESENTATION, ANALYSIS and INTERPRETATION of DATA

This chapter presents the data gathered from the respondents that were carefully analyzed and interpreted to determine if the developed CAI

material can be used as a supplementary material in teaching and solving for unknown values in linear equations.

Planning Stage

In this stage, the minimum learning competencies were considered in the design of the CAI material specifically on the title of the topics and the learning objectives. Scope and sequence based on the freshmen Mathematics curriculum was also added. Similarly, the students' needs (see table 3) were finally identified through reading of related books, articles, and having interviews with freshmen high school students, mathematics and computer teachers. Furthermore, a mathematics attitude survey was conducted for freshmen high school student-respondents. Learning objectives of the CAI material were identified like: 1) describe systems of linear equations, 2) use the basic concept of linear equations in solving problems involving systems of linear equations, 3) explain solutions after solving manually the given problems, 4) use CAI material in checking the final answers which were solved manually, 5) identify mistakes in the process of solving systems of linear equations.

Table 3 presents the identified common needs of the freshmen high school students that were considered in the design of the CAI material.

Table 3

Criteria for Design Based on Students' and Teachers' Needs

Students' Needs	Criteria for Design
Some freshmen high school students have a hard time solving linear equations specifically in isolation process of the unknown variable/s which will lead to solving its value/s in the equation. This problem was identified through the interviews with the freshmen students by the researcher.	The objectives for the CAI design were given focus. The design was done using the C++ program. The processes in solving for the unknown values of the *x* variable/s given in the following concept of the linear equations: $ax + b = c$ and $ax + by = c$ with $dx + ey = f$

Teachers' Needs	Criteria for Design
Teachers in mathematics find a hard time to finish their lessons in linear equation due to a limited 40-minute allotted time for the mathematics class. This problem was identified through the interviews by the researcher with	Practice set was included in the module. This is to allow the students to answer the problems manually and evaluate their answers using the developed CAI Material.

the mathematics teachers in the first year level.	
Teachers in computer cannot provide a CAI material due to lack of software availability.	The students can use the developed CAI material for free by allowing them to upload or save it in their Universal Serial Bus or USB.

Table 4 shows the results of the student-respondents mathematics attitude survey. The questionnaire was adapted from http://people. oregonstate.edu/~schorir/ ocept/survey. html, necessary revisions were made for this study.

Table 4

Results of Students' Mathematics Attitude Survey

Questions	Mean	Interpretation
1. Mathematics and computer are enjoyable and stimulating to me.	4.82	Strongly Agree
2. Mathematics and computer are NOT important in everyday life.	3.90	Agree
3. In mathematics you can be creative and discover things by means of computer.	4.52	Strongly Agree

4. I have never liked mathematics, and it is my most dreaded subject.	3.46	Fair
5. There is nothing creative about mathematics; it's just memorizing formulas and things.	**2.32**	**Disagree**
6. Students who have understood the mathematics they have studied will be able to solve any assigned problem in five minutes or less.	2.64	Fair
7. I try to learn mathematics because it helps develop my mind and helps me think more clearly in general.	4.22	Agree
8. Using the web (or a computer) is a good way for me to learn mathematics.	**4.96**	Strongly Agree
9. Everything important about mathematics is already known by mathematicians.	4.76	Strongly Agree
10. Mathematics makes me feel uneasy and confused.	2.96	Fair
11. Mathematics and computer are needed in order to keep the world running.	4.92	Strongly Agree
12. Mathematics is a solitary activity, done by individuals in isolation.	4.60	Strongly Agree
13. Mathematics is less important to people than computer.	4.44	Agree
14. Mathematics is needed in designing practically everything with the help of computer.	4.92	Strongly Agree
15. Communicating with other students thru web helps me to have a better attitude	4.80	Strongly Agree

towards mathematics.		
16. I am interested and willing to acquire further knowledge of mathematics and computer.	4.56	Strongly Agree
17. Real mathematics problems can be solved by common sense instead of the mathematical rules you learn in school.	2.84	Fair
18. The skills I learn in this mathematics class will help me in other classes.	4.60	Strongly Agree
19. The skills I learn in this computer class will help me in other classes.	4.10	Agree
20. I learn mathematics well from lectures.	2.68	Fair
GENERAL MEAN	**4.05**	**AGREE**
STANDARD DEVIATION	**0.89**	

Table 4 showed the responses of the students in their view about mathematics and computer. Item no. 8 got the highest mean of 4.96 which means that most of the student-respondents can learn mathematics using web, internet and computer. The responses of the student-respondents were supported by items nos. 11, 13, 14, and 15 with means that range from 4.80 to 4.94 which stated that computer creates a learning process and tells that computer is a tool for learning mathematics. Similarly, in item no. 20 stated that computer skills learned by the student-respondents would be a great help in learning other subject areas.

Item no. 5 got the lowest mean of 2.32 where the student-respondents perceived that mathematics is a non-creative subject and that they feel bored in memorizing formulas. Item nos. 6, 10, 17 and 20 got a mean that ranges from 2.64 to 2.94 stated that only those students who studied hard can learn and survive in mathematics. Most of them feel uneasy and confused in mathematics especially during lecture. Similarly, the student-respondents found that mathematics problems can be solved by common sense instead of rules taken during lecture.

Many students further agreed that mathematics is a complicated and most difficult subject to learn, but others said that the subject is such an enjoyable and important one. Most of the students responded that they could learn mathematics if the computer or web is available. Also, mathematics can be used as a tool to learn other subjects in high school level.

After gathering the data above, the design for the CAI material was started. There were several consultations from the two faculty members of Faculty of Engineering who are teachers in mathematics and computer.

Development Stage

After considering the common needs of the freshmen high school students, the design of the CAI material was prepared. In this stage the

actual programming of CAI material took place. It underwent several reviews and retests where the personal observations of the programmer, math teachers and the researcher were incorporated.

The C++ programming was initially used for the CAI material. It constituted the initial phase of the CAI material and computed the unknown *x* and *y* variables in linear equations. The CAI material was finally improved using the visual basic programming which considered most of the evaluators' comments on the CAI material interface.

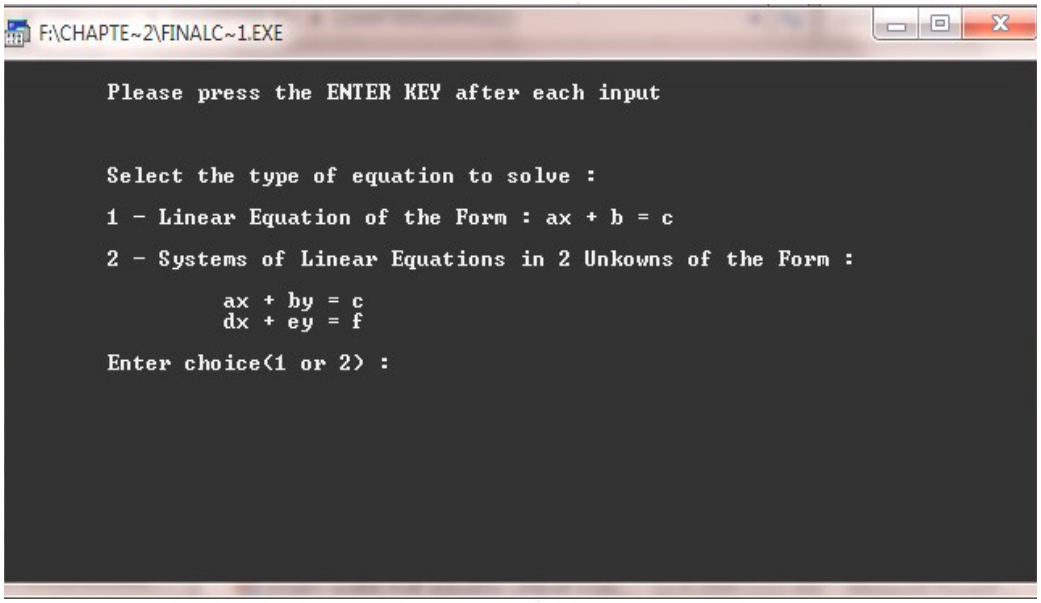

Figure 2 CAI Material of Linear Equations and Systems of Linear Equations

Figure 2 shows the screenshot of the developed CAI Material for Linear Equations and Systems of Linear Equations.

The storyboard of the developed Computer Aided Instructional Material(see appendix T).

Results of Instrument Validation and CAI Try-out

The developed CAI material was given to the evaluators for pilot testing of the CAI material and for validation of the evaluation instrument. The evaluators were composed of two (2) mathematics teachers, two (2) computer teachers and two (2) freshmen high school students.

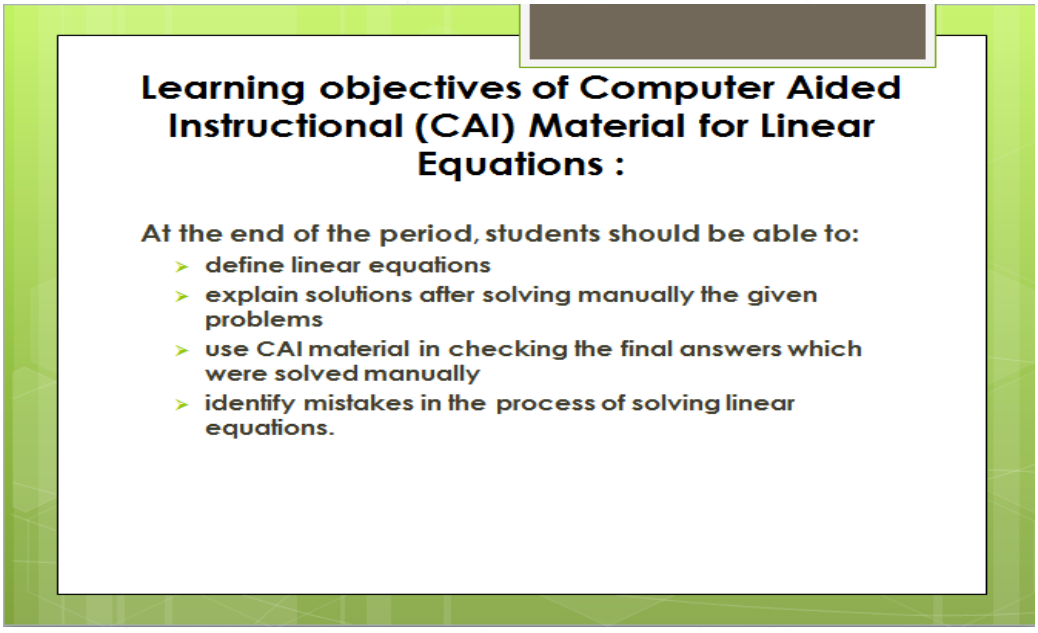

Figure 3 Objectives of CAI material

Figure 3 shows the screenshot of objectives of the developed CAI Material.

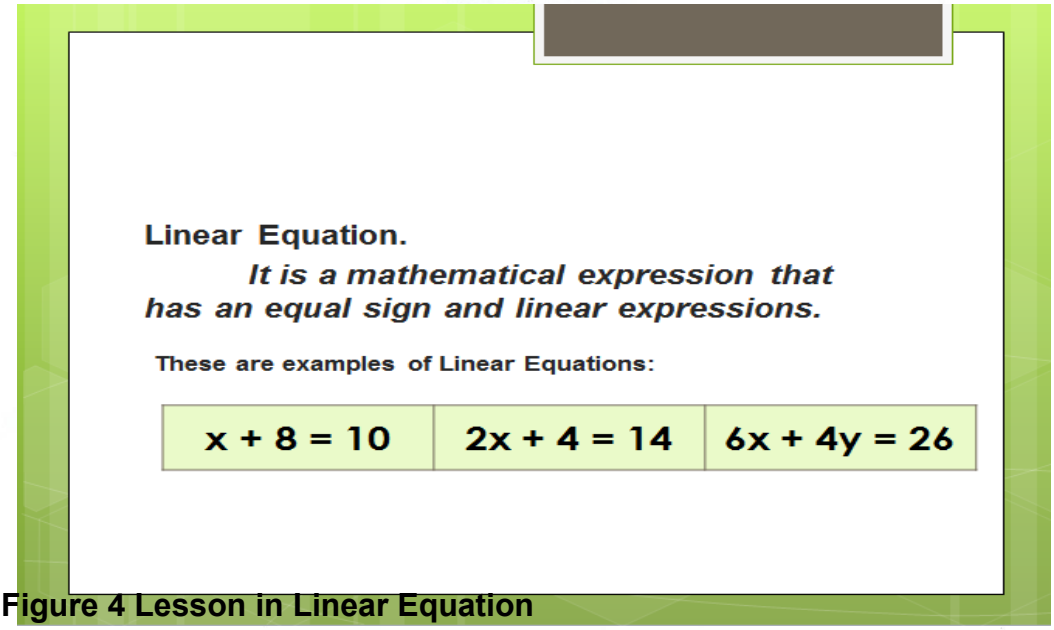

Figure 4 Lesson in Linear Equation

Figure 4 shows the screenshot of a powerpoint slide presentation of a lesson in linear equations.

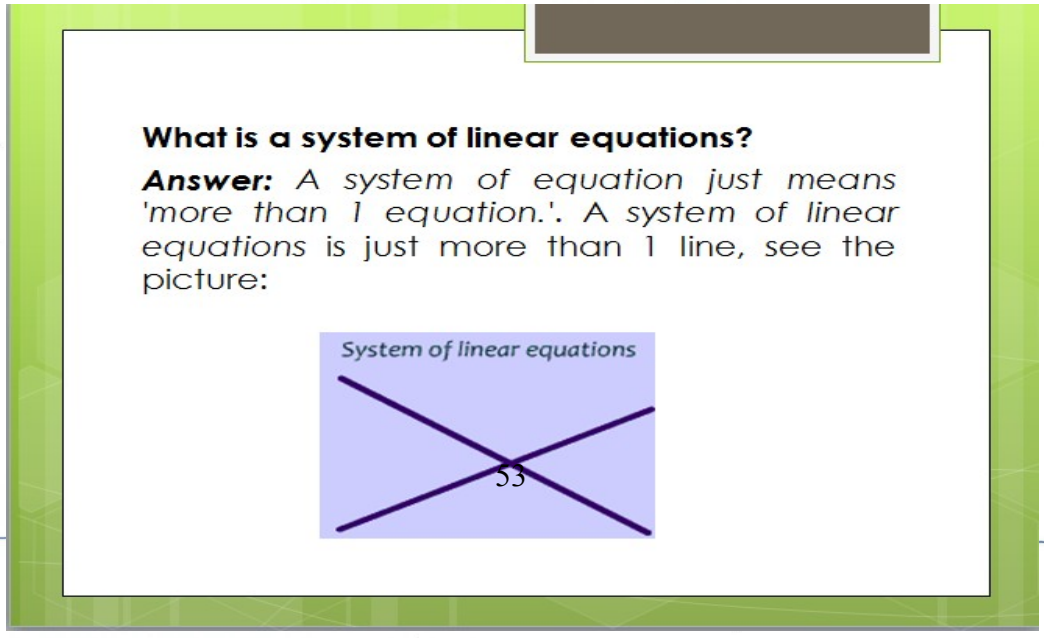

Figure 5 Lesson in Systems in Linear Equation

Figure 4 shows the screenshot of a PowerPoint slide presentation of a lesson in systems of linear equations.

Table 5 shows the results made by the mathematics teachers for validation and try-out of the CAI material in terms of objectives (see Appendix R and Appendix S).

Table 5

Mean Ratings given by the Mathematics Teachers for Instrument Validation and CAI Try-out in terms of Objectives

Objectives	Two Mathematics Teachers	
	Mean	Interpretation
1. The objectives are clear and specific.	5	Excellent
2. The objectives are sound and based on actual needs.	5	Excellent
3. The objectives are comprehensive.	5	Excellent

4. The objectives are attainable.	5	Excellent
5. The objectives are understood by students.	5	Excellent
6. The objectives are related to the content of the lesson.	5	Excellent
Mean	5	Excellent

Table 5 revealed that all items in the Objectives aspect got a mean of 5 which means excellent. This implies that, the mathematics teachers agreed that the objectives for CAI material met the needs of the students.

Table 6 shows the results made by the mathematics teachers for validation and try-out of the CAI material in terms of content.

Table 6

Mean Ratings given by the Mathematics Teachers

for Validation and Try-out of CAI in terms of Content

Content	Two Mathematics Teachers	
	Mean	**Interpretation**
1. The lessons are suited to the needs of the students.	5	Excellent
2. The lessons are suited to the level of understanding of the students.	5	Excellent
3. The lessons are aligned to the level of appreciation of students.	5	Excellent
4. The content has educational value.	5	Excellent

5. The lessons are adequate to achieve the objectives.	5	Excellent
Mean	5	Excellent

Table 6 showed that the Content aspect got a mean of 5 which means “Excellent”. This implies that, the mathematics teachers approved the content of the CAI material.

Table 7 shows the results made by the mathematics teachers for validation and try-out of the CAI material in terms of presentation.

Table 7

Mean Ratings given by the Mathematics Teachers for Instrument Validation and CAI Try-out in terms of Presentation

Presentation	**Two Mathematics Teachers**	
	Mean	**Interpretation**
1. The presentation of the lessons makes the students actively involved.	5	Excellent
2. The time allotted for the presentation is enough.	5	Excellent
3. The sentences used in the development of the lessons are easy.	5	Excellent
4. The presentation of the	5	Excellent

lessons gives critical thinking among the students.		
5. The delivery of the lessons helps the students to group the important concepts.	5	Excellent
Mean	5	Excellent

Table 7 shows the mean of 5 for Presentation aspect which means "Excellent". This implies that, the mathematics teachers accepted the presentation of the CAI material based on the items given in the table.

Table 8 shows the results made by the computer teachers for validation and try-out of the CAI material in terms of Technical Quality.

Table 8

Mean Ratings given by the Computer Teachers for Instrument Validation and CAI Try-out in terms of Technical Quality

Technical Quality	Two Computer Teachers	
	Mean	**Interpretation**
1. The technical presentation of the lessons is visible and creative.	5	Excellent
2. The courseware used matches the presentation of the material.	5	Excellent
3. The effects used in the slide are suited to the presentation of the material.	5	Excellent

4. The navigation keys respond quickly.	5	Excellent
5. The information displays are effective.	4	Very Good
6. The screen displays are consistent.	4	Very Good
7. The screen is readable and texts are not overcrowded.	5	Excellent
8. The courseware used captures the interest of the students.	5	Excellent
9. The program appropriately uses relevant computer capability.	4	Very Good
Mean	4.67	Excellent

Table 8 revealed the responses of the computer teachers in terms of the Technical Quality of the CAI material. Item nos. 1,2,3,4,7 and 8 got a mean of 5 which means “Excellent”. The computer teachers found that these items met the basic requirement of the initial development of the CAI material. Item nos. 5,6 and 9 got a mean of 4 which means “Very Good” stated that the computer teachers responded similarly as they both found the CAI material needs to be revised in terms of its interface. Similarly, the computer capability is relevant to the program used in the CAI material.

Table 9 shows the results made by the computer teachers for validation and try-out of the CAI material in terms of Instructional Design.

Table 9

Mean Ratings given by the Computer Teachers for Instrument Validation and CAI Try-out in terms of Instructional Design

Instructional Design	Two Computer Teachers	
	Mean	**Interpretation**
1. The screen is readable and texts are not overcrowded.	5	Excellent
2. The lessons are suited to the level of understanding of the students.	4.50	Excellent
3. The lessons are suited to the level of appreciation of the students.	4.50	Excellent
4. The content has educational value.	5	Excellent
5. The lessons are adequate to achieve the objectives.	5	Excellent
Mean	4.80	Excellent

Table 9 showed the mixed responses of the computer teachers in terms of the Instructional Design of the CAI material. Item nos. 1,4 and 5 got a mean of 5 which means “Excellent”. The responses of the computer teachers are said to be in consonance with the basic feature of the developed CAI material. Item nos. 2 and 3 got a mean of 4 which means “Very Good”. Although the interpretation for the said items is excellent, it implies the need to revise the interface of the developed CAI material by making it more interactive, virtual and colorful through visual basic programming.

Table 10 shows the results made by the student-respondents for validation and try-out of the CAI material in terms of presentation.

Table 10

Mean Ratings given by the Student-Respondents for Instrument Validation and CAI Try-out in terms of Presentation

Presentation	50 Student-Respondents	
	Mean	**Interpretation**
1. The presentation of the lessons makes the students actively involved.	5	Excellent
2. The time allotted for the presentation is enough.	4	Very Good
3. The sentences used in the development of the lessons are easy.	5	Excellent
4. The presentation of the lessons promotes critical thinking among the students.	5	Excellent
5. The delivery of the lessons helps the students to group the important concepts.	5	Excellent
Mean	4.80	Excellent

Table 10 showed the responses of the Student-Respondents in terms of Presentation of the CAI material. All items got a mean of 5 which means “Excellent”, except for item no. 2 which got a mean of 4 which means “Very Good”. This implies that, there is really a need for the researcher the developed CAI material.

Table 11 shows the Summary of Computed Means for Validation and Try-out of Checklist made by two (2) mathematics teachers, two (2) computer teachers and two (2) freshmen high school students

Table 11

Summary of Computed Means

for Validation of Checklist and Try-out of CAI

Respondents	Two Mathematics Teachers	Two Computer Teachers	Two Freshmen HS Students	General Mean
Mean	**5**	**4.73**	**4.80**	**4.84**
Interpretation	Excellent	Excellent	Excellent	Excellent

Table 11 showed that the mean ratings given by the two mathematics teachers, two computer teachers and two freshmen high school students were not that different from each other. The mean ratings given by two computer teachers and two freshmen high school students were close to the mean rating given by the two mathematics teachers which was 5. All mean ratings were interpreted as “Excellent” which implies that the validation of the checklist was successfully done before the actual try-out of the developed CAI material.

Table 12 shows the results of evaluation using the rubric. Two (2) mathematics teachers evaluated the checklists using the rubric. The checklists were evaluated over the five (5) categories, namely: Content, Sentence Construction, Mechanics, Aspects and Instructions.

Table 12

Mean Ratings Given by Two Mathematics Teachers for Checklist Evaluation using Rubric

CATEGORY	Mean
Content	4
Sentence Construction	4
Mechanics	3.50
Aspects	3
Instructions	4
Overall	3.70

Table 12 showed the mean ratings given by the mathematics teachers for checklist evaluation using a rubric. Categories like Content, Sentence Construction and Instructions got a mean rating of 4(see Appendix L) which means that, the mathematics teachers agreed perfectly on the stated categories in the rubric. The Mechanics category got a mean rating of 3.5 which means that, the mathematics teachers partially found a

grammatical error in the rubric. The Aspects category got a mean rating of 3 which means that, there was a need to improve the explanation of details to be fully understood by the evaluator of the checklist.

Table 13 shows the rubric for evaluation. Two (2) computer teachers evaluated the checklists using the rubric. The checklists were evaluated over the five (5) categories, namely: Content, Sentence Construction, Mechanics, Aspects and Instructions.

Table 13

Final Mean Ratings Given by Two Computer Teachers for Evaluation using Rubric

CATEGORY	Mean
Content	4
Sentence Construction	3
Mechanics	4
Aspects	4
Instructions	4
Overall	3.80

Table 13 showed the mean ratings given by the computer teachers for checklist evaluation using a rubric. Categories like Content, Mechanics,

Aspects and Instructions got a mean rating of 4 which means that, the computer teachers agreed perfectly on the stated Categories in the rubric. The Sentence Construction category got a mean rating of 3 which means that, the computer teachers found that most sentences in the checklist had introductory sentences, explanations or details, and concluding sentences.

Table 14 shows the rubric for evaluation. Two (2) student-respondents evaluated the checklists using the rubric. The checklists were evaluated over the five (5) categories, namely: Content, Sentence Construction, Mechanics, Aspects and Instructions.

Table 14

Final Mean Ratings Given by Two Student-Respondents for Checklist Evaluation using Rubric

CATEGORY	Mean
Content	3.50
Sentence Construction	4
Mechanics	4
Aspects	4
Instructions	3.50

Overall	3.80

Table 14 showed the mean ratings given by the Student-Respondents for checklist evaluation using a rubric. Categories like Sentence Construction, Mechanics and Aspects got a mean rating of 4 which means that, the Student-Respondents agreed perfectly on the stated Categories in the rubric. The Content and Instructions categories got a mean rating of 3.5 which means that, the Student-Respondents found the two categories are educational, valid, legible and reliable and were all partially based on the standards.

Evaluation Stage

The finished CAI material was given to the evaluators together with the evaluation adapted from the study of Zapata(2004). There were two teachers in mathematics and two in computer, and fifty freshmen high school students who evaluated the CAI material on the basis of objective, content, presentation, technical quality and instructional design.

The evaluation checklist of mathematics teachers composed of sixteen (16) aspects: six (6) from objectives, five (5) from content, and five (5) from presentation.

The evaluation checklist of computer teachers composed of fourteen (14) aspects: nine (6) from technical quality and five (5) from instructional design.

The evaluation checklist of freshmen high school students composed of six (6) aspects all six (6) from presentation.

Table 15 shows the results of the evaluation of the CAI material by the Mathematics Teachers in terms of objectives(see Appendix R and Appendix S).

Table 15

Final Mean Ratings given by the Mathematics Teachers

in terms of Objectives

Objectives	Two Mathematics Teachers	
	Mean	**Interpretation**
1. The objectives are clear and specific.	5	Excellent
2. The objectives are sound and based on actual needs.	5	Excellent
3. The objectives are comprehensive.	5	Excellent
4. The objectives are attainable.	5	Excellent
5. The objectives are understood by students.	5	Excellent
6. The objectives are related to the content of the lesson.	5	Excellent
Mean	5	Excellent

As revealed by the Table 15, all items got the highest mean rating of 5, which means “Excellent.” This implies that, the mathematics teachers agreed that the CAI material stated clearly its objectives based on the actual needs of the freshmen high school students.

Table 16 shows the results of the evaluation of the CAI material by the Mathematics Teachers in terms of content.

Table 16

Final Mean Ratings given by the Mathematics Teachers

in terms of Content

Content	Two Mathematics Teachers	
	Mean	Interpretation
1. The lessons are suited to the needs of the students.	4	Very Good
2. The lessons are suited to the level of understanding of the students.	4	Very Good
3. The lessons are suited to the level of appreciation of the students.	4	Very Good
4. The content has educational value.	5	Excellent
5. The lessons are	4.50	Very Good

adequate to achieve the objectives.		
Mean	4.30	Very Good

Table 16 showed that among the items, item 4 got the highest mean rating of 5 or "Excellent" which tells that, the content of the developed CAI material has an educational value. Item 5 got a mean rating of 4.50, which means "Very Good." This implies that, the mathematics teachers agreed that the lessons are adequate to the objectives of the CAI material. Items 1,2 and 3 got a mean rating of 4 or "Very Good", which means partially suited to the needs, understanding and appreciation of the students.

Table 17 shows the results of the evaluation of the CAI material by the Mathematics Teachers in terms of presentation.

Table 17

Final Mean Ratings given by the Mathematics Teachers

in terms of Presentation

Presentation	**Two Mathematics Teachers**	
	Mean	**Interpretation**
1. The presentation of the lessons makes the students actively involved.	4.50	Very Good

2. The time allotted for the presentation is enough.	3.50	Good
3. The sentences used in the development of the lessons are easy.	4	Very Good
4. The presentation of the lessons gives critical thinking among the students.	4.50	Very Good
5. The delivery of the lessons helps the students to group the important concepts.	4.50	Very Good
Mean	4.20	Very Good

As revealed by the Table 17, items 1,4 and 5 got the highest mean rating of 4.50, which means "Very Good." The mathematics teachers agreed that the CAI material provides student-centered activity in terms of its presentation. Item 3 though it means "Very Good" the mathematics teachers found the development of the lessons easy for the freshmen high school students. Item 2 got 3 or "Good" which means the time allotted for the presentation of the CAI material is enough.

Table 18 shows the results of the evaluation of the CAI material by the computer Teachers in terms of technical quality.

Table 18

Final Mean Ratings given by the Computer Teachers

in terms of Technical Quality

Technical Quality	Two Computer Teachers	
	Mean	Interpretation
1. The technical presentation of the lessons is visible and creative.	4	Very Good
2. The courseware used matches the presentation of the material.	4	Very Good
3. The effects used in the slide are suited to the presentation of the material.	4	Very Good
4. The navigation keys respond quickly.	4.50	Very Good
5. The information displays are effective.	4.50	Very Good
6. The screen displays are consistent.	4.50	Very Good
7. The screen is readable and texts are not overcrowded.	4	Very Good
8. The courseware used captures the interest of the students.	4.50	Very Good
9. The program appropriately uses relevant computer capability.	4.50	Very Good

Mean	4.28	Very Good

The developed CAI material's technical quality composed of ten (10) aspects. Table 18 showed that items 4,5,6,8 and 9 got a mean rating of 4.50 which means "Very Good." This means that, the effects used in each slide presentation are suited to its presentation. Items 1,2,3 and 7 got a mean rating of 4 or "Very Good." This implies that, there is a need to improve the information and text presentation display in the CAI material.

Table 19 shows the results of the evaluation of the CAI material by the computer Teachers in terms of instructional design.

Table 19

Final Mean Ratings given by the Computer Teachers

in terms of Instructional Design

Instructional Design	**Two Computer Teachers**	
	Mean	**Interpretation**
1. The screen is readable and texts are not overcrowded.	4	Very Good
2. The lessons are suited to the level of understanding of the students.	4.50	Very Good
3. The lessons are suited level of appreciation of the students.	4	Very Good
4. The content has educational value.	4	Very Good
5. The lessons are adequate to	4	Very Good

achieve the objectives.		
Mean	4.10	Very Good

Table 19 showed the mean ratings given by the computer teachers in terms of the Instructional Design of the developed CAI material. All items except item 2 got a mean rating of 4 which means "Very Good." Item 2 got 4.50 or "Very Good." The ratings imply that, the Instructional Design of the developed CAI material was adequate to leaning. Furthermore, the developed CAI material still needs to be improved to make it more interactive and effective.

Table 20 shows the results of the evaluation of the CAI material by the student-respondents in terms of presentation of lessons (see Appendix R and Appendix S).

Table 20

Final Mean Ratings given by the Student-Respondents in terms of Presentation

Presentation	**50 Student-Respondents**	
	Mean	**Interpretation**
1. The presentation of the lessons makes the students actively involved.	4.16	Very Good
2. The time allotted for the presentation is enough.	3.84	Very Good
3. The sentences used in the	3.92	Very Good

development of the lessons are easy.		
4. The presentation of the lessons gives critical thinking among the students.	3.86	Very Good
5. The delivery of the lessons helps the students to group the important concepts.	4.28	Very Good
Mean	4.01	Very Good

As revealed by the Table 20, the Student-Respondents cannot be considered experts when it comes to content and technical matters, the numbers of aspects in their evaluation form is different from that of the mathematics and computer teachers'. The student-respondents only evaluated the presentation of the developed CAI material. Item 5 got the highest mean rating of 4.28 and item 1 got 4.16 which both mean "Very Good." The said ratings imply that, the students agreed that they became a part of the concept and activity in the development of the CAI material. The other items, 2,3 and 4, got low mean ratings which tells that, the students are not satisfied with the presentation, especially with the time-allotted for the developed CAI material.

Table 21 shows the summary results of the evaluation of the CAI material by the mathematics teachers and student-respondents in terms of presentation.

Table 21

Summary of Final Means given by the Mathematics and the Student-Respondents in terms of Presentation

Presentation	Two Mathematics Teachers		50 Freshmen HS Students		Overall	
	Mean	Interpretation	Mean	Interpretation	Mean	Interpretation
1. The presentation of the lessons makes the students actively involved.	4.50	Very Good	4.16	Very Good	4.33	Very Good
2. The time allotted for the presentation is enough.	3.50	Good	3.84	Very Good	3.67	Very Good
3. The sentences used in the developm	4	Very Good	3.92	Very Good	3.96	Very Good

ent of the lessons are easy.						
4. The presentation of the lessons gives critical thinking among the students.	4.50	Very Good	3.86	Very Good	4.18	Very Good
5. The delivery of the lessons helps the students to group the important concepts.	4.50	Very Good	4.28	Very Good	4.39	Very Good
Mean	**4.20**	**Very Good**	**4.01**	**Very Good**	**4.12**	**Very Good**

Table 21 revealed the comparative responses between the mathematics teachers and student-respondents. In almost all categories, the developed CAI material was rated "Very Good" by all the respondents. The mathematics teachers rated the developed CAI material's objective as "Excellent" and content as "Very Good." On the other hand, both the mathematics teachers and student-respondents rated the developed CAI material's presentation as "Very Good." Considerably, the ratings given by the student-respondents were slightly lower than that of the teachers'. The

overall rating for the presentation aspect given by both the mathematics teachers and student-respondents was 4.12 which mean “Very Good.”

Table 22 shows the summary results of the evaluation of the CAI material by the mathematics teachers in terms of objective, content and presentation.

Table 22

Summary of Final Means of Mathematics Teachers

Categories	Two Mathematics Teachers Group Mean
Objective	5
Content	4.30
Presentation	4.20
Overall	4.50

Table 22 showed that the mathematics teachers evaluated the developed CAI material having a mean rating of 4.50 which means “Very Good as showed in Table 22” This indicates that, the instructional value is “Very Good.”

Table 23 shows the summary results of the evaluation of the CAI material by the computer teachers in terms of objective, content and presentation.

Table 23

Summary of Final Means of Computer Teachers

Categories	Two Computer Teachers Group Mean
Technical Quality	4.28
Instructional Design	4.10
Overall	4.19

Table 23 showed the computer teachers' assessment on the developed CAI material. It has a mean rating of 4.19 which means "Very Good." This indicates that, the computer teachers wanted to improve the developed CAI material in terms of its technical quality and instructional design.

Table 24 shows the summary results of the evaluation of the CAI material by the student-respondents in terms of presentation.

Table 24

Summary of Final Means of Student-Respondents

Category	Fifty Student-Respondents Group Mean
Presentation	4.01
Overall	4.01

Table 24 showed that the student-respondents evaluated the developed CAI material as “Very Good” with a mean rating of 4.01. This indicated that, the students were not that satisfied on the presentation of the developed CAI material. The student-respondents were looking for a more virtual, interactive and colorful CAI material.

The above tables and discussions only manifest that the developed CAI material for solving the unknown variables in linear equations gained approval from all the respondents to be used as a supplementary material in facilitating the learning of the freshmen high school students, likewise, in helping the mathematics teachers in classroom instruction.

Revision Stage

In this stage, the revision process was composed of three parts namely: composition, content and presentation. The researcher revised the developed CAI material considering the aforementioned parts.

In composition, the material was planned to become a supplementary material. However, after the evaluation, the teachers suggested that the CAI material be upgraded into a more interactive material and student-centered activity which was considered.

The common comments of the teacher-respondents in the content were to add more lessons in the CAI material that fit to the levels of understanding and appreciation of the students. Furthermore, the additional lessons must have educational value and must meet the primary objectives of learning.

With the presentation, the technical aspects needed improvements; therefore, individual differences of the freshmen high school students were accounted for. Students wanted to make the developed CAI material to be more interactive, equipped with virtual images and sound effects. The primary objective of the CAI material is to transmit learning to the learners.

CHAPTER 5

CONCLUSIONS and RECOMMENDATIONS

This chapter presents the summary of the study, the findings based on data gathered, conclusions drawn and the relevant recommendations based on the findings.

Summary of Findings

This study developed and evaluated a Computer Aided Instructional (CAI) material to be used as a supplementary material in teaching Linear Equations and systems of linear equations. Specifically, this study sought to achieve the following objectives: (1) develop CAI material as a supplementary material on solving for unknown values of *x* and *y* variables in systems of linear equations, (2) submit the developed CAI material to teachers for evaluation in terms of the following: Objective, Content and Presentation for Mathematics teachers; and Technical Quality and

Instructional Design for Computer teachers, and (3) submit for evaluation to student-respondents in terms of the presentation quality of the CAI material.

The researcher developed a CAI material following the planning, development, evaluation and revision stages. Before the CAI material was developed, a need analysis was administered to the freshmen high school students.

The content of the material is parallel with the results of the needs analysis and preparation in the planning stage.

The CAI material evaluation checklist utilized was adapted from the study of Zapata (2004) which contains five major components namely: objectives, content, presentation, technical quality and instructional design. The CAI material was presented and evaluated using a five-point scale: 5 as the highest and 1 as the lowest rates.

The research was conducted during the second semester of the academic year 2012 – 2013. Two (2) mathematics, two (2) computer teachers and two (2) freshmen high school students validated the checklists and tried-out the CAI material using the rubric adapted from the internet and revised by the researcher. Two (2) mathematics and two (2) computer teachers and fifty (50) freshmen high school students evaluated

the CAI material using the checklist adapted from the study of Zapata (2000).

Several comments and suggestions were considered for the revision stage. The respondents gave a mean rating of 5 for the developed CAI material's objective, 4.30 for its content, 4.12 for its presentation, 4.28 for its technical quality, and 4.10 for its instructional design. The CAI material got an overall rating of 4.50 from the mathematics teachers, 4.19 from the computer teachers, and an overall mean rating of 4.01 from the students-respondents.

Conclusions

The following conclusions were formulated based on the stated findings: (1) the CAI material on solving for unknown values of *x* and *y* variables in systems of linear equations was developed using a systematic paradigm which includes the following: Planning, Development, Evaluation and Revision Stages, (2) the developed CAI material was evaluated as " Very Good" by the Mathematics and the student-respondents, same goes with the Computer teachers who evaluated it as "Very Good", (3) the developed CAI material is suitable for use as a supplementary material in teaching linear equations and systems of linear equations.

Recommendations

The researcher recommends the following based on the findings and results of the respondents' evaluation and conclusion: (1) the developed CAI material be used as a supplementary material in teaching Linear Equations and Systems in Linear Equations, (2) it may be a professional development for teachers and administrators on developing CAI materials for specific learning areas, (3)it should be tried-out to a larger group of students for evaluation and validation purposes, lastly (4)it should be tested and evaluated for further improvement and future use of the students and teachers in Mathematics.

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APPENDIX A

LETTER OF REQUEST TO THE PRINCIPAL

Date

Principal
Name of School
Address of School

Dear **Principal:**

Greetings!

I am presently finishing my post graduate study at the Philippine Normal University in the degree of Master of Arts in Teaching Mathematics. Likewise, I am having my seminar paper in a form of research which in a soonest possible time will be defended come March of the present academic year.

In connection to this, I would like to request your good office be allowed to conduct a research study with a section in the freshmen level. Also, part of request is the use of the computer laboratory upon its availability for the same purpose.

I look forward to the kind approval of this request.

Thank you very much.

Respectfully,

ARNOLD C. DISTOR
Faculty Member of UST-CTHM
Researcher from PNU-MAT

APPENDIX B

LETTER OF REQUEST TO THE EVALUATORS

Date

Name of Evaluator
Name of School
Address of School

Dear **Sir/Madam:**

Greetings!

I am presently finishing my post graduate study at the Philippine Normal University in the degree of Master of Arts in Teaching Mathematics. Likewise, I am having my seminar paper in a form of research which in a

soonest possible time will be defended come March of the present academic year.

In connection to this, I would like to request you to participate in my research study by evaluating the developed CAI material. The evaluation forms will be sent thru your email together with the softcopy of the said material. Please send back the evaluation form in your most convenient time.

Thank you very much.

Respectfully,

ARNOLD C. DISTOR
Faculty Member of UST-CTHM
Researcher from PNU-MAT

APPENDIX C

EVALUATION FORM FOR MATHEMATICS TEACHERS

Name: _____ Age: _____
Degree Finished: _____ School: _____
Name of Employer: _____ Position: _____
Subject in Math: _____ Years in Service: ___

CAI Evaluation Form for Mathematics Teachers
(Adapted from the study of Zapata 2004)

Instructions:

Listed below are the fine aspects of the developed CAI material in Mathematics I – Objectives, Content, Delivery System, Technical Quality, and Instructional Design.

Evaluate each aspect by putting a check mark (✓) in the box after an item in each fine aspect. The scale below contains points with

respective verbal descriptions will guide you in giving your ratings to the different items.

5	Excellent
4	Very Good
3	Good
2	Needs Improvement
1	Poor

	5	4	3	2	1
Objective					
1. The objectives are clear and specific.					
2. The objectives are sound and based on actual needs.					
3. The objectives are comprehensive.					
4. The objectives are attainable.					
5. The objectives are understood by students.					
6. The objectives are related to the content of the lesson.					
Content					
1. The lessons are suited to the needs of the students.					
2. The lessons are suited to the level of understanding of the students.					
3. The lessons are suited level of appreciation of the students.					
4. The content has educational value.					
5. The lessons are adequate to achieve the objectives.					
Presentation					
6. The presentation of the lessons makes the students actively involved.					
7. The time allotted for the presentation is enough.					
8. The sentences used in the development of the lessons are easy.					
9. The presentation of the lessons gives critical thinking among the students.					
10. The delivery of the lessons helps the students to group the important					

concepts.						

Comments/Suggestions:

_____

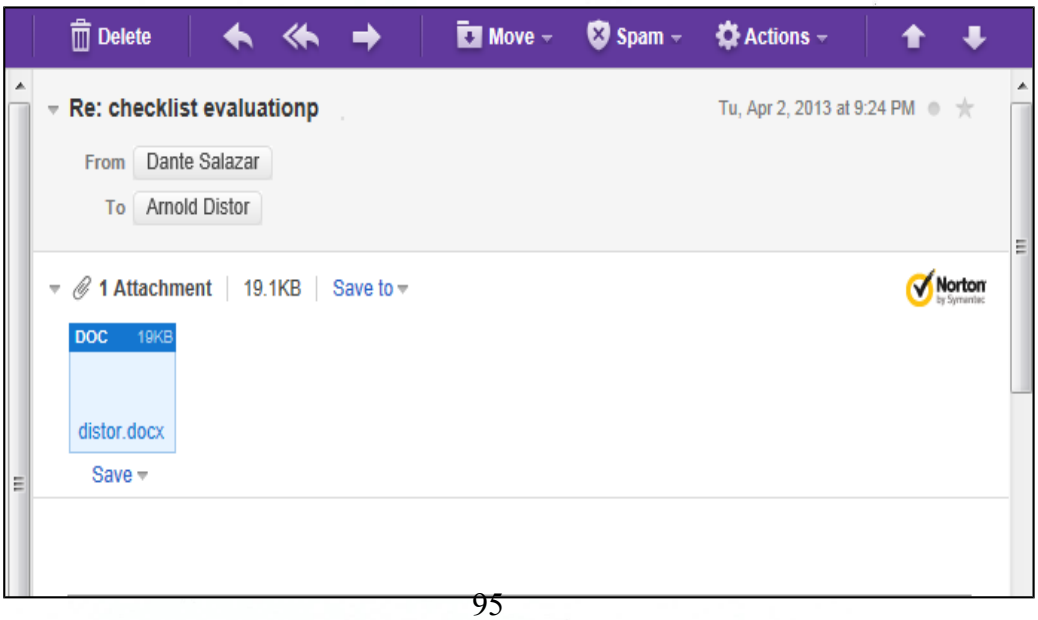
_____

_____

APPENDIX D

SCREENSHOTS OF MATHEMATICS TEACHERS EVALUATION

(retrieved from e-mail)

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Su, Apr 7, 2013 at 3:33 PM
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To Arnold Distor
CC Darlene Alberto
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Norton by Symantec
DOC 57KB
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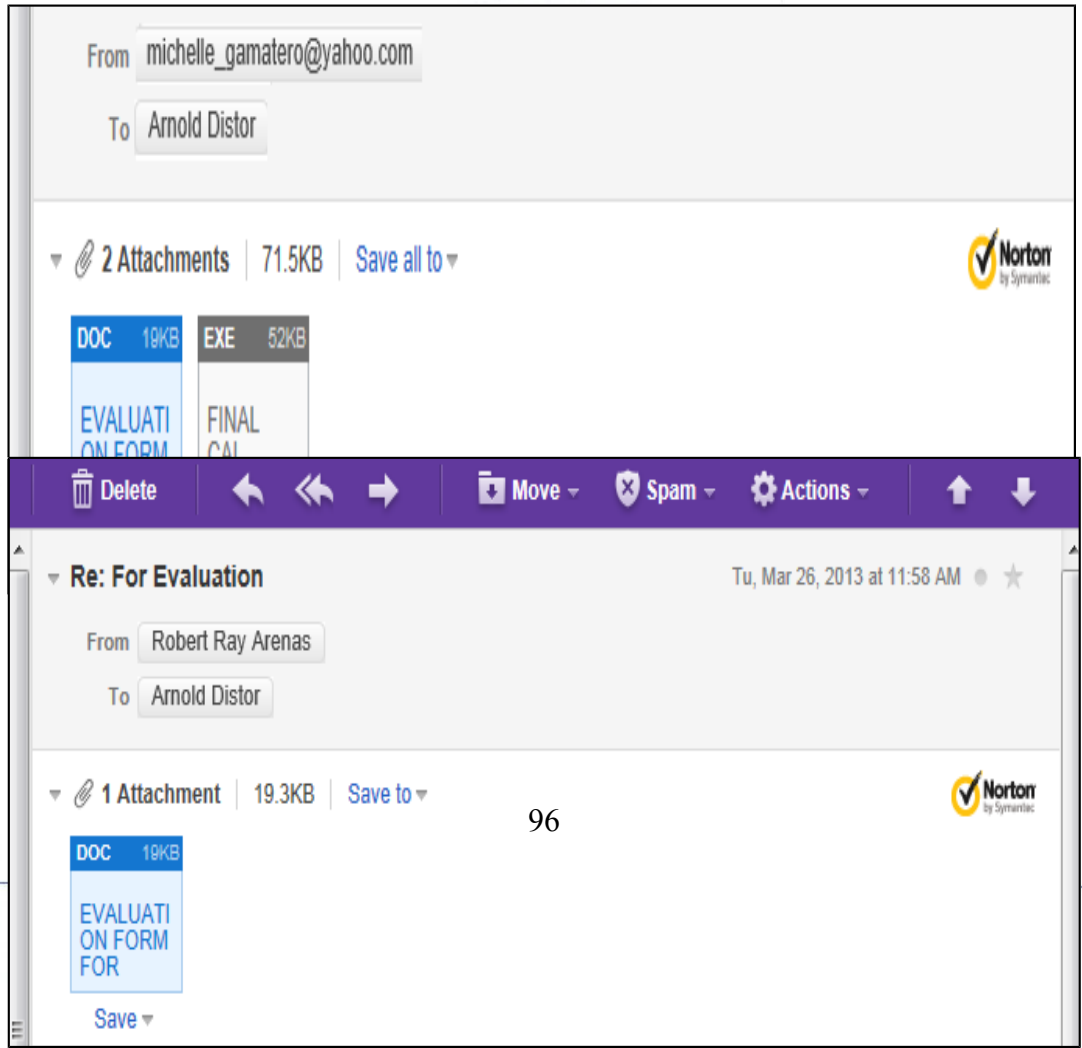
Save


From michelle_gamatero@yahoo.com
To Arnold Distor
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Norton by Symantec
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EVALUATI
FINAL
Delete
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Actions
Re: For Evaluation
Tu, Mar 26, 2013 at 11:58 AM
From Robert Ray Arenas
To Arnold Distor
1 Attachment 19.3KB Save to
Norton by Symantec
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EVALUATI ON FORM FOR
Save

APPENDIX E

MATHEMATICS TEACHERS EVALUATION

MATHEMATICS TEACHER EVALUATOR NO.1

Name: Michele Gamatero
Degree Finished: BS Statistics
Name of Employer: San Beda College
Years in Service: 10

Age: 35
School: UP Diliman
Poition: Teacher
Subject in Math:
Algebra,Trigonometry,
Statistics

CAI Evaluation Form for Mathematics Teachers
(Adapted from the study of Zapata 2004)

Instructions:

Listed below are the fine aspects of the developed CAI material in Mathematics I–Objectives, Content, Delivery System, Technical Quality, and Instructional Design.

Evaluate each aspect by putting a check mark (✓) in the box after an item in each fine aspect. The scale below contains points with respective verbal descriptions. It will guide you in giving your ratings to the different items.

Rating	Description
5	Excellent
4	Very Good
3	Good
2	Needs Improvement
1	Poor

	5	4	3	2	1
A. Objective					
1. The objectives are clear and specific.	/				
2. The objectives are sound and based on actual needs.	/				
3. The objectives are comprehensive.	/				
4. The objectives are attainable.	/				
5. The objectives are understood by students.	/				
6. The objectives are related to the content of the lesson.	/				
B. Content					
1. The lessons are suited to the needs of the students.	/				
2. The lessons are suited to the level of understanding of the students.	/				
3. The lessons are suited to the level of appreciation of the students.	/				
4. The content has educational value.	/				
5. The lessons are adequate to achieve the objectives.	/				
C. Presentation					
1. The presentation of the lessons makes the students actively involved.	/				
2. The time allotted for the presentation is enough.	/				

3. The sentences used in the development of the lessons are easy.	/				
4. The presentation of the lessons gives critical thinking among the students.	/				
5. The delivery of the lessons helps the students to group the important concepts.	/				

Comments/Suggestions:

Must be able to adapt to business and applied sciences in the sense that the exercises be given emphasis on the need as well of practical applications.

MATHEMATICS TEACHER EVALUATOR NO.2

Name: Robert Ray E. Arena
Degree Finished: Master in Math Ed
Name of Employer: UST-CTHM
Years in Service: 6 yrs

Age: 29
School: UST
Position: Instructor
Subject in Math: Business Math & Statistics

CAI Evaluation Form for Mathematics Teachers
(Adapted from the study of Zapata 2004)

Instructions:

Listed below are the fine aspects of the developed CAI material in Mathematics I–Objectives, Content and Presentation.

Evaluate each aspect by putting a check mark (✔) in the box after an item in each fine aspect. The scale below contains points with

respective verbal descriptions. It will guide you in giving your ratings to the different items.

Rating	Description
5	Excellent
4	Very Good
3	Good
2	Needs Improvement
1	Poor

	5	4	3	2	1
A. Objective					
1. The objectives are clear and specific.	/				
2. The objectives are sound and based on actual needs.	/				
3. The objectives are comprehensive.	/				
4. The objectives are attainable.	/				
5. The objectives are understood by students.	/				
6. The objectives are related to the content of the lesson.	/				
B. Content					
1. The lessons are suited to the needs of the students.	/				
2. The lessons are suited to the level of understanding of the students.	/				
3. The lessons are suited to the level of appreciation of the students.	/				
4. The content has educational value.	/				
5. The lessons are adequate to achieve the objectives.	/				
C. Presentation					
1. The presentation of the lessons makes the students actively involved.	/				
2. The time allotted for the presentation is enough.	/				
3. The sentences used in the development of the lessons are easy.	/				
4. The presentation of the lessons gives critical thinking among the students.	/				
5. The delivery of the lessons helps the	/				

	students to group the important concepts.					

MATHEMATICS TEACHER EVALUATOR NO.3

Name: MANOLO P. BINUYA
Degree Finished: BS in Electrical Eng'g
Name of Employer: UST-Faculty of Eng'g
Years in Service: 13 yrs

Age: 45
School: UST
Position: Instructor
Subjects in Math: Major Courses

CAI Evaluation Form for Mathematics Teachers
(Adapted from the study of Zapata 2004)

Instructions:

Listed below are the fine aspects of the developed CAI material in Mathematics I–Objectives, Content and Presentation.

Evaluate each aspect by putting a check mark (✓) in the box after an item in each fine aspect. The scale below contains points with respective verbal descriptions. It will guide you in giving your ratings to the different items.

Rating	Description
5	Excellent
4	Very Good
3	Good
2	Needs Improvement
1	Poor

	5	4	3	2	1
A. Objective					
1. The objectives are clear and specific.	/				
2. The objectives are sound and based on actual needs.	/				
3. The objectives are comprehensive.	/				
4. The objectives are attainable.	/				
5. The objectives are understood by students.	/				
6. The objectives are related to the content of the lesson.	/				
B. Content					
1. The lessons are suited to the needs of the students.	/				
2. The lessons are suited to the level of understanding of the students.	/				
3. The lessons are suited to the level of appreciation of the students.	/				
4. The content has educational value.	/				
5. The lessons are adequate to achieve the objectives.	/				
C. Presentation					
1. The presentation of the lessons makes the students actively involved.	/				
2. The time allotted for the presentation is enough.	/				
3. The sentences used in the development of the lessons are easy.	/				
4. The presentation of the lessons gives critical thinking among the students.	/				
5. The delivery of the lessons helps the students to group the important concepts.	/				

MATHEMATICS TEACHER EVALUATOR NO.4

Name: DANTE SALAZAR
Degree Finished: MAT-MATH
Name of Employer: SAN BEDA COLLEGE
Years in Service: 9 YEARS

Age: 30
School: PNU
Position: TEACHER
Subject in Math: HS MATH

CAI Evaluation Form for Mathematics Teachers
(Adapted from the study of Zapata 2004)

Instructions:

Listed below are the fine aspects of the developed CAI material in Mathematics I–Objectives, Content, Delivery System, Technical Quality, and Instructional Design.

Evaluate each aspect by putting a check mar (✔) in the box after an item in each fine aspect. The scale below contains points with respective verbal descriptions. It will guide you in giving your ratings to the different items.

Rating	Description
5	Excellent
4	Very Good
3	Good
2	Needs Improvement
1	Poor

	5	4	3	2	1
A. Objective					
1. The objectives are clear and specific.	/				
2. The objectives are sound and based on actual needs.	/				
3. The objectives are comprehensive.	/				
4. The objectives are attainable.	/				
5. The objectives are understood by students.	/				
6. The objectives are related to the content of the lesson.	/				
B. Content					
1. The lessons are suited to the needs of the students.	/				
2. The lessons are suited to the level of understanding of the students.	/				
3. The lessons are suited to the level of appreciation of the students.	/				
4. The content has educational value.	/				
5. The lessons are adequate to achieve the objectives.	/				
C. Presentation					
1. The presentation of the lessons makes the students actively involved.	/				
2. The time allotted for the presentation is enough.	/				
3. The sentences used in the development of the lessons are easy.	/				
4. The presentation of the lessons gives critical thinking among the students.	/				
5. The delivery of the lessons helps the students to group the important concepts.	/				

APPENDIX F

TALLY SHEET FOR MATHEMATICS TEACHERS' EVALUATION

	5	4	3	2	1	Mean
A. Objective						
1. The objectives are clear and specific.	4					5
2. The objectives are sound and based on actual needs.	4					5
3. The objectives are comprehensive.	4					5
4. The objectives are attainable.	4					5
5. The objectives are understood by students.	4					5
6. The objectives are related to the content of the lesson.	4					5
B. Content						
1. The lessons are suited to the needs of the students.	4					5

2. The lessons are suited to the level of understanding of the students.	4					5
3. The lessons are suited to the level of appreciation of the students.	4					5
4. The content has educational value.	4					5
5. The lessons are adequate to achieve the objectives.	4					5
C. Presentation						
1. The presentation of the lessons makes the students actively involved.	4					5
2. The time allotted for the presentation is enough.	4					5
3. The sentences used in the development of the lessons are easy.	4					5
4. The presentation of the lessons gives critical thinking among the students.	4					5
5. The delivery of the lessons helps the students to group the important concepts.	4					5

APPENDIX G

EVALUATION FORM FOR COMPUTER TEACHERS

Name: _____ Age: _____
Degree Finished: _____ School: _____
Name of Employer: _____ Position: _____
Subject in Computer: _____ Years in Service:
_____

CAI Evaluation Form for Computer Teachers
(Adapted from the study of Zapata 2004)

Instructions:

Listed below are the fine aspects of the developed CAI material in Linear Equations – Technical Quality and Instructional Design.

Evaluate each aspect by putting a check mark (✓) in the box after an item in each fine aspect. The scale below contains points with respective verbal descriptions will guide you in giving your ratings to the different items.

5	Excellent
4	Very Good
3	Good
2	Needs Improvement
1	Poor

	5	4	3	2	1
Technical Quality					
1. The technical presentation of the lessons is visible and creative.					
2. The courseware used matches the presentation of the material.					
3. The effects used in the slide are suited to the presentation of the material.					
4. The navigation keys respond quickly.					
5. The information displays are effective.					
6. The screen displays are consistent.					
7. The screen is readable and texts are not overcrowded.					
8. The courseware used captures the interest of the students.					
9. The program appropriately uses relevant computer capability.					
Instructional Design					
1. The screen is readable and texts are not overcrowded.					
2. The lessons are suited to the level of understanding of the students.					
3. The lessons are suited level of appreciation of the students.					
4. The content has educational value.					
5. The lessons are adequate to achieve the objectives.					

Comments/Suggestions:

_____

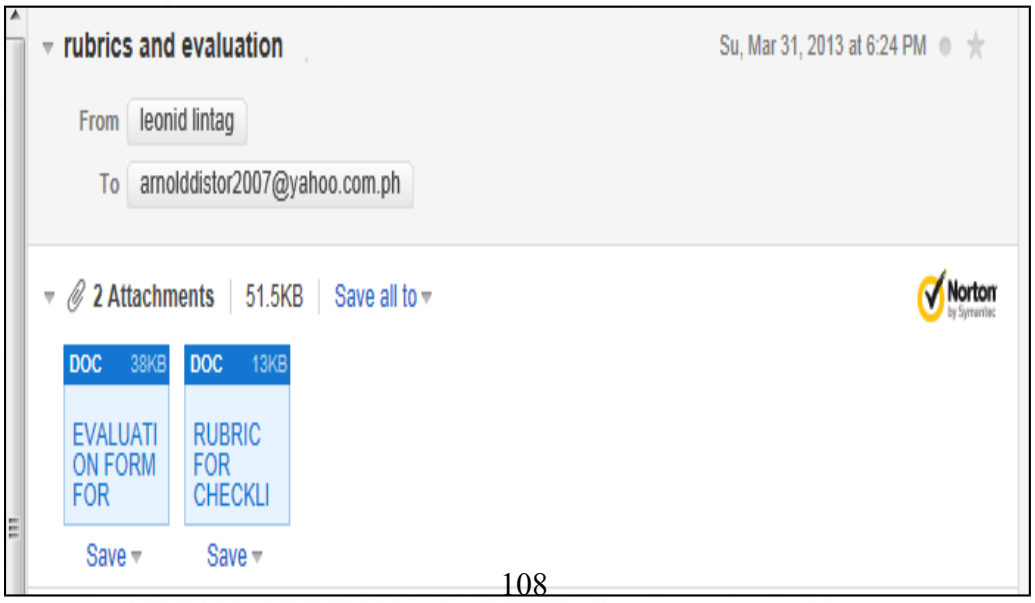
_____

_____

APPENDIX H

SCREENSHOTS OF COMPUTER TEACHERS EVALUATION

(retrieved from e-mail)

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To manolo binuya
CC arnolddistor2007@yahoo.com.ph
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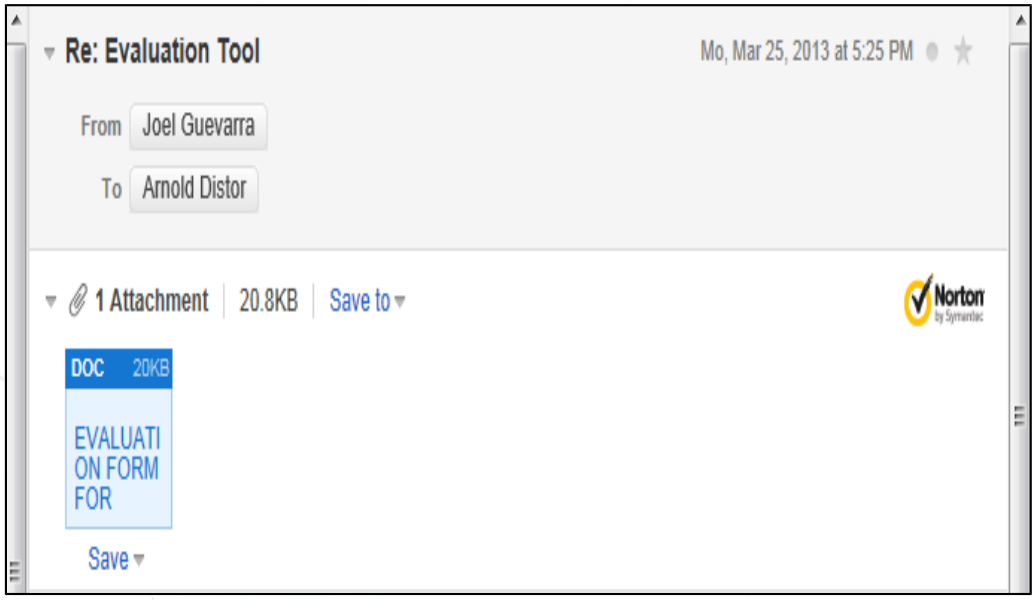
DOC 56KB
EVALUATION FORM FOR
Save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Mo, Mar 25, 2013 at 5:25 PM
From Joel Guevarra
To Arnold Distor
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Norton
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EVALUATION FORM FOR
Save

APPENDIX I

COMPUTER TEACHERS EVALUATION

COMPUTER TEACHER EVALUATOR NO.1

Name: Joel Bryan A. Guevarra, M.Ed.
Degree Finished: Master in Education
Name of Employer: UST High School
Years in Service: 7 years

Age: 26
School: UST
Position: Teacher
Subject in Computer: TLE 2,3,4

CAI Evaluation Form for Computer Teachers
(Adapted from the study of Zapata, 2004)

Instructions:

Listed below are the fine aspects of the developed CAI material in Linear Equations–Technical Quality and Instructional Design.

Evaluate each aspect by putting a check mark (✓) in the box after an item in each fine aspect. The scale below contains points with respective verbal descriptions. It will guide you in giving your ratings to the different items.

Rating	Description
5	Excellent
4	Very Good
3	Good
2	Needs Improvement
1	Poor

	5	4	3	2	1
A. Technical Quality					
1. The technical presentation of the lessons is visible and creative.	/				
2. The courseware used matches the presentation of the material.	/				
3. The effects used in the slide are suited to the presentation of the material.	/				
4. The navigation keys respond quickly.	/				
5. The information displays are effective.		/			
6. The screen displays are consistent.		/			
7. The screen is readable and texts are not overcrowded.	/				
8. The courseware used captures the interest of the students.	/				
9. The program appropriately uses relevant computer capability.		/			
B. Instructional Design					
1. The screen is readable and texts are not overcrowded.	/				
2. The lessons are suited to the level of understanding of the students.	/				
3. The lessons are suited to the level of appreciation of the students.	/				
4. The content has educational value.	/				
5. The lessons are adequate to achieve the objectives.	/				

COMPUTER TEACHER EVALUATOR NO.2

Name: Leonid C. Lintag
Degree Finished: MS IT
Name of Employer: UST
Years in Service: 6

Age: 30
School: TUP – Manila
Position: Instructor
Subject in Computer: MIS, COMP101

CAI Evaluation Form for Computer Teachers
(Adapted from the study of Zapata, 2004)

Instructions:

Listed below are the fine aspects of the developed CAI material in Linear Equations–Technical Quality and Instructional Design.

Evaluate each aspect by putting a check mark (✓) in the box after an item in each fine aspect. The scale below contains points with respective verbal descriptions. It will guide you in giving your ratings to the different items.

Rating	Description

5	Excellent
4	Very Good
3	Good
2	Needs Improvement
1	Poor

	5	4	3	2	1
B. Technical Quality					
1. The technical presentation of the lessons is visible and creative.	/				
2. The courseware used matches the presentation of the material.	/				
3. The effects used in the slide are suited to the presentation of the material.	/				
4. The navigation keys respond quickly.	/				
5. The information displays are effective.		/			
6. The screen displays are consistent.		/			
7. The screen is readable and texts are not overcrowded.	/				
8. The courseware used captures the interest of the students.	/				
9. The program appropriately uses relevant computer capability.		/			
B. Instructional Design					
1. The screen is readable and texts are not overcrowded.	/				
2. The lessons are suited to the level of understanding of the students.		/			
3. The lessons are suited to the level of appreciation of the students.		/			
4. The content has educational value.	/				
5. The lessons are adequate to achieve the objectives.	/				

COMPUTER TEACHER EVALUATOR NO.3

Name: Darlene D. Alberto
Degree Finished: MEP
Name of Employer: UST
Years in Service: 8

Age: 41
School: USC, Cebu
Position: Instructor
Subject in Math:
Algebra,Trigonometry,
Geometry,
Differential Equations

CAI Evaluation Form for Mathematics Teachers
(Adapted from the study of Zapata 2004)

Instructions:

Listed below are the fine aspects of the developed CAI material in Mathematics I–Objectives, Content, Delivery System, Technical Quality, and Instructional Design.

Evaluate each aspect by putting a check mark (✓) in the box after an item in each fine aspect. The scale below contains points with

respective verbal descriptions. It will guide you in giving your ratings to the different items.

Rating	Description
5	Excellent
4	Very Good
3	Good
2	Needs Improvement
1	Poor

	5	4	3	2	1
C. Technical Quality					
1. The technical presentation of the lessons is visible and creative.	/				
2. The courseware used matches the presentation of the material.	/				
3. The effects used in the slide are suited to the presentation of the material.	/				
4. The navigation keys respond quickly.	/				
5. The information displays are effective.		/			
6. The screen displays are consistent.		/			
7. The screen is readable and texts are not overcrowded.	/				
8. The courseware used captures the interest of the students.	/				
9. The program appropriately uses relevant computer capability.		/			
B. Instructional Design					
1. The screen is readable and texts are not overcrowded.	/				
2. The lessons are suited to the level of understanding of the students.	/				
3. The lessons are suited to the level of appreciation of the students.	/				
4. The content has educational value.	/				
5. The lessons are adequate to achieve the objectives.	/				

COMPUTER TEACHER EVALUATOR NO.4

Name: MANUEL MIRANDA JR.
Degree Finished: MBA
Name of Employer: SAN BEDA COLLEGE
Years in Service: 10 YEARS

Age: 33
School: PNU
Position: TEACHER
Subject in Math: HS MATH AND COMPUTER

CAI Evaluation Form for Mathematics Teachers
(Adapted from the study of Zapata 2004)

Instructions:

Listed below are the fine aspects of the developed CAI material in Mathematics I–Objectives, Content, Delivery System, Technical Quality, and Instructional Design.

Evaluate each aspect by putting a check mark (✓) in the box after an item in each fine aspect. The scale below contains points with respective verbal descriptions. It will guide you in giving your ratings to the different items.

Rating	Description
5	Excellent
4	Very Good
3	Good
2	Needs Improvement
1	Poor

	5	4	3	2	1
D. Technical Quality					
1. The technical presentation of the lessons is visible and creative.	/				
2. The courseware used matches the presentation of the material.	/				
3. The effects used in the slide are suited to the presentation of the material.	/				
4. The navigation keys respond quickly.	/				
5. The information displays are effective.		/			
6. The screen displays are consistent.		/			
7. The screen is readable and texts are not overcrowded.	/				
8. The courseware used captures the interest of the students.	/				
9. The program appropriately uses relevant computer capability.		/			
B. Instructional Design					
1. The screen is readable and texts are not overcrowded.	/				
2. The lessons are suited to the level of understanding of the students.		/			
3. The lessons are suited to the level of appreciation of the students.		/			
4. The content has educational value.	/				
5. The lessons are adequate to achieve the objectives.	/				

APPENDIX J

TALLY SHEET FOR COMPUTER TEACHERS' EVALUATION

	5	4	3	2	1	Average Mean
Technical Quality						
1. The technical presentation of the lessons is visible and creative.	4					5
2. The courseware used matches the presentation of the material.	4					5
3. The effects used in the slide are suited to the presentation of the material.	4					5
4. The navigation keys respond quickly.	4					5
5. The information displays are effective.		4				4

6. The screen displays are consistent.		4				4
7. The screen is readable and texts are not overcrowded.	4					5
8. The courseware used captures the interest of the students.	4					5
9. The program appropriately uses relevant computer capability.		4				4
Instructional Design						
1. The screen is readable and texts are not overcrowded.	4					5
2. The lessons are suited to the level of understanding of the students.	2	2				4.50
3. The lessons are suited level of appreciation of the students.	2	2				4.50
4. The content has educational value.	4					5
5. The lessons are adequate to achieve the objectives.	4					5

APPENDIX K

EVALUATION FORM FOR STUDENT-RESPONDENTS

Name: _____ Age: _____
Year/Section: _____ School: _____

CAI Evaluation Form for Student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

Listed below are the fine aspects of the developed CAI material in Mathematics I – Objectives, Content, Delivery System, Technical Quality, and Instructional Design.

Evaluate each aspect by putting a check mark (✓) in the box after an item in each fine aspect. The scale below contains points with respective verbal descriptions will guide you in giving your ratings to the different items.

5	Excellent
4	Very Good
3	Good
2	Needs Improvement
1	Poor

	5	4	3	2	1
Presentation					
1. The presentation of the lessons makes the students actively involved.					
2. The time allotted for the presentation is enough.					
3. The sentences used in the development of the lessons are easy.					
4. The presentation of the lessons gives critical thinking among the students.					
5. The delivery of the lessons helps the students to group the important concepts.					
6. The activities are student-centered.					

Comments/Suggestions:

_____

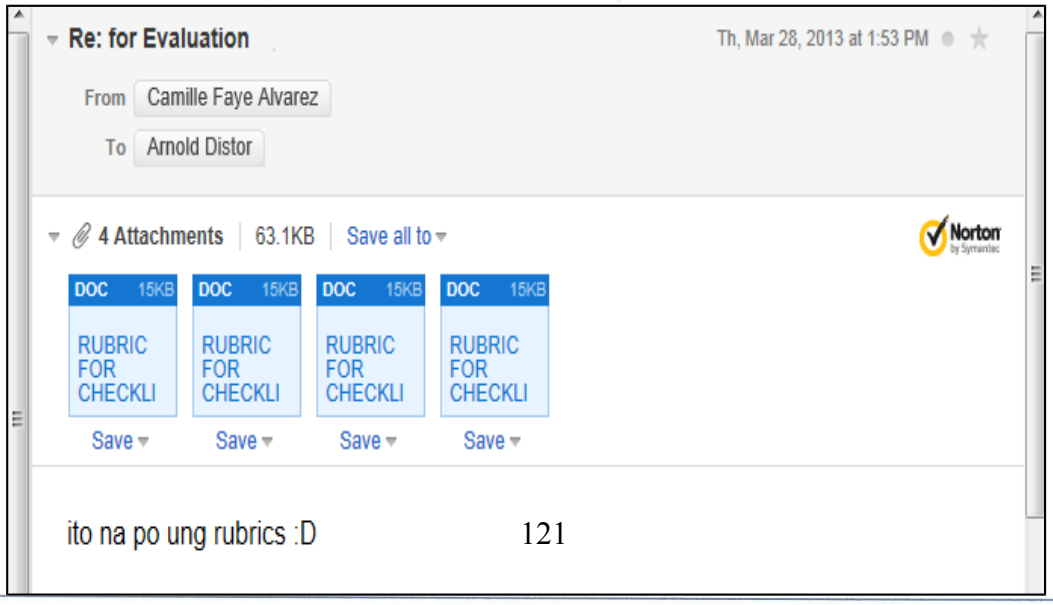
_____

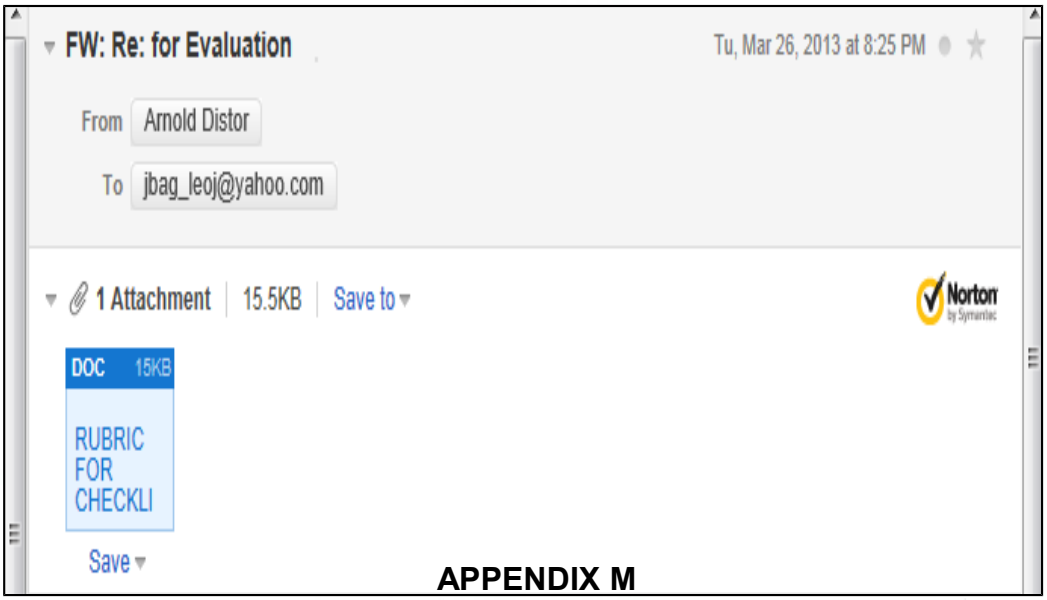
_____

APPENDIX L

SCREENSHOTS OF STUDENT-RESPONDENTS EVALUATION

(retrieved from e-mail)





APPENDIX M

STUDENT-RESPONDENTS EVALUATION

STUDENT EVALUATOR NO.1

Name: ABUEL, DANIEL JOHN DT. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

Given below is a fine aspect of the developed CAI material in Mathematics I–Presentation.

Evaluate each aspect by putting a check mark (✔) in the box after an item in each fine aspect. The scale below contains points with

respective verbal descriptions. It will guide you in giving your ratings to the different items.

Rating	Description
5	Excellent
4	Very Good
3	Good
2	Needs Improvement
1	Poor

	5	4	3	2	1
A. Presentation					
1. The presentation of the lessons makes the students actively involved.	/				
2. The time allotted for the presentation is enough.	/				
3. The sentences used in the development of the lessons are easy.	/				
4. The presentation of the lessons gives critical thinking among the students.	/				
5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.2

Name: ARELLANO, FERDINAND L. Age: 12 1/2
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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Evaluate each aspect by putting a check mark (✓) in the box after an item in each fine aspect. The scale below contains points with respective verbal descriptions. It will guide you in giving your ratings to the different items.

Rating	Description
5	Excellent

4	Very Good
3	Good
2	Needs Improvement
1	Poor

	5	4	3	2	1
A. Presentation					
1. The presentation of the lessons makes the students actively involved.		/			
2. The time allotted for the presentation is enough.		/			
3. The sentences used in the development of the lessons are easy.		/			
4. The presentation of the lessons gives critical thinking among the students.		/			
5. The delivery of the lessons helps the students to group the important concepts.		/			
6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.3

Name: AUSTRIA, JOHN ROGELIO E. Age: 13 1/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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Evaluate each aspect by putting a check mark (✓) in the box after an item in each fine aspect. The scale below contains points with respective verbal descriptions. It will guide you in giving your ratings to the different items.

Rating	Description
5	Excellent

4	Very Good
3	Good
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1	Poor

	5	4	3	2	1
A. Presentation					
1. The presentation of the lessons makes the students actively involved.	/				
2. The time allotted for the presentation is enough.	/				
3. The sentences used in the development of the lessons are easy.	/				
4. The presentation of the lessons gives critical thinking among the students.	/				
5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.4

Name: BANARES, LHIANA REIGN S. Age: 12 1/2
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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Rating	Description
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4	Very Good
3	Good
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A. Presentation					
1. The presentation of the lessons makes the students actively involved.	/				
2. The time allotted for the presentation is enough.		/			
3. The sentences used in the development of the lessons are easy.	/				
4. The presentation of the lessons gives critical thinking among the students.		/			
5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.5

Name: BAGALAY, BEATRICE MARIE G. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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Rating	Description
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A. Presentation					
1. The presentation of the lessons makes the students actively involved.	/				
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3. The sentences used in the development of the lessons are easy.	/				
4. The presentation of the lessons gives critical thinking among the students.			/		
5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.6

Name: BALTAZAR, SOPHIA BOY M. Age: 12 1/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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A. Presentation					
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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.7

Name: CABALLERO, DIANA JANE M. Age: 13 1/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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A. Presentation					
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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.8

Name: CADIZ, CAILA PATRICIA F. Age: 12 1/2
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.9

Name: CARREON, RENZ JAN ITTO B. Age: 12 1/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.			/		
6. The activities are student-centered.			/		

STUDENT EVALUATOR NO.10

Name: DALUSONG, MARIAH C. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.		/			
6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.11

Name: DANAO, JOSHUA CAMSON Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.12

Name: DIZON, MARIA HANNA T. Age: 12 1/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.13

Name: ECO, MA. INGRID L. Age: 11 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.14

Name: EJERCITO, JULIANA LUZ T. Age: 12 1/2
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.15

Name: FRANCO, MARINETTE L. Age: 13 1/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.			/		
6. The activities are student-centered.			/		

STUDENT EVALUATOR NO.16

Name: FRANCO, DERBY ANN T. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.		/			
6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.17

Name: GALUT, RAINA S. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

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A. Presentation					
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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.18

Name: GARCIA, ALYSSA MAY E. Age: 12 1/2
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.19

Name: GATBONTON, JAN CARLO Y. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.20

Name: GOCON, JAZZ P. Age: 11 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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STUDENT EVALUATOR NO.21

Name: GUILLO, MIKEL JASPER E. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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STUDENT EVALUATOR NO.22

Name: HERNANDEZ, LANZ S. Age: 13 1/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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STUDENT EVALUATOR NO.23

Name: IGAYA, MARK FRANCIS S. Age: 12 1/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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STUDENT EVALUATOR NO.24

Name: ISLA, JOSE ANTONIO DL. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.			/		

STUDENT EVALUATOR NO.25

Name: JOSE, JUSTIN RUTH V. Age: 12 1/2
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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STUDENT EVALUATOR NO.26

Name: LOPEZ, JOHN MATTHEW C. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

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STUDENT EVALUATOR NO.27

Name: LUNA, KASPER F. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

Given below is a fine aspect of the developed CAI material in Mathematics I–Presentation.

Evaluate each aspect by putting a check mark (✓) in the box after an item in each fine aspect. The scale below contains points with respective verbal descriptions. It will guide you in giving your ratings to the different items.

Rating	Description
5	Excellent

4	Very Good
3	Good
2	Needs Improvement
1	Poor

	5	4	3	2	1
A. Presentation					
1. The presentation of the lessons makes the students actively involved.		/			
2. The time allotted for the presentation is enough.		/			
3. The sentences used in the development of the lessons are easy.		/			
4. The presentation of the lessons gives critical thinking among the students.		/			
5. The delivery of the lessons helps the students to group the important concepts.		/			
6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.28

Name: MABAGOS, ANDREW M. Age: 11 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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A. Presentation					
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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.29

Name: MARCELINO, REGINALD R. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

Given below is a fine aspect of the developed CAI material in Mathematics I–Presentation.

Evaluate each aspect by putting a check mark (✔) in the box after an item in each fine aspect. The scale below contains points with respective verbal descriptions. It will guide you in giving your ratings to the different items.

Rating	Description
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1	Poor

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A. Presentation					
1. The presentation of the lessons makes the students actively involved.	/				
2. The time allotted for the presentation is enough.	/				
3. The sentences used in the development of the lessons are easy.	/				
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5. The delivery of the lessons helps the students to group the important concepts.		/			
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.30

Name: NUGUID, ERICO M. Age: 12 1/2
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.		/			
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.31

Name: PAANO, LOUISE F. Age: 12 1/2
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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Evaluate each aspect by putting a check mark (✔) in the box after an item in each fine aspect. The scale below contains points with respective verbal descriptions. It will guide you in giving your ratings to the different items.

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3. The sentences used in the development of the lessons are easy.			/		
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5. The delivery of the lessons helps the students to group the important concepts.			/		
6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.32

Name: PACLEB, ELAISHA A. Age: 12 1/2
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.			/		
6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.33

Name: QUINTANA, MARIONNE C. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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4. The presentation of the lessons gives critical thinking among the students.				/	
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6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.34

Name: QUINTANA, MARIONNE C. Age: 12 1/2
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

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5. The delivery of the lessons helps the students to group the important concepts.			/		
6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.35

Name: RAMOS, DENISE R. Age: 12 1/2
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

Given below is a fine aspect of the developed CAI material in Mathematics I–Presentation.

Evaluate each aspect by putting a check mark (✓) in the box after an item in each fine aspect. The scale below contains points with respective verbal descriptions. It will guide you in giving your ratings to the different items.

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5. The delivery of the lessons helps the students to group the important concepts.		/			
6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.36

Name: ROGELIO, PAULINE B. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.			/		

STUDENT EVALUATOR NO.37

Name: RUFINO, NICOLE L. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

Given below is a fine aspect of the developed CAI material in Mathematics I–Presentation.

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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.38

Name: SAMBILAY, SEAN IVAN Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.		/			
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.39

Name: SALOM, JOMAR Q. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.40

Name: SANTOS, AARON ALEXIS N. Age: 12 1/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.			/		
6. The activities are student-centered.			/		

STUDENT EVALUATOR NO.41

Name: TABAGO, URAINE F. Age: 12 1/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.42

Name: TAYAO, GABRIEL T. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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4. The presentation of the lessons gives critical thinking among the students.		/			
5. The delivery of the lessons helps the students to group the important concepts.		/			
6. The activities are student-centered.		/			

STUDENT EVALUATOR NO.43

Name: TUASON, THANEL D. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

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5. The delivery of the lessons helps the students to group the important concepts.		/			
6. The activities are student-centered.	/				

STUDENT EVALUATOR NO.44

Name: ULEP, DWIGHT G. Age: 13 1/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

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STUDENT EVALUATOR NO.45

Name: UY, DANIEL MARI ANTHONY C. Age: 12 $^{3}/_{4}$
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

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STUDENT EVALUATOR NO.46

Name: VILLAREAL, MARY C. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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STUDENT EVALUATOR NO.47

Name: VILORIA, JAN MARI S. Age: 13 1/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.			/		

STUDENT EVALUATOR NO.48

Name: VINUYA, KYLE EDISON V. Age: 12 1/2
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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STUDENT EVALUATOR NO.49

Name: YLANA, BIANCA YSABELLA O. Age: 12 3/4
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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3. The sentences used in the development of the lessons are easy.		/			
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5. The delivery of the lessons helps the students to group the important concepts.	/				
6. The activities are student-centered.			/		

STUDENT EVALUATOR NO.50

Name: ZAMORA, SEAN TERENCE B. Age: 12 1/2
Year/Section: 1st Year Saint Augustine School: UST High

CAI Evaluation Form for student-Respondents
(Adapted from the study of Zapata 2004)

Instructions:

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6. The activities are student-centered.		/			

APPENDIX N

TALLY SHEET FOR STUDENT-RESPONDENTS' EVALUATION

	5	4	3	2	1	Mean
A. Presentation						
1. The presentation of the lessons makes the students actively involved.	23	19	3	3	2	4.16
2. The time allotted for the presentation is enough.	20	14	10	3	3	3.84
3. The sentences used in the development of the lessons are easy.	19	10	20	0	1	3.92
4. The presentation of the lessons gives critical thinking among the students.	21	10	10	9	0	3.86

5. The delivery of the lessons helps the students to group the important concepts.	25	16	8	0	1	4.28

APPENDIX O

MATHEMATICS ATTITUDE SURVEY FORM

Name _____ Section/Class Number_____

I am interested in your ideas about mathematics, computer and this class. Your answers to the questions that follow will help me understand what you think mathematics and computer are all about.

This questionnaire in not something to be graded and your answers are completely anonymous. Please tell me what you really think by putting a check mark(✔)in the box corresponding to Strongly Agree, Agree, Undecided, Disagree, or Strongly Disagree.

Thank you for your help!

Questions	SA (5)	A (4)	U (3)	D (2)	SD (1)
1. Mathematics and computer are enjoyable and stimulating to me.					
2. Mathematics and computer are NOT important in everyday life.					
3. In mathematics you can be creative and discover things by means of computer.					
4. I have never liked mathematics, and it is my most dreaded subject.					
5. There is nothing creative about mathematics; it's just memorizing formulas and things.					
6. Students who have understood the mathematics they have studied will be able to solve any assigned problem in five minutes or less.					
7. I try to learn mathematics because it helps develop my mind and helps me think more clearly in general.					
8. Using the web (or a computer) is a good way for me to learn mathematics.					
9. Everything important about mathematics is already known by mathematicians.					
10. Mathematics makes me feel					

uneasy and confused.					
11. Mathematics and computer are needed in order to keep the world running.					
12. Mathematics is a solitary activity, done by individuals in isolation.					
13. Mathematics is less important to people than computer.					
14. Mathematics is needed in designing practically everything with the help of computer.					
15. Communicating with other students thru web helps me to have a better attitude towards mathematics.					
16. I am interested and willing to acquire further knowledge of mathematics and computer.					
17. Real mathematics problems can be solved by common sense instead of the mathematical rules you learn in school.					
18. The skills I learn in this mathematics class will help me in other classes.					
19. The skills I learn in this computer class will help me in other classes.					
20. I learn mathematics well from lectures and Computer Aided					

Instruction material.					

APPENDIX P

TALLY SHEET FOR STUDENTS' MATHEMATICS ATTITUDE

Questions	SA	A	U	D	SD
1. Mathematics and computer are enjoyable and stimulating to me.	45	2	2	1	
2. Mathematics and computer are NOT important in everyday life.	30	5		10	5
3. In mathematics you can be creative and discover things by means of computer.	42	2		2	4

4. I have never liked mathematics, and it is my most dreaded subject.	25	1		20	4
5. There is nothing creative about mathematics; it's just memorizing formulas and things.	10	2		20	18
6. Students who have understood the mathematics they have studied will be able to solve any assigned problem in five minutes or less.	10	10	1	10	19
7. I try to learn mathematics because it helps develop my mind and helps me think more clearly in general.	30	10	1	9	
8. Using the web (or a computer) is a good way for me to learn mathematics.	48	2			
9. Everything important about mathematics is already known by mathematicians.	40	8	2		
10. Mathematics makes me feel uneasy and confused.	10	8	2	30	
11. Mathematics and computer are needed in order to keep the world running.	46	4			
12. Mathematics is a solitary activity, done by individuals in isolation.	40	5		5	
13. Mathematics is less important to people than computer.	40	2	2	2	4
14. Mathematics is needed in designing practically everything with	46	4			

the help of computer.					
15. Communicating with other students thru web helps me to have a better attitude towards mathematics.	40	10			
16. I am interested and willing to acquire further knowledge of mathematics and computer.	40	5		3	2
17. Real mathematics problems can be solved by common sense instead of the mathematical rules you learn in school.	10	4	10	20	6
18. The skills I learn in this mathematics class will help me in other classes.	30	20			
19. The skills I learn in this computer class will help me in other classes.	30	20			
20. I learn mathematics well from lectures and Computer Aided Instruction material.	10	10	2	10	18

APPENDIX Q

RUBRIC FORM FOR CHECKLISTS' EVALUATION

CATEGORY	4 Points	3 Points	2 Points	1 Point	Point
Content	The content is educational, valid and reliable. It is based on the curriculum and standards.	The content is educational, valid and reliable. It is based on the standards.	The content is partially educational, valid and reliable.	The content is not based on the curriculum and standards.	
Sentence Construction	All sentences include introductory sentence, explanations or details, and concluding sentence.	Most sentences include introductory sentence, explanations or details, and	Sentences included related information, but were typically not constructed well.	Paragraphing structure was not clear and sentences were not typically related within the	

		concluding sentence.		paragraphs.	
Mechanics	No grammatical, spelling or punctuation errors.	Almost no grammatical, spelling or punctuation errors	A few grammatical spelling or punctuation errors.	Many grammatical, spelling, or punctuation errors.	
Aspects	Information clearly relates to the main aspect. The supporting details are explained and understandable	Information clearly relates to the main aspect. The supporting details are partially explained.	Information clearly relates to the main aspect. No details are given.	Information has little or nothing to do with the main aspect.	
Instructions	Instructions are neatly presented and include all required information.	Instructions all required information and are legible.	Instructions include most required information and are legible.	Instructions are missing required information and are difficult to read.	

APPENDIX R

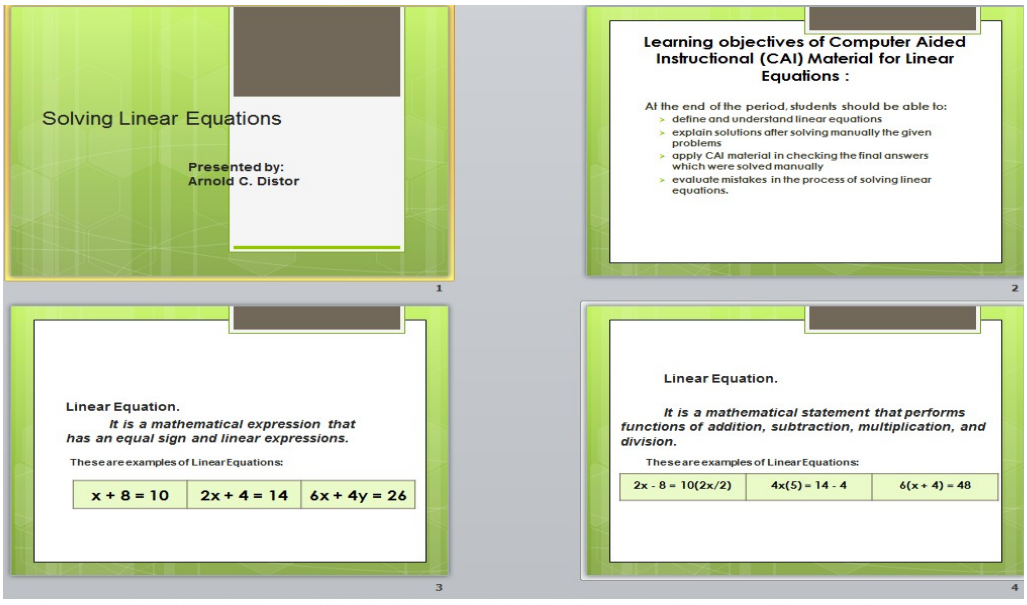
TALLY SHEET FOR CHECKLISTS' EVALUATION USING RUBRIC

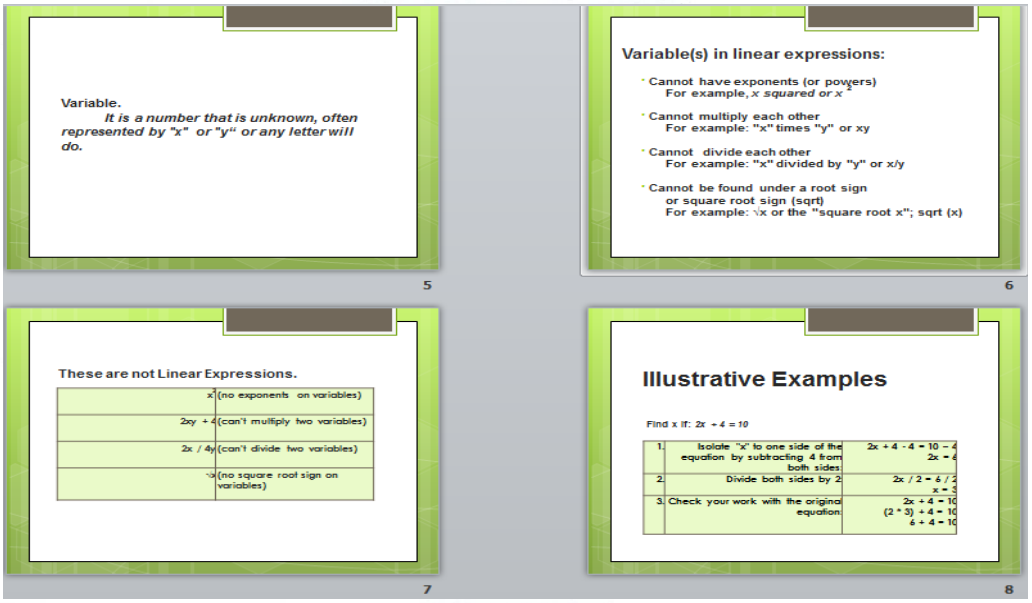
CATEGORY	4 Points	3 Points	2 Points	1 Point	Mean
Content	5	1			3.83
Sentence Construction	4	2			3.67
Mechanics	5	1			3.83
Aspects	4	2			3.67
Instructions	5	1			3.83

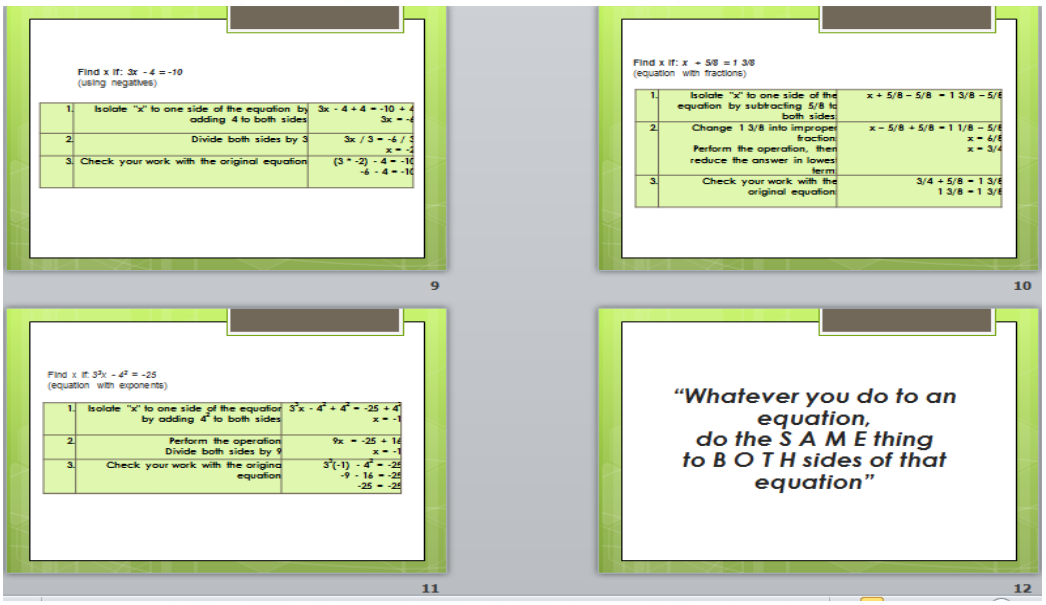
APPENDIX S

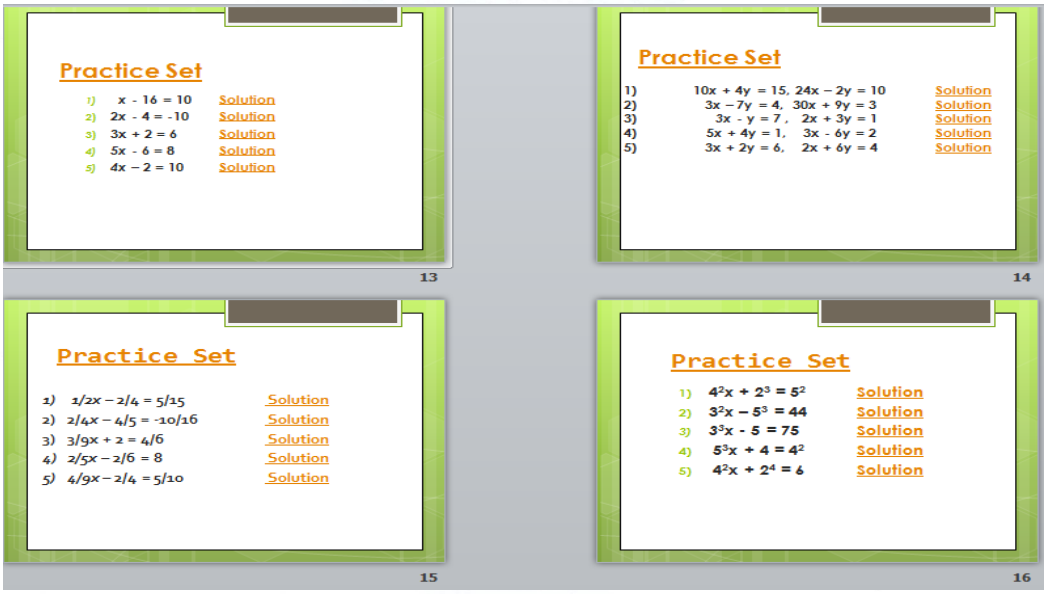
SCREENSHOTS OF THE LESSONS IN LINEAR EQUATIONS

(retrieved from Microsoft PowerPoint)




Variable.
It is a number that is unknown, often represented by "x" or "y" or any letter will do.
5
Variable(s) in linear expressions:
Cannot have exponents (or powers)
For example, x squared or x²
Cannot multiply each other
For example: "x" times "y" or xy
Cannot divide each other
For example: "x" divided by "y" or x/y
Cannot be found under a root sign or square root sign (sqrt)
For example: √x or the "square root x"; sqrt (x)
6
These are not Linear Expressions.
x² (no exponents on variables)
2xy + 4 (can't multiply two variables)
2x / 4y (can't divide two variables)
√x (no square root sign on variables)
7
Illustrative Examples
Find x if: 2x + 4 = 10
1. Isolate "x" to one side of the equation by subtracting 4 from both sides: 2x + 4 - 4 = 10 − 4, 2x = 6
2. Divide both sides by 2: 2x / 2 = 6 / 2, x = 3
3. Check your work with the original equation: 2x + 4 = 10, (2 * 3) + 4 = 10, 6 + 4 = 10
8

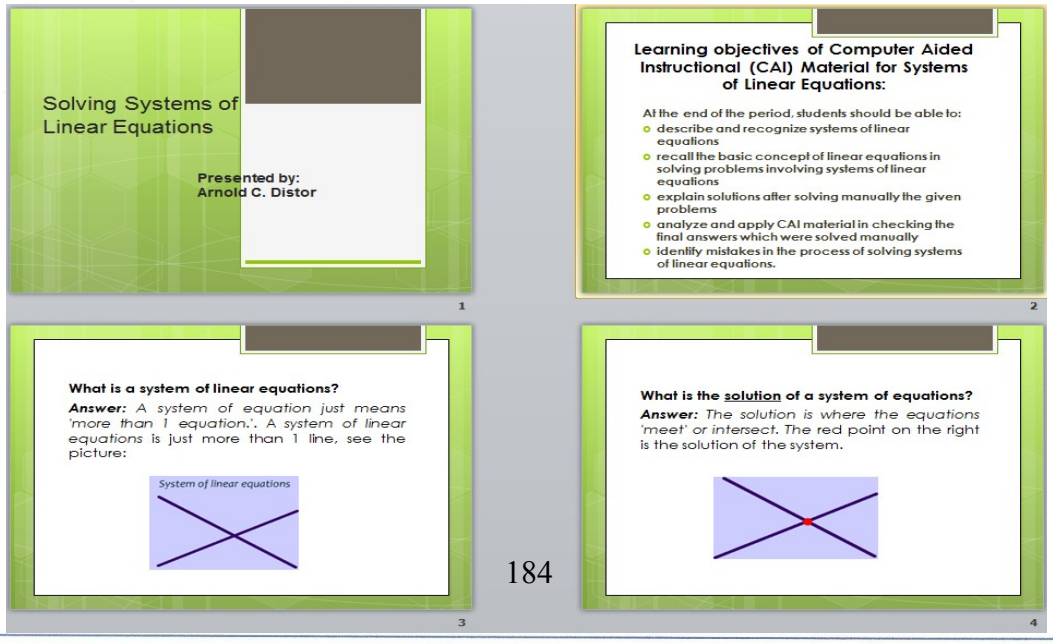

Find x if: 3x - 4 = -10
(using negatives)
1. Isolate "x" to one side of the equation by adding 4 to both sides: 3x - 4 + 4 = -10 + 4, 3x = -6
2. Divide both sides by 3: 3x / 3 = -6 / 3, x = -2
3. Check your work with the original equation: (3 * -2) - 4 = -10, -6 - 4 = -10
9
Find x if: x + 5/8 = 1 3/8
(equation with fractions)
1. Isolate "x" to one side of the equation by subtracting 5/8 to both sides: x + 5/8 − 5/8 = 1 3/8 − 5/8
2. Change 1 3/8 into improper fraction. Perform the operation, then reduce the answer in lowest term: x − 5/8 + 5/8 = 1 1/8 − 5/8, x = 4/8, x = 3/4
3. Check your work with the original equation: 3/4 + 5/8 = 1 3/8, 1 3/8 = 1 3/8
10
Find x if: 3²x - 4² = -25
(equation with exponents)
1. Isolate "x" to one side of the equation by adding 4² to both sides: 3²x - 4² + 4² = -25 + 4², x = -1
2. Perform the operation. Divide both sides by 9: 9x = -25 + 16, x = -1
3. Check your work with the original equation: 3²(-1) - 4² = -25, -9 - 16 = -25, -25 = -25
11
"Whatever you do to an equation, do the S A M E thing to B O T H sides of that equation"
12



APPENDIX T

SCREENSHOTS OF THE LESSONS IN SYSTEMS OF LINEAR EQUATIONS

(retrieved from Microsoft PowerPoint)

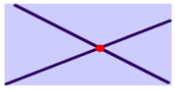


How many solutions can systems of linear equations have?
There can be zero solutions, 1 solution or infinite solutions, each case is explained in detail on the succeeding slides. Note: Although systems of linear equations can have 3 or more equations, we are going to refer to the most common case, a stem with exactly 2 lines.

5

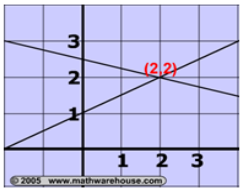
Case I: *1 Solution*

This is the most common situation and it involves lines that intersect exactly 1 time.



6

Example 1
The solution of the system of equations below is (2,2) which marks the point where the two lines intersect.



9

"Whatever you do to an equation, do the S A M E thing to B O T H sides of that equation"

10

Practice Set

1)	10x + 4y = 15, 24x – 2y = 10	Solution
2)	3x – 7y = 4, 30x + 9y = 3	Solution
3)	3x - y = 7 , 2x + 3y = 1	Solution
4)	5x + 4y = 1, 3x - 6y = 2	Solution
5)	3x + 2y = 6, 2x + 6y = 4	Solution

11

APPENDIX U

PROCEDURES IN THE USE OF COMPUTER AIDED INSTRUCTIONAL MATERIAL FOR LINEAR EQUATIONS AND SYSTEMS OF LINEAR EQUATIONS

INTRODUCTION:

The researcher used the ***Cognitive learning theory approach*** because of the objectives taken from the mathematics syllabus for high school freshmen. In the Cognitive learning theory the students should be provided with ***techniques, procedures, organization and structure*** in order to develop internal cognitive structure that strengthens the students understanding of the concept in the brain.

The ***Cognitive learning theory*** was utilized in developing the CAI material, because the mental processes of the high school freshmen students were considered. Objectives like to ***recognize, recall, analyze, reflect, apply, create, understand, and evaluate*** were emphasized in this study. The students need assistance to develop prior knowledge and integrate new knowledge. This is the primary reason why the researcher

developed a CAI material in Algebra more specific on the concept of linear equations and systems in linear equations.

Students can solve problems involving linear equations and systems of linear equations and can use the developed CAI material to evaluate the manually computed results.

Linear Equation is an algebraic equation in which each term is either a constant or the product of a constant and (the first power of) a single variable. Linear equations can have one or more variables. Linear equations occur with great regularity in most sub-areas of mathematics and especially in applied mathematics.

Appendices S and T show the manual process of the solving the linear equations and systems in linear equations. While ***Appendix V*** shows the automated process. The user will be guided by the steps given below.

1. Since the linear equations are in different forms therefore, the user can select the type of equation to solve:
   (1) if the linear equation is in ***ax + b = c*** form where ***one variable*** is unknown.
   (2) if the linear equation is in ***ax + by = c*** and ***dx + ey = f*** form where ***two variables*** are unknown.

2. If (1) is selected for one unknown variable, an option is being asked as ***what type of number*** that the user needs for ***coefficients a, b and c***:

   (1) if an ***integer***
   (2) if a ***fraction***
   (3) if an ***exponent***

Take note: For ***fraction***, the user needs to enter the ***numerator*** and the ***denominator***. Likewise, for ***exponential***, the user needs to enter the ***base*** and ***exponent***. Press the ***Enter*** key for each entry.

3. The ***CAI material*** will show instantly the equivalent of the unknown variable. No solutions will be presented. The CAI material is only a tool that will help a student ***evaluate*** his/her answer which was solved manually.

4. If (2) is selected for two unknown variables, an option is being asked ***as to what type of number*** that the user needs for ***coefficients a, b, and c*** in ***equation 1***:

(1) if an ***integer***
(2) if a ***fraction***
(3) if an ***exponent***

Take note: For ***fraction***, the user needs to enter the ***numerator*** and the ***denominator***. Likewise, for ***exponential***, the user needs to enter the ***base*** and ***exponent***. Press the ***Enter*** key for each entry.

5. If the user is done already in all the entries for ***equation 1***, the user can proceed to complete the entries in ***equation 2***. The user needs to follow the steps given in no. 4.

6. The ***CAI material*** will show instantly the equivalent of the unknown variable. No solutions will be presented. The CAI material is only a tool that will help a student ***evaluate*** his/her answer which was solved manually.
7. In every ***complete process*** from selecting a linear equation form up to giving out the value of the unknown variable, the CAI material will ask the user if he/she wants to solve another linear equation problem. Options like (***y***) if ***Yes*** and (***n***) if ***No*** are provided. Then the CAI material will prompt the user in the first step.

8. It is very important that the user needs to give exactly what is being asked by the CAI material. If the CAI material needs a ***numerical coefficient***, the user needs to enter a number. Likewise, for a literal coefficient, the user needs to enter an alphabet. Otherwise, wrong entries could lead the CAI material to malfunctioning.

APPENDIX V

C++ PROGRAMMING FOR CAI MATERIAL

```
#include <iostream.h>
#include<conio.h>
#include<math.h>

int display()
{
  int co;

  cout<<"\n\n\t\t1 - integer\n\t\t2 - fraction\n\t\t3 - exponential\n\n";
  cout<<"\tEnter choice (1,2 or 3): ";
  cin>>co;
  return co;
}

float input(int co)
{
```

```
  float a,b;

  if(co==1)
  {
    cout<<"\n\tEnter an integer : ";
    cin>>a;
    return a;
  }
  if(co==2)
  {
    cout<<"\n\tEnter the numerator : ";
    cin>>a;
    cout<<"\n\tEnter the denominator : ";
    cin>>b;
    return (a/b);
  }
  if(co==3)
  {
    cout<<"\n\tEnter the base : ";
    cin>>a;
    cout<<"\n\tEnter the exponent :";
    cin>>b;
    return (pow(a,b));
  }
  return 0;
}
 int main()
{

   float a,b,c,x,ch,co;
   char choice;
do{
   clrscr();
   cout<<"\n\tPlease press the ENTER KEY after each input \n\n";
   cout<<"\n\n\tSelect the type of equation to solve :\n\n";
   cout<<"\t1 - Linear Equation of the Form : ax + b = c\n\n";
   cout<<"\t2 - Systems of Linear Equations in 2 Unkowns of the Form
:\n\n";
   cout<<"\t\t ax + by = c\n";
   cout<<"\t\t dx + ey = f\n";
   cout<<"\n\tEnter choice(1 or 2) :  ";
```

```
cin>>ch;
if (ch == 1)
{
   cout<<"\n\tEnter coefficients a,b,c :\n ";
   cout<<"\n\tSelect the type of coefficient a ";
   co=display();
   a=input(co);
   cout<<"\n\tSelect the type of coefficient b ";
   co=display();
   b=input(co);
   cout<<"\n\tSelect the type of coefficient c ";
   co=display();
   c=input(co);

   if(a==0)
        cout<<"\n\tNo Solution!";
   else
        cout<<"\n\tx = "<<(c-b)/a<<endl<<endl;
}
else
{
   float a1,a2,b1,b2,c1,c2,x1,y1,Ax,Ay,A;
   cout<<"\n\tEnter the coefficients of equation 1 (a,b,c)\n ";
   cout<<"\n\tSelect the type of coefficient a ";
   co=display();
   a1=input(co);
   cout<<"\n\tSelect the type of coefficient b ";
   co=display();
   b1=input(co);
   cout<<"\n\tSelect the type of coefficient c ";
   co=display();
   c1=input(co);

   cout<<"\n\tEnter the coefficients of equation 2 (d,e,f)\n ";
   cout<<"\n\tSelect the type of coefficient d ";
   co=display();
   a2=input(co);
   cout<<"\n\tSelect the type of coefficient e ";
   co=display();
   b2=input(co);
   cout<<"\n\tSelect the type of coefficient f ";
```

```
      co=display();
      c2=input(co);

      A=a1*b2-a2*b1;
      if(A==0)
          {
           cout<<"\n\tNo Solution!";
           goto END;
          }
     Ax=c1*b2-c2*b1;
     Ay=a1*c2-a2*c1;
     cout<<"\n\tThe solution is : \n\n\tx = "<<Ax/A<<endl
          <<"\n\ty = "<<Ay/A<<endl;
  }
END:
  cout<<"\n\n\tDo you want to solve another (y or n)? : ";
  cin>>choice;
}while(choice == 'y' || choice == 'Y');
return 0;
}
```

CURRICULUM VITAE

DISTOR, ARNOLD CASTELO

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Email Address	Arnolddistor2007@yahoo.com.ph		
Birthdate	October 15, 1967	BIRTHPLACE	Manila
Civil Status	Married	RELIGION	Roman Catholic

ACADEMIC QUALIFICATIONS

Degrees	Institution	DATE (mm/yyyy)	Specialization
MAT	Philippine Normal University	2013	Mathematics

MBA	San Beda College, Manila	2008	Business Administration
Computer Application	Informatics, Binondo, Manila Branch	1999	Computer Education Office Application and Design
BSE	Philippine Normal College	1989	Mathematics

GOVERNMENT EXAMINATIONS PASSED

NATURE OF EXAMS	DATE OF EXAMS	REMARKS
PRC-LET	November 10, 1991	Passed
PRC- Professional	August 5, 1990	Passed

WORK EXPERIENCE

DATE	POSITION	OFFICE/SCHOOL
June 1, 1989 June 2008	Regular Teacher & Part-time Instructor	San Beda College, Basic Education Department
June 9, 2008 Present	Tenured Faculty Member	University of Santo Tomas, College of Tourism and Hospitality Management