2010

A Survey of transition strategies to improve the performance of Chord in the face of rapidly changing IP addresses

Timothy Ecklund

CAPSTONE PROJECT

Using 3D graphic and animation software to enhance learning experience in GED Math

By

Willy Benson. Ochaya

A Capstone Project to be submitted in partial fulfillment of the requirements for the Degree of Master of Science in Multidisciplinary Studies
With Concentration in Information Technology

Rochester Institute of Technology
Center for Multidisciplinary Studies
31 Lomb Memorial Drive
Rochester, NY 14623-5603

Winter Quarter, 2006

Approved by ______________________________
Chairperson of Supervisory Committee

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Program Authorized
to Offer Degree ______________________________

Date ______________________________

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Table of Contents

List of figures

Number *Page*

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Abstract:

The first GED Tests were developed in 1942 to measure the major outcomes and concepts generally associated with four years of high school education. Initiated by the United States Armed Forces Institute (USAFI), the original tests were administered only to military personnel so that returning World War II veterans could more easily pursue their educational, vocational, and personal goals.

During the 1950s, it became apparent that civilians could also benefit from the program, a need that the American Council on Education undertook to fulfill. From 1945 to 1963, the program was administered by the Veteran's Testing Service. In 1963, in recognition of the transition to a program chiefly for non-veteran adults, the name was changed to the General Educational Development Testing Service.

Since that time, the GED Testing Service has guided and directed a program which now serves more than 800,000 test takers annually at approximately 3,200 overseas Centers.http://www.adultlearningcenter.com/GED%20History.htm

Today the GED, or General Educational Development Test, certifies that the taker or school dropout has attained American or Canadian high school-level academic skills.

The Rochester City school district accounts for the largest school dropout* rate in Monroe County. Most of this group is at-risk young people between 12 and 25 years of age. At Threshold Center for Alternative Youth Development, the average data for participants over the past four years indicates that 30% are pregnant or parenting, 35% are involved with the criminal justice system, 21% are homeless, and 10% have been involved in domestic violence requiring police interventions. (Threshold, Graduation Ceremony 2004, Circular).

To pass the GED, the test taker must perform in at least the 40th percentile of high school seniors nationwide, though individual states can set their own requirements for passing. Some states also require that students take an additional test showing an understanding of federal, state, and/or local government. en.wikipedia.org/wiki/GED.

This study was designed to explore trends in the use of 3D graphics and animation software within an educational context to enhance learning and to promote the use of calculators for a broader learning experience. This study targeted students in the GED

component of Threshold Center for Alternative Youth Development who specifically were preparing to take the math section of the examination. Evidence from an array of studies (Simonson & Thompson, 1994; Weller, (1996); Lazarowitz and Huppert (1993); Yalcinalp, Geban, and Ozkan (1995) indicates that (computer) technology in the classroom can have a positive impact on students learning, in terms of achievement in certain subject areas.

There is much yet to be learned. This is because:

1. Little has been done to study the use of 3D graphic and animation software in enhancing learning among high school dropouts.

2. Research in the use of 3D graphics and animation has mostly been informal, content specific or non-existent. There is much to be done. This study is just the beginning

The results of this study indicate that students who had tried the interactive 3D graphics and animation instructional software:

1. Learn more and with ease;
2.Were better able to work under pressure because of the timed quizzes;
3.Were able to use the Casio *fx*- 260 Solar calculator more easily than the actual traditional calculator. 3D graphic and animation software had, indeed, enhanced their learning experience.

Terms used : **Animation, Authoring, Benjamin Bloom, Computer software, Computer Assisted Instruction, Courseware, Computer-Based Training, Compression**, **Curriculum, Clip Art, Educational Technology, Graphics Interchange Format (GIF),Geometry, Graphic Designer, Hypertext, Hypertext Markup Language, Interactive, Instructional Technology, Instructional design, Module, Multimedia, Pedagogy, Robert M. Gagné, Three-D, Quicktime.** *See Glossary page 96-100*

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* A dropout is defined as any student who left school before graduation for any reason except death and did not enter another school or high school equivalency preparation program.
http://www.emsc.nysed.gov/irts

ACKNOWLEDGMENTS

The author wishes to express sincere appreciation to Professor Marla Schweppes of the Department of Animation, Professor David Hart of Department of Mathematics and Statistics, Professor Dianne Bills, Department of Information Technology, Professor Chris Jackson, Department of Computer Graphic and Professor Rayno Niemi Ph. D, Department of Information Technology for their assistance in the preparation of this MS Capstone. Professor Richard Morales, Graduate Coordinator, Department of Multidisciplinary Studies.

I would like also to thank CASIO ELECTRONICS CO., LTD, Unit 6 1000 North Circular Road, London NW2 7 JD,UK.(CASIO COMPUTERCO.,LTD. 6-2 Hon-Machi 1-chome,Shibuya-ku,Tokyo 151-8543, Japan) for permission for the adaptation of the Casio fx-260 solar Calculator in this format.

My appreciation to the New York State Department of Labor and Steck Vaugan, Harcourt, Inc, for all the seminars conducted related to the use of the Calculator for GED 2001. Also a word of thanks to Threshold Center for Alternative Youth Development, and the students, who piloted in the use of the manual. Finally, thanks to those who participated in the demo study of the software.

I would like to thank my wife Irene Ochaya, daughters Joan A. Ochaya and Lyria Ochaya and Mr. Joe McWilliams for all the support and encouragement during my work on this project.

Thanks also to the members of the committee for their valuable input.

INTRODUCTION

In 2002, the GED testing service chose the Casio *fx*-260 calculator for GED Math tests. Many students have not been exposed to the advanced calculators in use today and are unable to utilize a calculator to its fullest capability. The purpose of this study is to create a user guide to help students at Threshold to learn how to use the Casio *fx*-260 calculator and also to help them develop skills in the use of the technology that can be applied to other areas of life. The project involved the design and implementation of a software/hardware system using existing software to achieve this goal. As a result, some of the bundled software, for example Microsoft Office, and the stand alone software, for example, Maya and Adobe Photoshop, were used to create the project to solve this unique problem.

The skills developed in utilizing the fx-260 are also seen as a stepping stone in career development for the skills needed in higher education and in workplace technology. Many technological training programs are established to bridge the "Digital divide" (commonly understood as the differential access to technology of low- income and "minority" populations to technical training and skills). Most programs limit goals to creating fluent technology users. This project hopes to open the issue of 3D graphics to a broader definition in which both the instructor and student alike strive to bring 3D graphics to life in a classroom to increase learning experience in GED Math. Teachers and students can use bundled software like Microsoft Office, Microsoft Works -Word, and Photoshop, to create animated 3D graphics. The goal is not to make them users of technology, but to make them the designer of materials as well.

According to the 2001 Census, 58% of school dropouts come from City School District in Monroe County. [Figure1]. Threshold Center for Alternative Youth Development has been the point of access for some of these youth to get a second chance in life. It serves as an urban sanctuary for those youths who have less access to education and technology. This is especially true for the low income families and for African Americans, who do not have educational and technological resources at home.

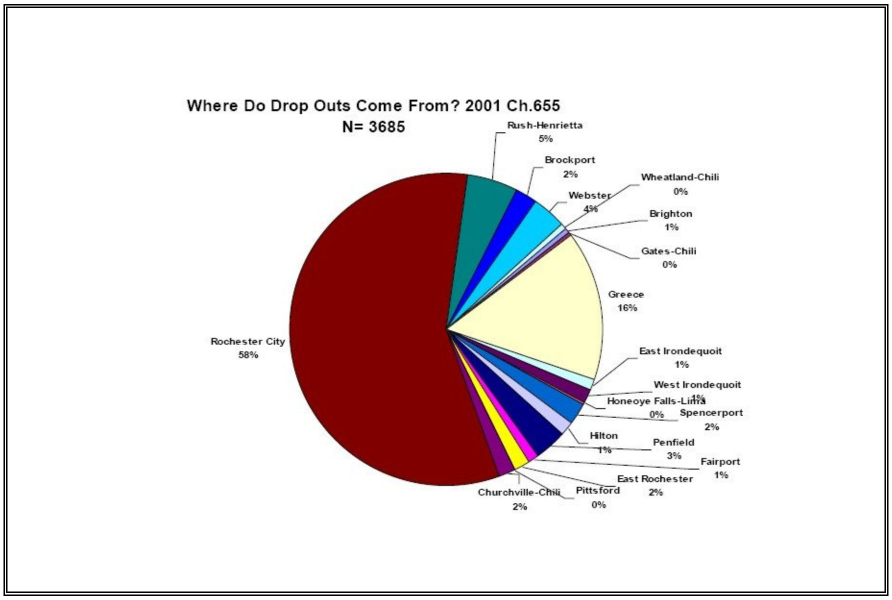

Figure1 Adapted from http://www.rit.edu/~jmkgcj/research/OtherStudies/School.pdf

Objective:

This study is designed to explore trends in the use of 3D graphics and animation software within an educational context to enhance learning and to promote the use of calculators for a broader learning experience, within GED math at Threshold. I worked at Threshold from June 2002 to August 2005 as a Computer Career Educator, training Threshold students using the Casiofx-260 Solar Calculator.

Goals:

- To show how using 3D Graphics and animation software can enhance learning experiences in GED math.
- To design 3D interactive abstract framework to demonstrate how 3D graphics and animation software can enhance learning.
- To visualize the evolutionary dynamics of software, such as Maya, Flash, Word Draw tools and Photoshop systems.
- To convert Casio fx-260 graphic into 3D graphic.

Premise:

Using well designed 3D graphic and animation software has tremendous potential for enhancing learning experiences. This didactic* software can help the student obtain, organize, manipulate, and display information in a real and meaningful way. Well designed 3D graphic and animation software can also help the teacher (who would need to be trained in the use of 3D graphic and animation software) to apply this skill instructionally within his or her subject area. To be successful, each instructor would need sufficient time and skills to experiment with different 3D graphic and animation software in order to master those skills necessary to create 3D graphic design. Well designed 3D graphics and animation instructional software:

- Enhance student ability.
- Improve computing skills.
- Provide improved instructional strategies.

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*Didactic speech, writing that is intended to teach people a lesson, Longman Group Ltd 1995

Overview:

In 2002, the GED Testing Service chose the Casio *fx*-260 Solar calculator for math tests. In my experience many students have not been exposed to this type of advanced calculator [figure 2 below] and were unable to utilize the calculator to its fullest potential. In response to this need, I designed, created and produced a manual, instructor guide, and Powerpoint presentation to go with the Casio fx-260 Solar calculator. Because of the educationally diverse nature of the students at Threshold-- they range in level from sixth to twelfth grade--it was necessary for me to develop a manual that was "user friendly" to accommodate these increasingly diverse backgrounds in terms of age, gender, culture, life experience and educational attainment*. This diversity prohibits one-size-fits all approach to learning. Redesigning smaller chunks of curriculum to modules will allow the students to decide how quickly or how slowly to work through the features of the Casio fx-260 Solar Calculator.

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*"Students who have certain kinds of conditions such as living with one parent being a member of a minority group, having limited English proficiency, and so on, are defined as at risk because, statistically, students in these categories are more likely to be among the lowest achievement groups or to drop out of school altogether".http://www.ncrel.org/sdrs/areas/rpl_esys/equity.htm

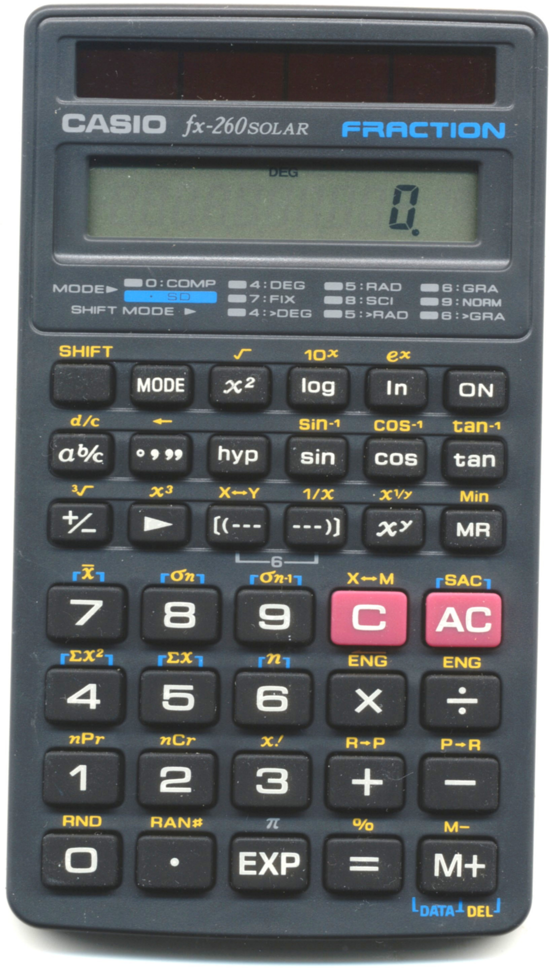

Figure 2. CASIO *fx-260 SOLAR Calculator*

Problem:

Research involving graphing calculators is extremely limited. Studies involving (graphing) calculators and computers tend to be focused on student learning (Wilson & Krapfl, 1994; Dugdale, Wagner, & Kibbey, 1992; Ruthven, 1990; Heid, Sheets, Matras, 1990; Lesh, 1987; Wright, 1989; Stuessy & Rowland, 1989). Discussion about the use of computers and graphing calculators in mathematics education is centered around how the

tools can best be used to enhance such learning (Leinhardt, Zaslavsky, & Stein, 1990; Demana & Waits, 1990; Shumway, 1990). These discussions appear to assume that teachers welcome the technology and are going to use it to provide rich and meaningful learning experiences for mathematics students.

(http://www.aace.org/dl/files/JCMST/JCMST162269.pdf)

On the other hand very little has been done to use 3D Graphics/Animation in enhancing learning for high school dropouts. Research in the use of 3D graphics is primarily informal, for example gaming --and in many cases, non-existent.

Nothing specific has been designed for youth at risk, ages 12 to 25, in Rochester even though there would seem to be a significant need. Not only does Rochester lead the rest of the county in its rate of school drop outs, according to the New York State for the Bureau of Women's Health (1999), Rochester also has the highest rate of teen pregnancy in Monroe County. It also has inordinately high rates of crime (Klofa's report).

http://www.rit.edu/~jmkgcj/research/SACSI/WP17.pdf

Solutions that have already been tried:

- Ross 1999 indicated that "…multimedia (among other emerging technologies) is superior to 'traditional' instruction, often because it is 'interactive' and because it is rich in content using a multiple combination of software like Flash Photoshop, Maya, etc., to create highly interactive applications in which information flows both ways from the application to user and from user to the application. Students learn and retain more once they are involved in creating or evaluating the end product commonly known as Computer Assisted Instruction (CAI).

- The traditional notion of teaching has embraced the teacher as the dispenser of knowledge, using a talk and chalk approach, while the students sit, listen, and accept. Books with pictures or drawings still serve as the primary visual aid in many classrooms. This nontechnical approach to communication historically has been the only way some schools could afford to enhance the student learning experience, and this needs to change.

Literary Review:

Computer-Assisted Instruction (CAI)

CAI includes approaches that utilize computers to deliver information in a step-by-step manner that is similar to programmed learning. CAI aims to enhance student achievement of specific content-related instructional objectives (Simonson & Thompson, 1994; Weller, 1996). Findings on the effectiveness of CAI,. Jegede, Okebukola, and Ajewle (1991) compared the achievement of 12th grade Nigerian students who studied biology for three months under two different approaches. The first utilized traditional lecture/demonstration while the second approach made use of an interactive CAI instructional package, which presented students with text and graphics followed by question-and-answer sessions. No significant differences were found between the biology achievement of the experimental and comparison groups.

Lazarowitz and Huppert (1993) assessed the influence for integrating a computer-assisted learning program into classroom-laboratory instruction on 10th grade 181 respondents (82% female) gained knowledge of bacterial growth and science process skills.

The assessment spanned three 45-minute periods per week for four weeks. Compared to students in the control group who received conventional classroom-laboratory instruction, students in the experimental group used the program to simulate and construct graphs of microorganism growth. Females in the experimental group achieved significantly higher scores than the control females on content knowledge and science process skills (specifically, interpreting data and controlling variables). No such differences were found for male students in the experimental group.

Yalcinalp, Geban, and Ozkan (1995) compared the effect of utilizing a CAI tutorial program versus traditional recitation sessions to supplement classroom instruction on students' understanding of chemical formulas and the mole concept. Participants were 101 8th grade students in two general science classes. Both experimental and control students attended the same lectures but received differential supplementary instruction (i.e., CAI versus recitation sessions).

Students in the experimental group scored significantly higher than those in the control group on a test that assessed their knowledge and comprehension of the target concepts, as well as their ability to solve problems involving these concepts. It should be noted, nonetheless, that the above mentioned three studies did not control for significant confounding variables, such as novelty, teacher effects, and the increased efforts usually invested in novel approaches that are introduced into otherwise traditional educational settings.

Christmann, Badgett, and Lucking (1997) conducted a meta-analysis that compared the academic achievement of students in grades six through twelve who received either traditional instruction or instruction supplemented with computer-assisted instruction (CAI) across eight curricular areas. The mean effect size for science, derived from eight relevant research studies, was 0.639 in favor of the CAI students. This mean effect size, it should be noted, was highest among all eight academic areas investigated and indicates a relatively substantial effect for CAI on the achievement of secondary science students. More recently, Christmann and Badgett (1999) conducted a meta-analysis of the research that assessed the effect on the academic achievement of science students exposed to, versus those not exposed to, CAI within four academic areas (general science, biology, chemistry, and physics), all seem to have done well according to the study. These are some example of success studies related to the use of CAI in different subject areas but none in the use of 3D graphic and animation software.

With the exception of my target group (high school drop outs) and of the specific use I made of bundled and stand alone 3Dgraphic and animation software, these studies were closely related to the current study. They all studied the use of Computer Assisted Instruction, and I narrow my study on the use of 3D graphic and animation software.

There are different types of learning strategies and outcomes which vary with the amount of effort required in learning. Bloom's work (Bloom et.al., 1956) describes these differences among types of learning with taxonomy of objectives in the cognitive domain (specifically recall, comprehension, application, analysis, synthesis, and evaluation). David Marrill went on further to develop more emphasis on task analysis in terms of interaction of two dimensions, specifically. Merrill, (1983) content (specifically facts, concepts, procedures, and principles and performance level. These outcomes were similar

to four of Robert Gagne's categories. Robert Gagne (1985) divided possible learning outcomes into four large categories or domains:

1 Verbal information

2 Intellectual skills

3 Cognition strategies

4 Attitudes and psychomotor skills

R. Gagne (1972) also suggested that lessons include nine vents of instruction: (1) gaining attention; (2) informing the learner of the objective; (3) stimulating recall of prerequisite learning; (4) presenting stimulus materials; (5) providing learning guidance; (6) eliciting performance; (7) providing feedback; (8) assessing performance; (9) and enhancing retention and transfer. All are related to effective design of any instructional materials.

There are a variety of terms used to describe the educational use of computers and each has a slightly different meaning. Such uses, according to Tarlor (1980), can be divided into three main groups:

(1). The computer as a tool (via word processor, data base, spread sheet, and graphics application)

(2). The computer as learner (as "taught" by the user who issues a set of instructions to the computer through a programming language such as Logo, and games

(3). The computer as an instructor (or provider of instructional material). This latter situation is termed Computer Based Instruction (CBI) or Computer Assisted Instruction (CAI) which is an older term than CBI. Computer Based Instruction has traditionally been composed of four main components: (1) Drill and Practice, (2) Games and Simulation (3) Modeling and (4) Hypertext, Hypermedia, Multimedia and e - learning. (This later component was added as the result of the advent of modern technology).They are expensive to author and produce. [http://www.microbelibrary.org/submit/index.asp?bid=998]

Traditionally, teachers have spent much of their time, and sometimes students' time, manually preparing teaching aids, posters, graphics and transparencies, to enhance the learning experience. There are many tools that could be utilize by both student and teacher, even though in schools equipped with computers, the ratio of students to powerful multimedia computers is only 35:1 in the USA. (According to Former Vice President Al Gore: Reaching Technology Goals, http://165.224.220.253/about/offices/list/os/technology/plan/national/goals.html) and it is almost non existent in institutions like Threshold: Threshold provides medical, educational and counseling services to youth (ages 12 to 25) in downtown Rochester. Its programs are designed to meet the specific needs of youth at-risk.

Today many classrooms are equipped with computers bundled with useful software, such as Microsoft Office (PowerPoint, Word, Excel, and Paint Image editor, Notepad, Access and Outlook) and other vendor software that can help teachers prepare their own instructional support materials, otherwise, known as audio-visual aids. These can be 3

Dimensional graphics, lecture notes, voice recognition, audio tapes, pictures and graphs to illustrate the teacher's point. These are growing rapidly. The advent of the digital cameras, camera phones and PDAs with built in cameras are widely in use today. They all come with bonus software for editing, animation and e-mail for productivity. These software and tools are underutilized for creating educational materials. Although software such as Adobe Photoshop, Microsoft PowerPoint, Maya, Flash, FrontPage, Microsoft Expression (code name Acrylic Graphic Designer) require more advanced skills, these skills can be learned.

Students and teachers need multimedia tools for breaking communication barriers in the classroom. Students and teacher could use camera phones or PDAs built in cameras to capture a 3D graphic image or to animate the image they have captured with the software. These are tools that are available today with the equipment that came with them. This can help them to communicate ideas in a manner appropriate to the needs of educationally diverse populations of student at Threshold.

In a report presented to the US Congress entitled *Teachers and Technology, Making the Connection*, the Office of Technology Assessment (1995) states that teaching students with "differing ability, background and interest has posed an external dilemma to educators. Instruction, for example, that is appropriate and beneficial to one student may have a negative effect on another…Some students require additional explanations, while others have grasped the materials and are ready to go on. Since having forty million private instructors is impossible, compromises are necessary and teaching usually progresses at the average level of the class. Poorer students are left hanging in their

confusion and the brightest students miss exciting challenges" With carefully designed 3D graphic and animation instructional software, "as tutors, the learning of one individual will never be hindered by the abilities and weakness of others. Each student will move at his or her own pace, unaffected by the rate of learning of any other student" (p31).
The report also noted that computer, "technology can be a resource to enhance student achievement and interest in learning, [if] "teachers can invest more time and energy to learn to use (computers) in their teaching" (p31). Evidence from an array of studies as noted in (p12-15), indicates that (computer) "technology in the classroom can have a positive impact on students learning, in terms of achievement in certain subject areas, development of skills and attitudes towards schools" (p.57).

According to my study, high school dropouts functioning on a ninth grade level in this group seem to perform well both in timed and untimed quizzes. One contributing factor may be that they have just dropped out of school and the information is still fresh in their minds. Performances tend to decline (see figure 4 and figure 5) for students who have been out of school for two or more years. For example the figure with participants who are beyond grade 12^{th} are college students, instructors and other adults tested randomly show that they seem to lose track of math. Other contributing factors may be:

- Domestic problems (pregnancy, fending for oneself)
- Peer pressures (drugs, alcohol, crimes)
- An individual has been out school for a long time and forgotten about math.

It should be noted that of participants over the past four years: 30% are pregnant or are parents, 35% are involved with the criminal justice system, 21% are homeless and 10% have been involved in domestic violence requiring police intervention*. The majority of the program participants also receive public assistance. (Threshold Graduation Ceremony circular dated, 2003.). In all these categories, students who tried the interactive 3D graphic and animation instructional software felt that they had (1) learned more, (2) were better able to work under pressure because of the timed quizzes, and (3) were able to use the Casio *fx*- 260 Solar calculator more easily than the actual traditional calculator. 3D graphic and animation software had, indeed, enhanced their learning experiences. For those who had been out of school for more than a year, the interactive 3D graphic and animation techniques employed seem to motivate them to learn more. They also felt challenged by the computer.

What does the literature say about the problem?

Bringing three dimensional experiences into a classroom, using graphics software, participatory approaches, interactivities, and self motivation have been lacking from traditional classroom settings. Field trips were the only way students could share real experiences. Today many classrooms are flooded with students with various backgrounds, cultures, and experiences that are totally different from one another, and as a result teachers are faced with difficulties in breaking these cultural barriers.

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*City Addicted to a Gun habit- operation Law and Order, Democrat & Chronicle, Sunday, November 2005 p16A

Client or Target Audience

Threshold is a multi-service agency located in downtown Rochester with satellite programs in city schools and neighborhood community centers. Services and programs include Primary Heath Care, Family Planning, Health Education, a High School Diploma Equivalency Program, Vocational Programs, Job Placement, Computer Training, Life Skills, Prevention and Supportive Services, and Community Outreach. Threshold serves Rochester's highest risk young people aged 12 to 25. Each year, more than 5, 000 people are served at the downtown site and thousands more through the satellite operations.

The majority of program participants receive public assistance and many of them are referred to Threshold by Department of Social Service (DSS) and Criminal Justice. These diverse backgrounds in terms of age, gender, culture, life experience, and educational attainment prohibits a "one-size-fits all"* approach to learning. I had to adapt multiple learning styles and explore new options to better accommodate these specific groups of learners.

Goals and Expectations:

To get a second chance, individuals who did not complete high school may take their GED through their state education system to qualify for a high school equivalency certificate. Today, a high school diploma remains the primary ticket to many entry-level jobs.

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* http://www.answers.com/topic/one-size-fits-all - appealing or answering to a wide range of tastes or needs.

In many cases, it's also the prerequisite for advancement in employment, occupational training, and postsecondary education. The Department of Social Service and Criminal Justice Systems also encourage high school dropouts to obtain their GED diplomas as a means by which to obtain gainful employment or to pursue high education.

Mentor:

Professor Hart of the Math Department, Professor Niemi, RIT, [Mr. and Mrs. Greenlea, Threshold, Mrs. Karen Drum, Rochester School District (GED Instructor), Professor Christ Jackson, and Professor Richard Morales are being considered as mentors.

<u>Capstone Project Rationale:</u>

To design and create a tutorial that might eliminate the traditional teaching approach wherein the teacher serves as the dispenser of knowledge, using "talk and chalk," while the students sit, listen, and accept the instruction. This nontechnical approach to communication, historically, has been the only way that some schools have been able to provide education. Fundamental to this study is the belief that a technological approach, using 3D graphics and animation bundled, and stand alone software could be used to effectively enhance the learning experience.

Once designed, the tutorial could be provided to GED teachers and their students. The tutorial, which is designed for use with the Casiofx-260 solar calculator, and which features 3D graphic, movie clips, and interactive quiz, could then be used to enhance the learning experience of students preparing for their GED math test.

To design, for the purpose of this study, will mean to make a deliberate decision based on sound rationale about how something should be effectively designed. This involves planning, thinking, constructing, testing, and redesigning. It is the unifying of form with content within a set of constraints, and includes a sense of unity of form and purpose.

Methodology:

The project consists of the design and implementation of a software/hardware system using existing software to create highly interactive applications in which information flows both ways from the application to the user and from the user to the application to achieve this goal. For example, the resulting software is bundled, such as Microsoft Office, while others stand alone, e.g, Maya, Adobe Photoshop. Etc. Microsoft recently introduced the Expression Family of products. The new brand includes "Acrylic," a graphics creation program for bitmap and vector graphics; "Sparkle," a 2-D and 3-D animation tool; and "Quartz" for creating advanced Web sites. The program is "about Windows applications. Like Flash, Sparkle does create animations and an object can be exported as a WBA file for viewing in a Web browser.

Sparkle is being angled as an interface tool and is tightly integrated with Visual Studio, even utilizing the same build mechanism for executable files" says Wayne Smith, senior European product manager for the Expression family to solve this unique problem.

It will consist of:

<u>Research</u>**:**

I used Synopsis & References (of existing materials, books and manuals). I used the manual that came with the calculator, other material, and my prior work on Casio fx-260 calculator, math books, and GED instructor.

I converted the existing materials like the Casio fx-260 graphic into interactive 3D graphic, (interaction and animation) and animated geometrical shapes into animation movies using Flash, action script, Word, draw tool, Adobe Photoshop, Maya, Power Point, etc).

<u>Content</u>:

- scanned Casio fx-260 and converted it to interactive multimedia Casio fx-260
- For instructor I included a PowerPoint Show (possibilities) for stand up lecture.
- 3D Graphics (show richness of the medium) and use examples in the classroom.
- Animation (show action, movement and interactivities) to show graphics and motion
- Graphics (illustrate point) and interaction
- Audio (audio to add substance to the senses)
- Target Audience (dropout students preparing for the math component of the GED).

<u>Prototype</u>:

- Design (demo, including quiz, using calculator)
- Design & interface (interactive demo)
- 3D graphics (3D movie)
- Animation, graphic, audio-(animated 3D geometrical shapes)

Figure 11 shows the combination of software use in creating the 3D graphic animation. Figure 6 summarizes the process involved in the creation of the module and figure 7 shows the direction for the interface.

User testing and evaluation see tutorial at:

http://www.rit.edu/~wbo6788/Animation/Flash_animation/Movie/Filing_in.swf

Participants are invited into the computer lab, and they are asked to register their name, grade date and instruction on how to proceed (See Chart 1 and 2). They start with the timed quiz which is usually fast and requires alertness, and the second phase uses the same quiz but this time not timed, and they are allowed as much time as they like, to complete the quiz. The results are as seen in Figure 4 and 5.

Skills and personal resources

I will work with tutors from the Department of Information Technology, Graphic Design and Animation, and Multidisciplinary Professional Studies to complete this task. I will use my skills in instructional design, multimedia development, multimedia programming [action script], graphics, and animation to create animated modular tutorials. The skill that I built in the concentration **A,** (Learning and Technology, Interactive Courseware, Instructional Multimedia, and Performance Support), prepared me with skills I need in designing courseware, and instructional multimedia as seen in my Capstone Project.

The skill that I built in concentration **B,** (Interactive multimedia, Programming for interactive multimedia) will help me to select and evaluate the software and hardware relevant and necessary for designing and creating this project.

Concentration **C** (ST.3D interactive animation, animation and graphics for film, and lighting for film and video) will provide me with a useful design tool for creating and producing the tutorial. Current Themes in Information Technology helped me understand the nature of the Internet, where information technology is going. Context and Trends steered me in the direction where I would like to be.

The Capstone will combine my cross disciplinary studies as noted in the study plan and will help me to create the courseware. As noted above, most of the students at Threshold come from a variety of socio-economic backgrounds, most of them are high school dropouts, and multimedia materials can help instructors impart effective lessons plan to enhance the learning experience. 3D graphic and animation software bundled in software normally is supplied with the computers, something the study is recommending GED instructors to explore for authoring modularized curriculum for their lesson plan.

"Authoring" for the purpose of this study means to create highly interactive applications in which information flows both ways from the application to the user and from the user to the application. This I learned in concentrations **A, B** and **C,** as will be shown in the tutorial. This software is not directly designed to help those who have dropped out of school. Further review and evaluation will be required to determine its effectiveness with GED students. Concentration **A, B** and **C** helped me to identify and evaluate the potential of software like Adobe Photoshop, Microsoft PowerPoint, Maya, Director, Flash, FrontPage, and Dreamweaver. While they may have a steep learning curve, these can be learned.

As the information technology [IT] professional and technology advocates, it is our responsibility to analyze, evaluate, and recommend any new trend or development in Information Technology that can enhance classroom experience. Based on my multidisciplinary background and training as a curriculum designer/learning support professional and multimedia professional, I will use Maya, Photoshop, Flash, Word Draw tool to create the interactive tutorial. (Figure 11 p 44).

I am convinced that 3 dimensional graphic and animation software provides many unique features and can be used as a tool to enhance any learning experience, especially one that involves geometrical forms, figures, or models. In math, for example geometry is the study of figures in a space of a given number of dimensions and of a given type. The most common types of geometry are plane geometry (dealing with object like lines, circles, triangles, and polygons) and solid geometry (dealing with objects like the lines, spheres, and polyhedrons) (http://mathworld.wolfram.com/Geometry.html). This could be animated using Gif software or Maya. Graphics software packages such as Paint Shop Pro allow images to be converted into gif format. It is also possible to produce animated Gif images. These consist of a set of individual Gifs which are overlaid in quick succession like "frames" in a film.
(http://ourworld.compuserve.com/homepages/davidbowers/Getty98/main.htm)

STEPS:

I will show how software, such as Adobe Photoshop, Microsoft Word, PowerPoint, Maya, Director, and Flash can help shape and enrich the teaching and learning experience and then narrow my approach in designing a short tutorial module (see Figure

10 and 11) to show how software like Maya and Flash (with its features such as polygon, sphere cylinder, cone, circle volume rectangular, cube, and cylinder and wire frame) can be rendered into solids to illustrate and to provide a rich multimedia geometry lesson using an interactive and participatory approach created in Flash software (see Figure 11). Participatory approaches will encourage students to:

- Explore and analyze the software features
- Plan for themselves what action to take to learn more about the software with the guidance of the instructor
- Monitor and evaluate the results themselves.

This approach can encourage the instructor and student alike to explore the shape of spheres, cylinders, and cones interactively in real time using all the software attributes and making math fun to learn. I will also provide a directory of resources wherein the instructor and student can locate a variety of tutorials available to improve their skills (See page p 34-36).

To find out whether my approach to education would work well in practice, I used Threshold Center for Alternative Youth Development Students, I designed an interactive module for [Figure 7]; geometrical figures [Figure 4]; geometrical quiz and evaluation for them to try out.

In testing the module, two interactive quizzes were randomly administered to 15 students. One quiz was designed with a timer, and one without. Data were collected by means of observations, informal discussions and informal interviews. Fifteen participants were invited into a computer lab, and they were asked to register their name, grade, date, and instruction on how to proceed with the quiz (See Chart 1 and 2). They start with the timed

quiz which is usually fast and requires alertness, and the second phase uses the same quiz but this time not timed, and they are allowed as much time as they like to complete the quiz. The results are as seen in (Figure 3 and 4).

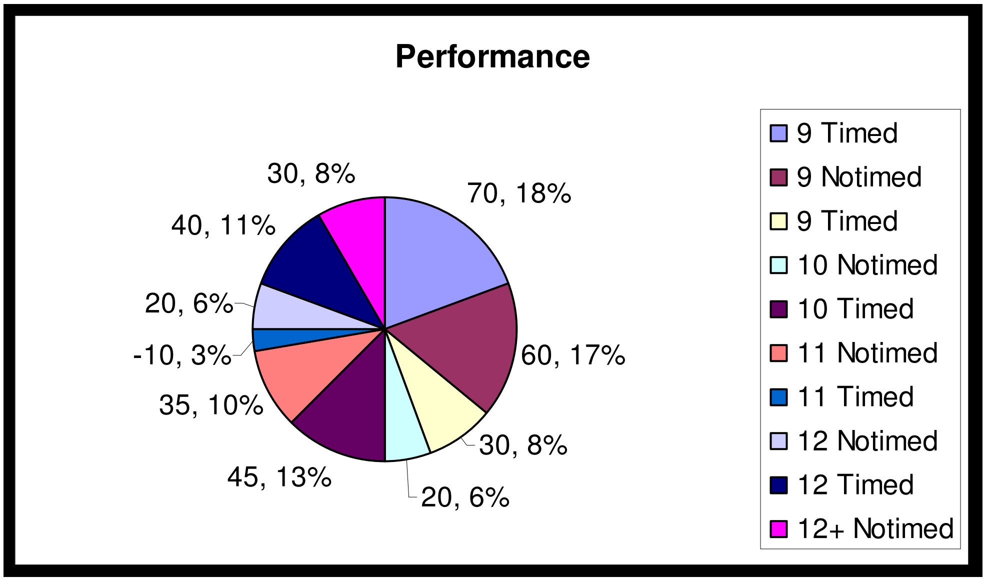


Figure 3 Showing the performance with and without timed quiz. And grade level ranging from 9 to 12 and over
Note: the 12+ group is instructors, and college students tested randomly

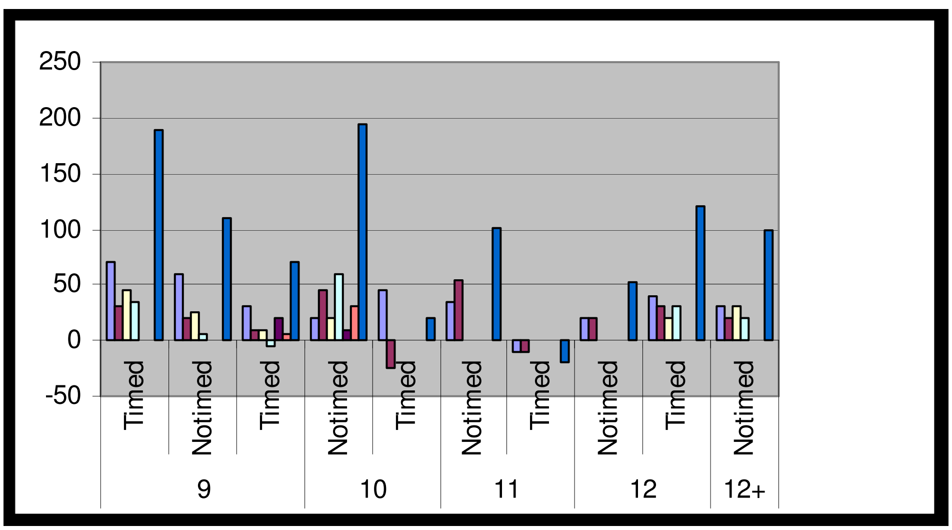


Figure 4 Figure showing the scores are better with time for those in grade 9 while those in grade 1o seem to do well without timer Note: the 12+ group is instructors, and college students tested randomly

Analysis and Conclusion

According to this survey the students who took the quiz with the benefit of a timer perform on average, (18%) better than that taken without (17%). Those results indicate that the use of interactive quizzes does improve performance. Those who participated in the survey (interactive quiz) seems to get more motivated to learn and kept coming for more.

The study also found that in practice 3D graphics tended to lose quality when high end software like Maya was compressed, and exported to another type of software for further using Microsoft Word. By comparison, drawing tools seemed to do well in any form. It is also inexpensive and could be manipulated simply by using the Microsoft Movie Maker, (Quicktime) and Media Player powerpoint or as part of the word document itself. Microsoft software therefore, would seem to have been the better choice.

OBSERVATION:

Today, most of the software comes with bundled or separate as “clip art,” and are also available for free from the interne. These can be used freely as a resource, as well as a tool, for creating a rich learning experience without leaving the classroom.

Unfortunately most of the web-based curriculum materials are available only by subscription and, while those are beginning to impact the classroom, they are not available to those who have dropped out of school. Teachers can use Microsoft Office

Work and other standalone software, such as like Adobe Photoshop, Media Producer, Microsoft Expression, and Powerpoint, to create interactive multimedia at no cost at all. Teachers would need to have more than a rudimentary understanding of how to operate a computer. A working knowledge of standard input and output devices (for example, a mouse, disk drive, printer, speaker), is necessary. They would also need to know how to perform basic system operations such as program installation, deletion, and backing up files. They would additionally, need to know how to use drawing and 3D graphic tools and animation. Such personal productivity skills could be used as a means to foster the teacher's skills in modular curriculum design. This familiarity, in turn, would encourage participants to learn more about the potential of the bundled software that is packaged with the computer. Those who engage in personal productivity programs by using word processors, spreadsheets, databases and graphics programs would become increasingly familiar with computer operations.

SUGGESTION:

Howson and Kahane (1986) suggest two distinct ways the teacher can choose to use computers in the mathematics classroom. The first is to use the computer as an "aid for the teacher." The second is to "allow and expect the students to interact with the computer" (p. 27). Some of the ways in which students can interact with computers include using computers to check student answers, and to provide drill and practice routines. (http://www.aace.org/dl/files/JCMST/JCMST162269.pdf). With abundant software and digital equipment students and teachers can create a 3D graphic animation.

To begin any lesson plan, use the right media for your lesson:

Make the lesson modular not in chunk and make it simple. For example:

1. If you're going to grab the learner's attention with 3D graphics and animation, be sure to make the content relevant.

2. Clip art from Microsoft Office CD or website, and other 3D graphics can add a lot to enhance the learning experience, but adding a random graphic just to have a graphic does not add power to your lesson plan -- and may detract from it. The same can be said for using color. But a well-selected or drawn image, figure, diagram, or a thoughtfully selected color can enhance the learning experience in math.

3. It must attract and hold the student's attention.

4. Instead of selecting a 3Dgraphic just to attract attention, use it to focus attention on the lesson plan.

5. Microsoft Office System products provide 140,000 clip arts and drawing tool. Any clip art can be customized to suit any needs.

To help you determine the right type of 3D graphic and even the best program to use to create the graphic, consider the following three questions:

(a) Who is your intended audience?

Consider their age and background.

(b) How will they use the 3D graphic?

To benefit from interactive computer based tutorial

(c) What type of content is the 3D graphic intended to emphasize?

If you need to draw attention to impressive numeric data, an Excel chart is likely the way to go.

- If you want to draw attention to shapes and geometrical figures, Visio, Microsoft draw tool, Microsoft Expression (Code name Acrylic Graphic Designer) is the tool

- If the graphic is demonstrating points about geometry, or other factual information that's not data-driven, consider a Microsoft Office PowerPoint 2003 slide or a Microsoft Office Visio 2003 diagram and Microsoft Expression (Code name Acrylic Graphic Designer).

- If you want an effective image to draw attention to a point rather than to directly illustrate the point, a well-chosen piece of clip art or 3D graphic might be just what you need.

A good 3D graphic will get attention whether it's good or bad, but the effect of a good graphic can differ dramatically from that of a bad one. Be sure that the 3D graphics represent the content of the lesson.

Choose your graphics wisely, and then take advantage of the tools available in Microsoft Office System products. Microsoft Expression brings together the best of vector- and pixel-based capabilities (Code name Acrylic Graphic Designer) and other stand alone software like Maya, Flash to create 3D graphic and animation more quickly and expertly. Microsoft recently introduced the Expression Family of products. The new brand includes "Acrylic," a graphics creation program for bitmap and vector graphics; "Sparkle," a 2-D and 3-D animation tool; and "Quartz" for creating advanced Web sites. The program is "about Windows applications. Like Flash, Sparkle does create animations and an object can be exported as a WBA file for viewing in a Web browser. Sparkle is being angled as an interface tool and is tightly integrated with Visual Studio, even utilizing the same build mechanism for executable files" says Wayne Smith, senior European product manager for the Expression family.

See the useful link outlined below.

http://www.microsoft.com/products/expression/en/demos.aspx?v=gd_effects

http://www.microsoft.com/products/expression/en/demos.aspx?v=expression_vision

Authoring Software:

The following software applications can be used to write HTML code: Microsoft

Notepad (available **Free** as a standard application on all versions of Windows)

- Netscape Composer

http://channels.netscape.com/ns/browsers/default.jsp
(available as a **free** standard feature of all versions of Netscape Communicator)

- http://channels.netscape.com/ns/browsers/default.jsp
  (available as a **Free** standard feature of all versions of Netscape Communicator)
- Microsoft Word-draw tool
  (also available on all versions of Microsoft Office)
- Microsoft FrontPage
- Microsoft Expression
- Window Movie Maker

- Adobe GoLive
- Macromedia DreamWeaver
- Allaire HomeSite

http://www.winsupersite.com/reviews/windowsxp_plus_dme_2.asp

For low-cost XP add-on offering new digital photo, music, and movie applications. Plus! DME, I felt, was destined for greatness, especially its Plus! Photo Story tool, which lets consumers easily create animated movies out of digital photo collections.

Creating a Web Site in HTML:

Using "Acrylic," a graphics creation program for bitmap and vector graphics; "Sparkle," a 2-D and 3-D animation tool; and "Quartz" for creating advanced Web sites, from Microsoft. For tutorial try this website:

http://archive.ncsa.uiuc.edu/General/Internet/WWW/HTMLPrimer.html

At this site, one is able to access information concerning:

- basic HTML commands
- modifying the size and appearance of text
- creating lists, tables, and frames
- linking to other sites
- adding images to a Web page

Graphics:
http://webmonkey.wired.com/webmonkey/design/graphics/
At this site one can learn how to create and modify digital graphics, including:

- Adobe Photoshop and other common graphics applications
- the best colors for the Web (Web-safe palette)
- basic techniques to create and edit graphics
- where to go for icons and buttons (free libraries of Web clip art)

A collection of articles show how to get the most out of Photoshop and the devices that work in conjunction with it. Topics include: Buyer's Guides, Monitor Calibration, Graphics File Formats, Compression, Scanning Issues, White Balancing and much more.

Advance skills may be accessed through:

http://www.alias.com/eng/index_flash.shtml

Maya Personal learning Edition

Maya Personal Learning Edition is a special version of Maya software, which provides free access to Maya for non-commercial use. It will give 3D graphics and animation students, industry professionals, and those interested in breaking into the world of computer graphics (CG) an opportunity to explore all aspects of the award winning Maya Complete software in a non-commercial capacity. Available for **Maya 5,6 or 7** on the Windows 2000/XP Professional and Mac OS X operating systems.

As well as through which is a source for three dimension imagery, tutorial, and texture:

> http://webreference.com/3d/
> Source of 3 D tutorials
> http://www.adobe.com/products/photoshop/main.html
> Industry standard image manipulation software.
> http://www.alias.com/eng/products-services/maya/index.shtml
> 3D animation software.
> http://www.3dcafe.com/asp/default.asp

CONCLUSION:

The current study indicates that students with diverse socio-economic and educational backgrounds perform better using 3Dgraphics and animation and are more inclined to learn via the use of interactive visual features. They feel that the computer is challenging them and that they must win before they quit. The timer for example tends to make them more determined to finish the quiz, and do it again and again.

The overall approach seemed to enhance their perception in the various concepts introduced in the program. The challenge involved with taking a timed quiz enhanced their concentration and, in effect, helped them to pick the correct response. The combination of 3D graphics experience, the participatory approach, animation, interactivity, along with the self determination of the respondent, seemed to enhance the student’s ability to learn.

The current study also indicates that “at-risk” youth perform better using 3Dgraphic and animation and are more motivated to learn via the use of interactive 3D visual features. (They seem to enjoy competing with the computer. The timer tends to make them more determined to finish the quiz and challenges them to try them again). (http://www.rit.edu/~wbo6788/Animation/Flash_animation/Movie/Filing_in.swf) shows that the student is motivated by using 3D Graphics and animation and they are challenged by the interactive features of the visual product. They also felt that the computer was challenging them and that they must win before they quit. The timer tends to makes them more determined to finish the quiz and do it again and again. In the untimed quiz they seem to take their time in answering the questions and, in turn make the wrong selection.

However, the overall approach seems to enhance their perception in the various concepts introduced in the program. For example, the ideas of the timed quiz help them to concentrate and pick the right answer under pressure. Bringing three dimensional experiences into a classroom, using graphics software, participatory approach, interactivities, and self - determination from the demo or tutorial seem to enhance their ability to learn.

Despite the fact that "Students who have certain kinds of conditions such as living with one parent, being a member of a minority group, have limited English proficiency, and so on, are as at risk because, statistically, they are also among the lowest achievement groups or drop out of school” from my study they, seem to have benefited from this study

as presented at Threshold Center for Alternative Youth Development.

http://www.ncrel.org/sdrs/areas/rpl_esys/equity.htm

The traditional teaching approaches where the teacher as the dispenser of knowledge using "talk and chalk," while the students sit, listen, and accept, still exist. Books, with pictures or drawings, still serve as the primary visual aid in many classrooms. This non technical approach to communication historically has been the only way some schools could afford to enhance the student learning experience, and this needs to change.

Further research needs to be done to determine how to use 3D graphic in mathematics education. There is also a need to investigate student and school dropout views of the use of 3Dgraphic and animation software in mathematics and mathematics education in a modular form, since school dropout attitudes toward technology and mathematics varies with socio-economic background and grade levels.

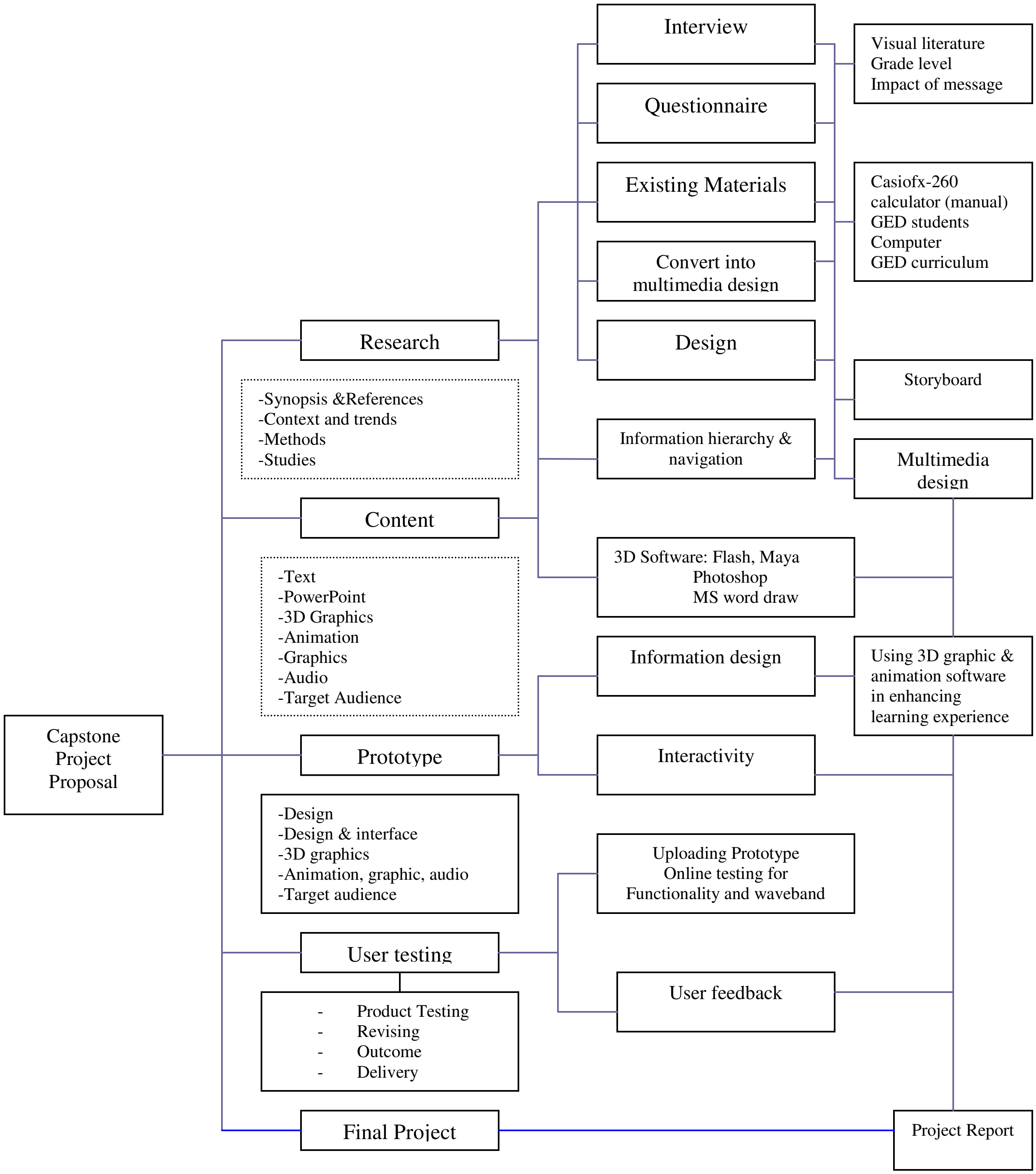


Figure 5 Design flow chart

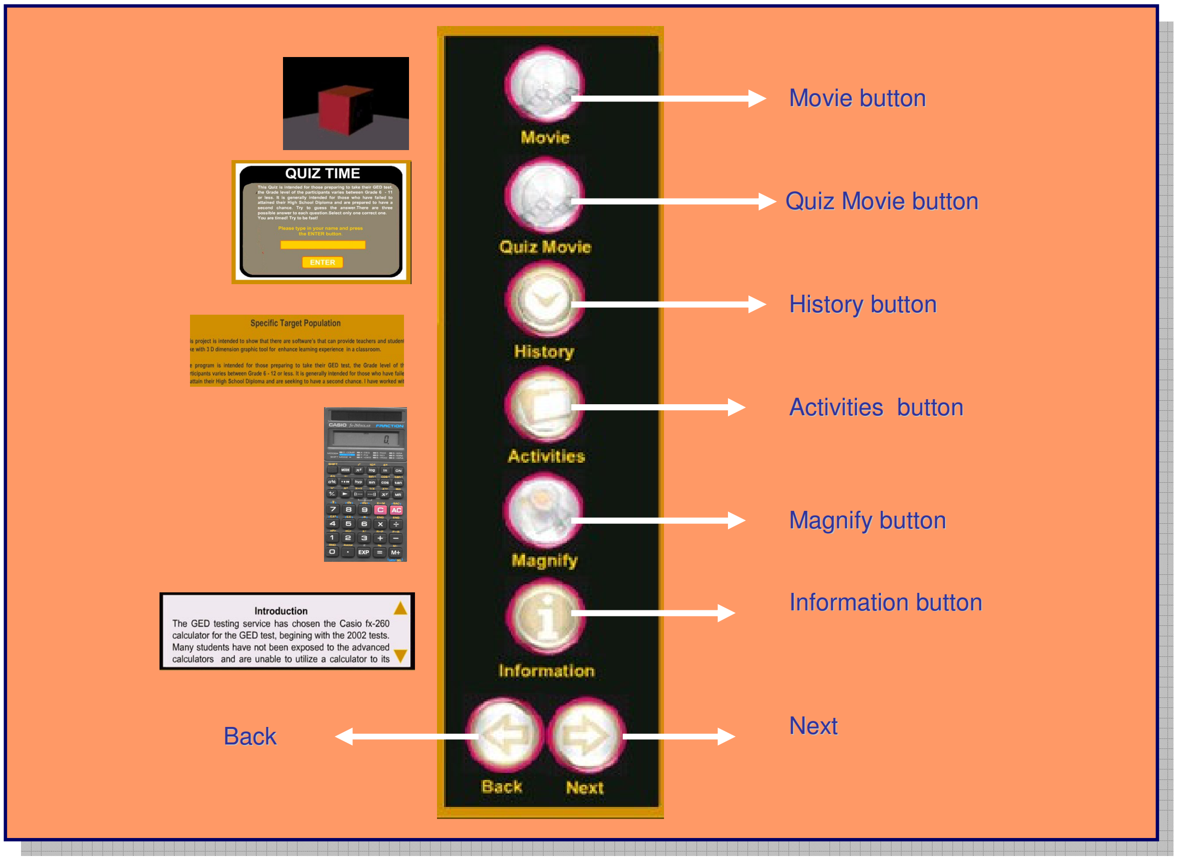


Figure 6 Screenshot of interactive buttons

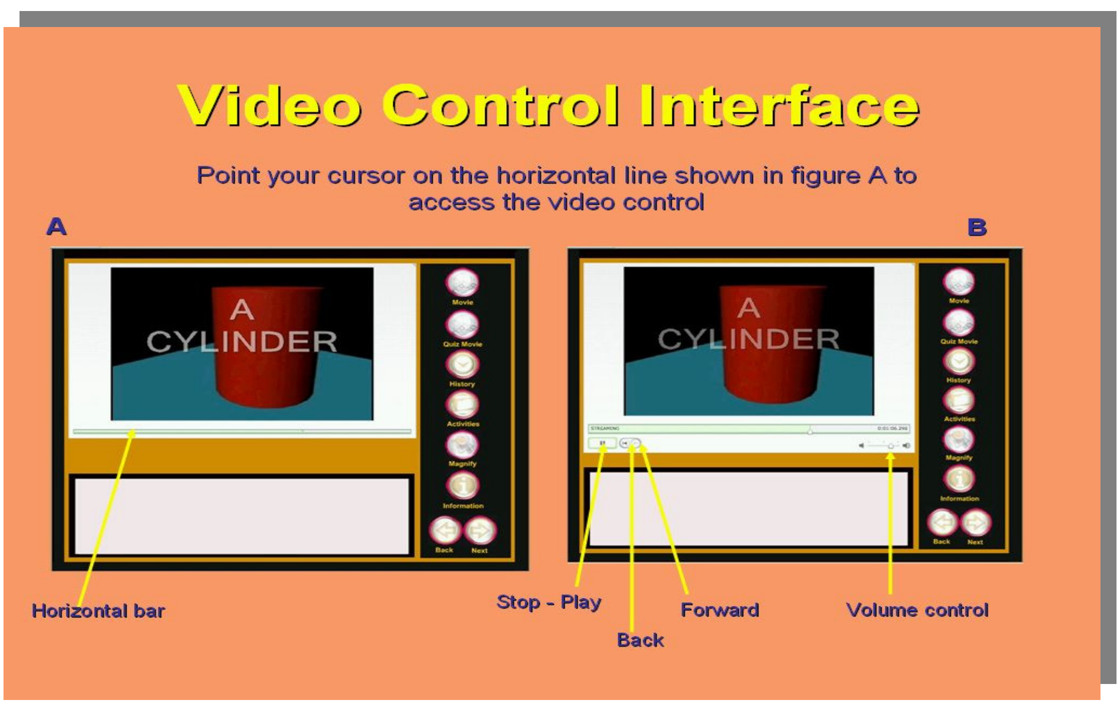


Figure 7 screenshot of video control Interface

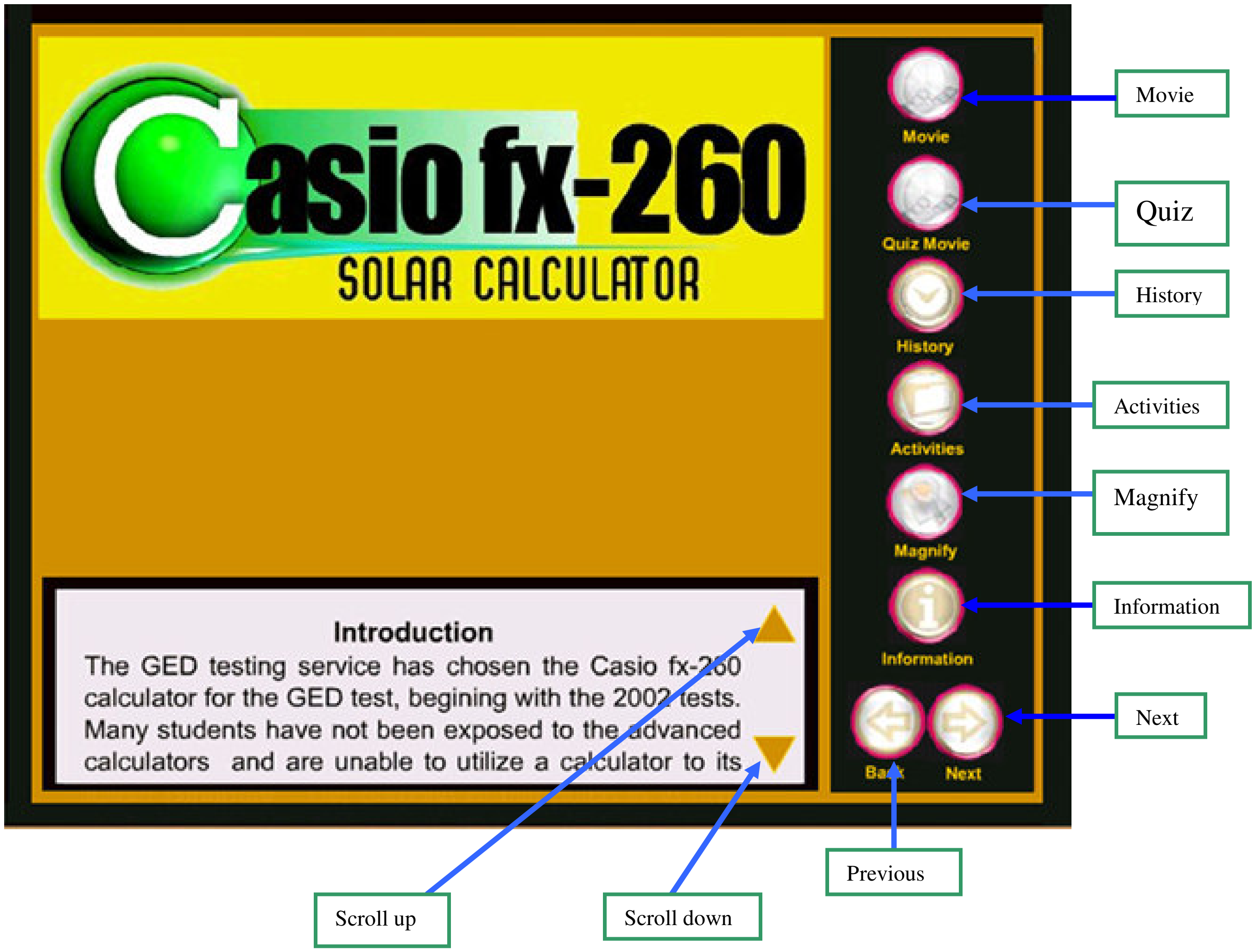


Figure 8. Screenshot and Guide to User Interface

USING CASIO Fx-260 SOLAR CALCULATOR

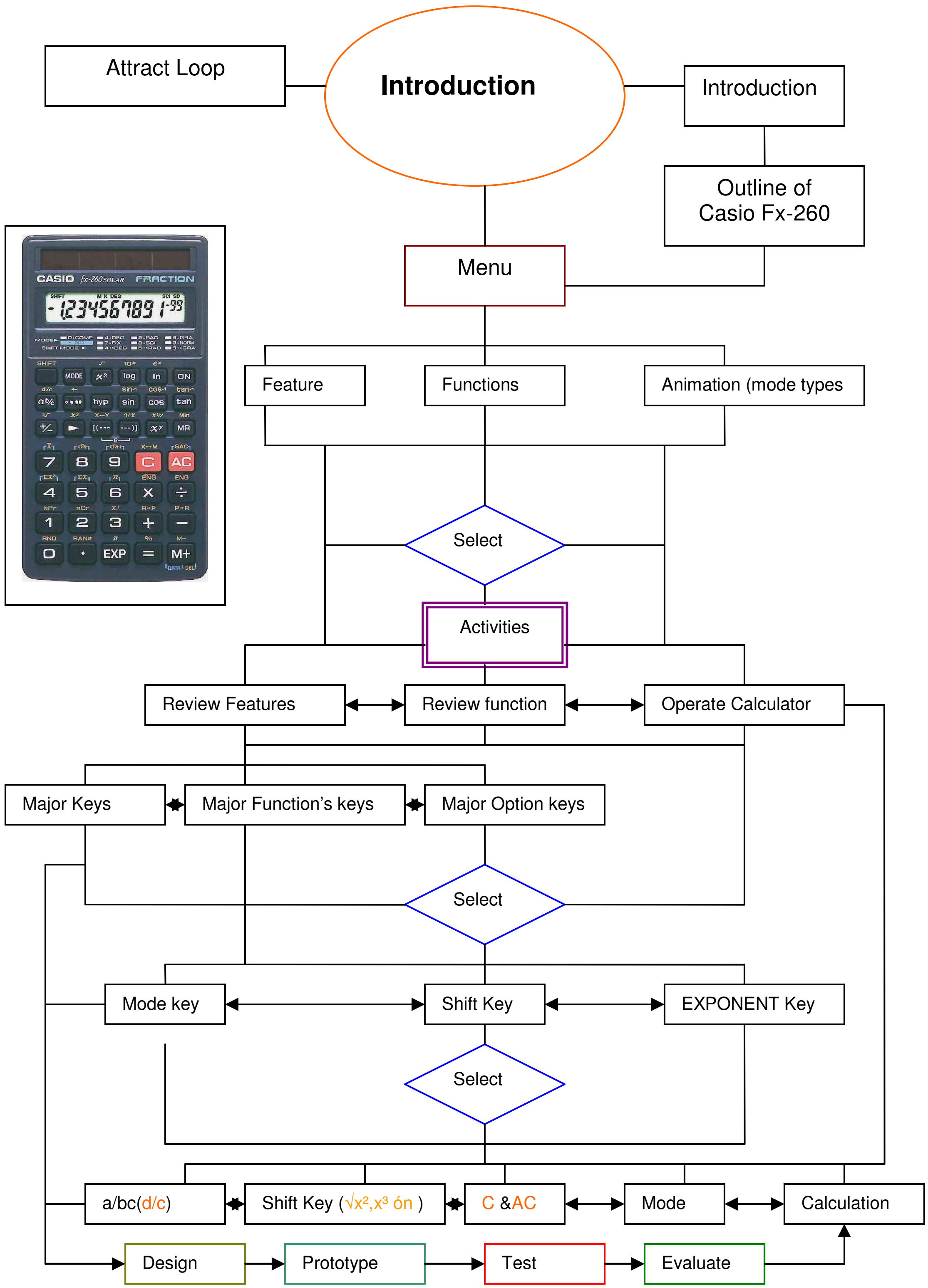


Figure 9. Design for using 3D Casio Fx260 Calculator & Interface flow Chart for the module, for figure 2

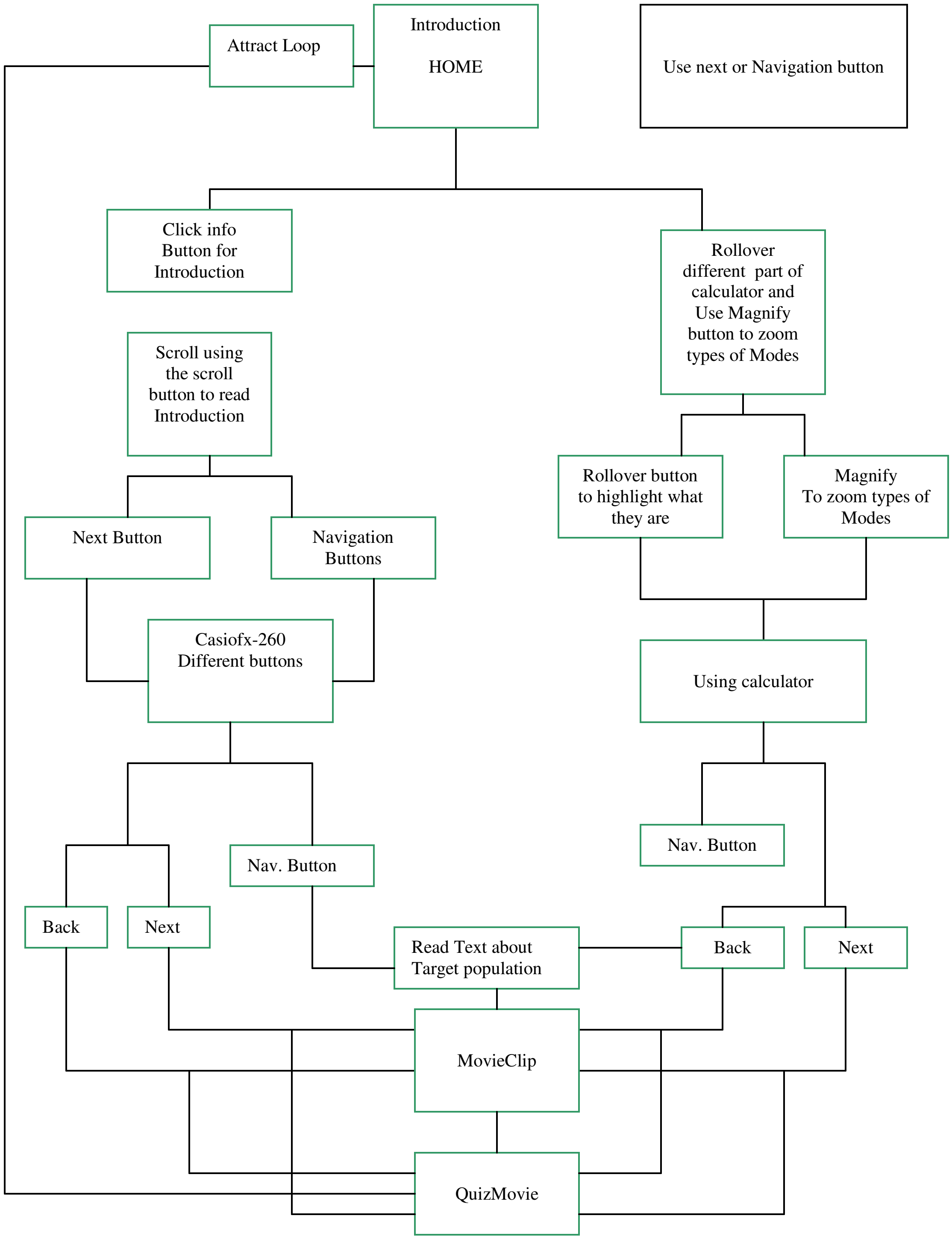


Figure 10. Interface and navigation design. Also see figure 3 above and figure 9 below for actual user interface screenshot

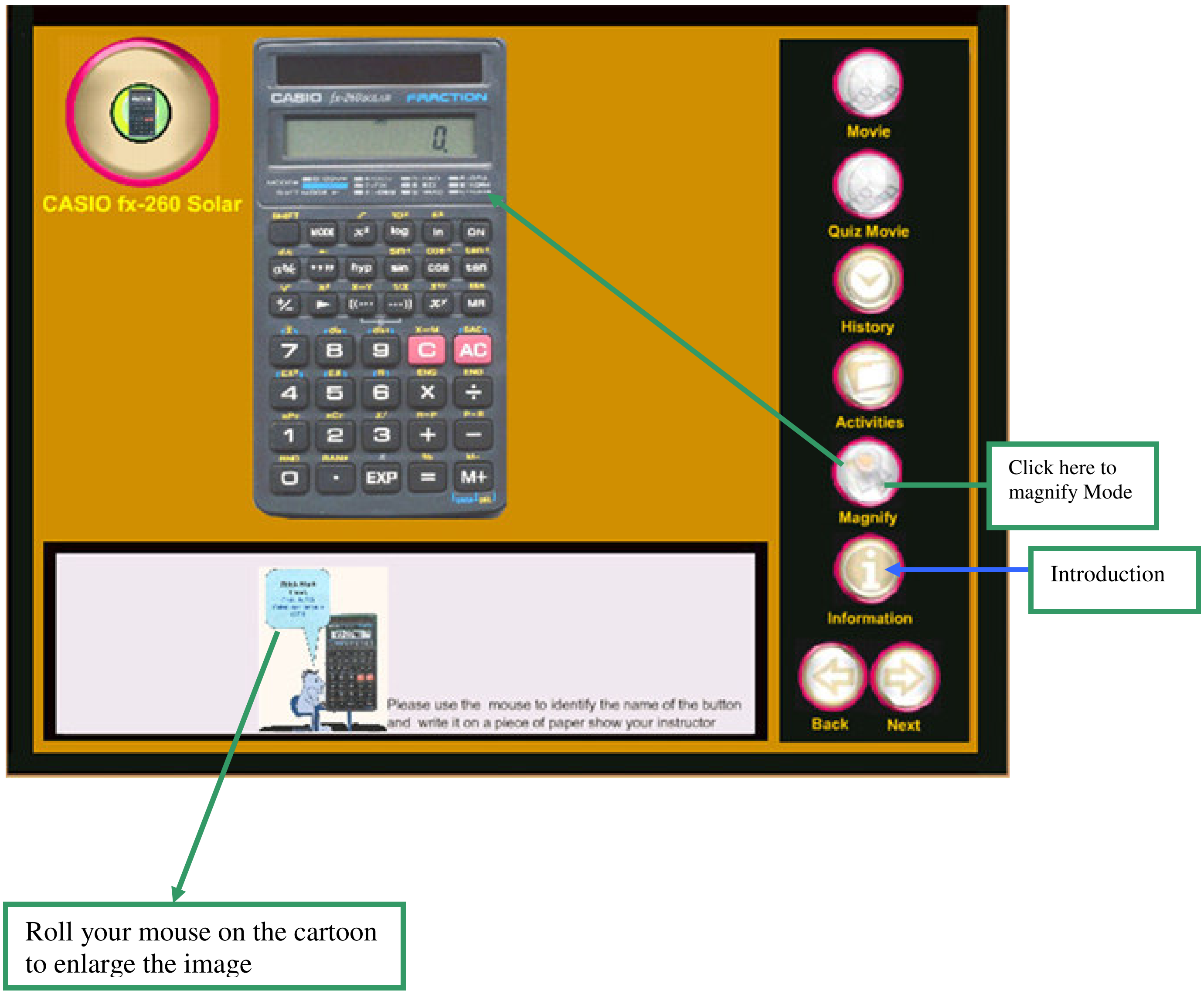


Figure 11. Screenshot and guide to user interface

Figure 12. Flow chart of the module objective

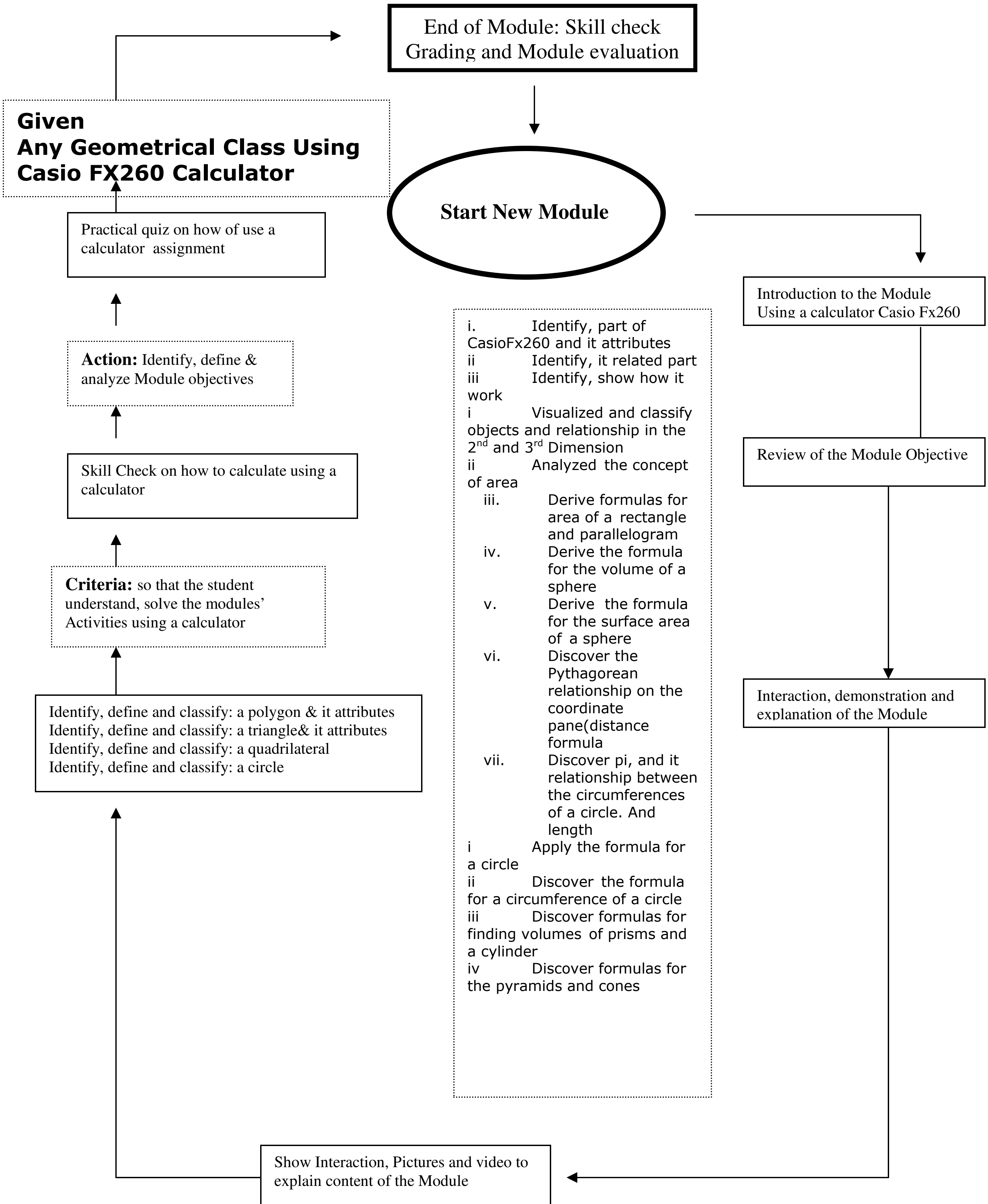
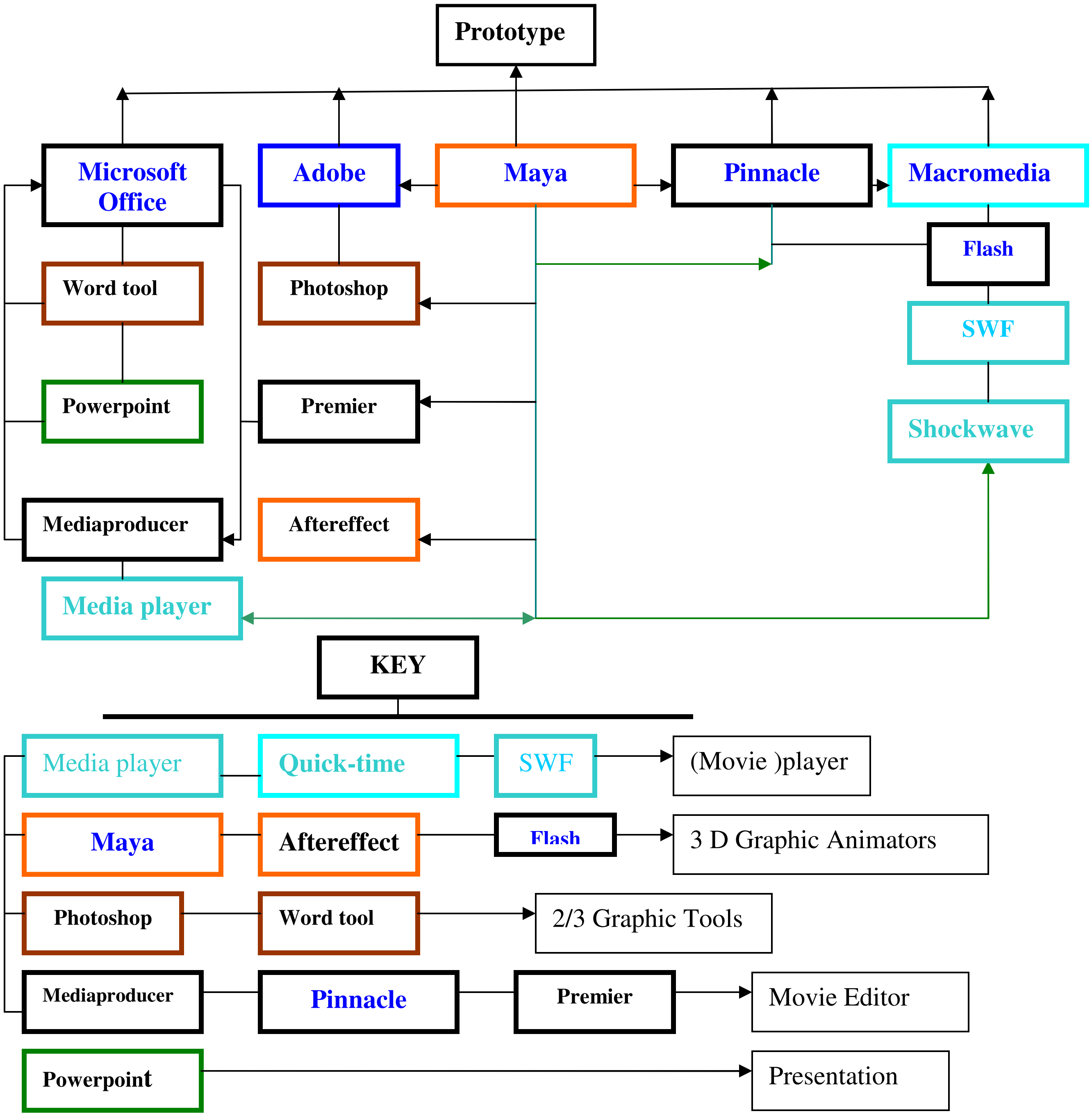


Figure 13 show how the 3D Graphic and Animation Software is Used in the Production of this Prototype



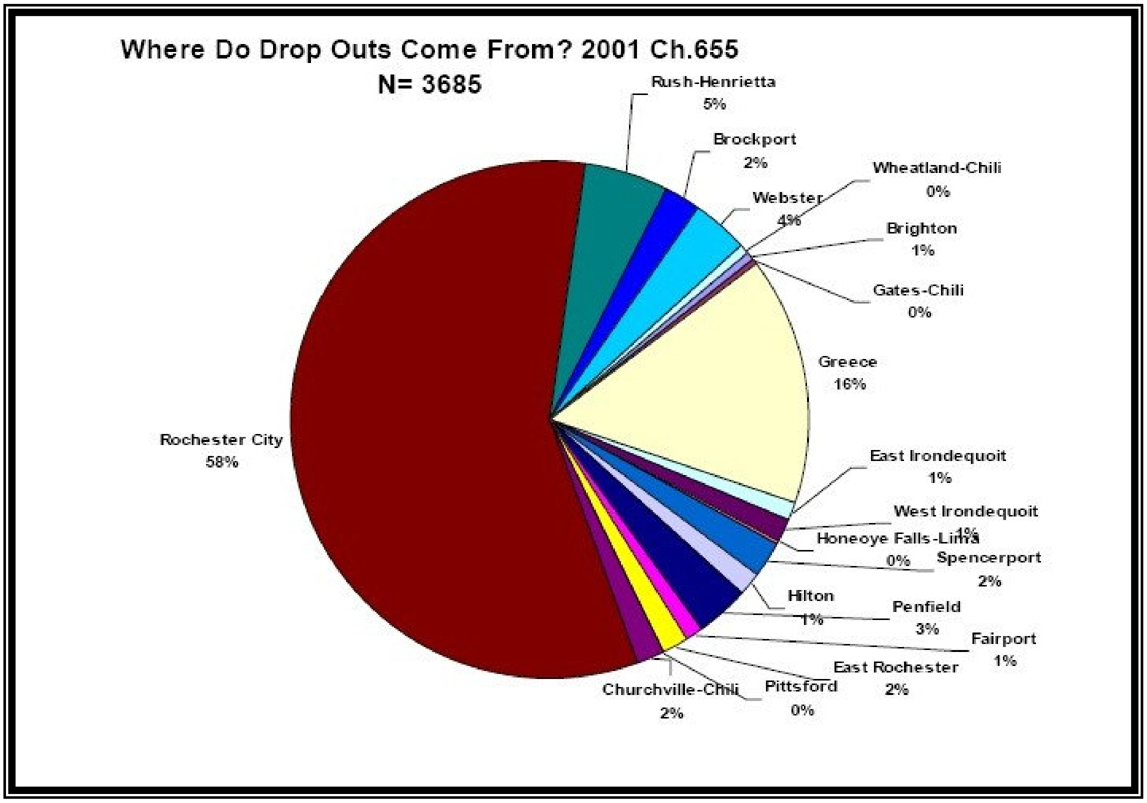


Figure 14. City of Rochester Has the largest drop out.
(Adapted from http://www.rit.edu/~jmkgcj/research/OtherStudies/School.pdf)

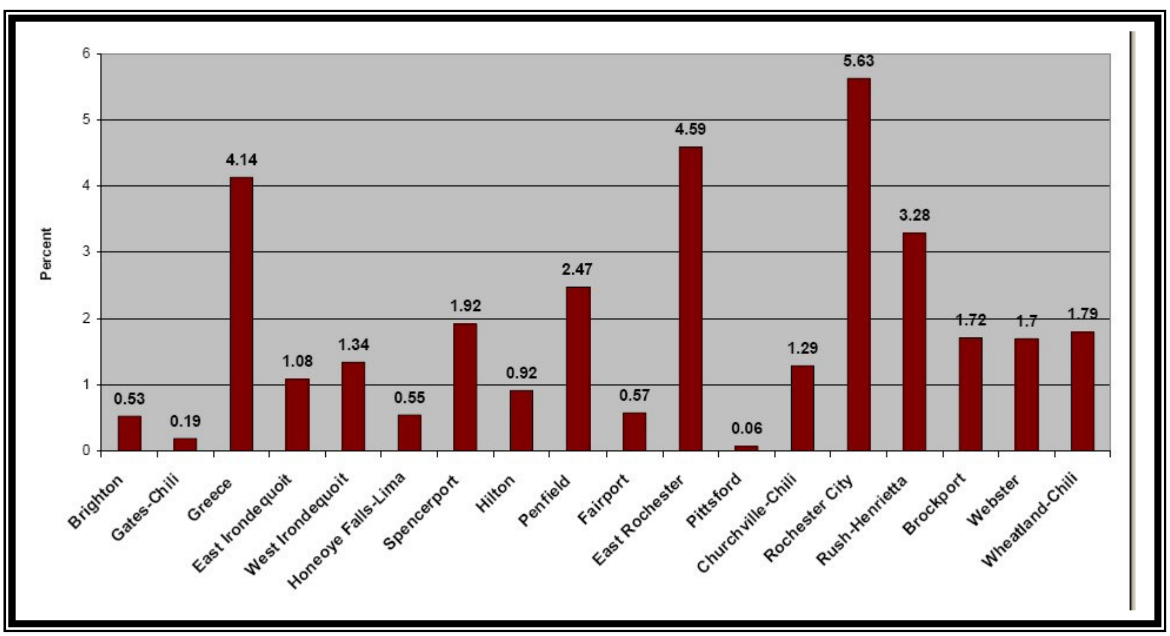


Figure 15. Dropout Rate in Monroe County
(Adapted from http://www.rit.edu/~jmkgcj/research/OtherStudies/School.pdf)

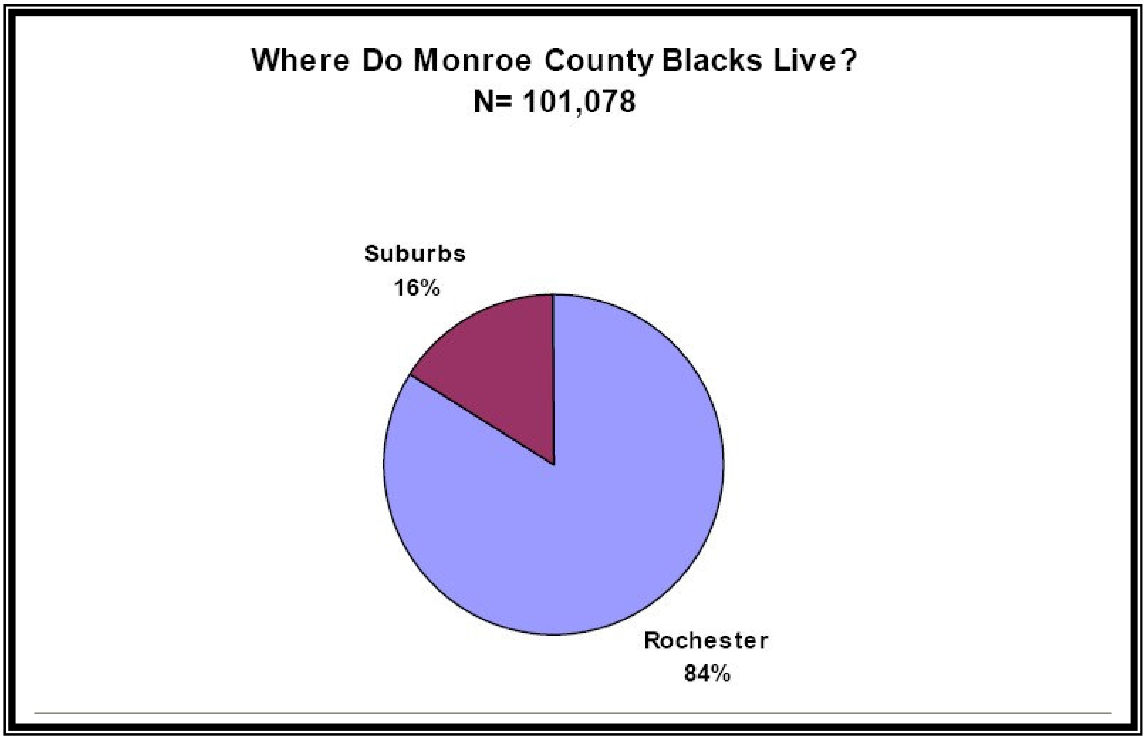


Figure 16 Number of black in Rochester
(Adapted from http://www.rit.edu/~jmkgcj/research/OtherStudies/School.pdf)

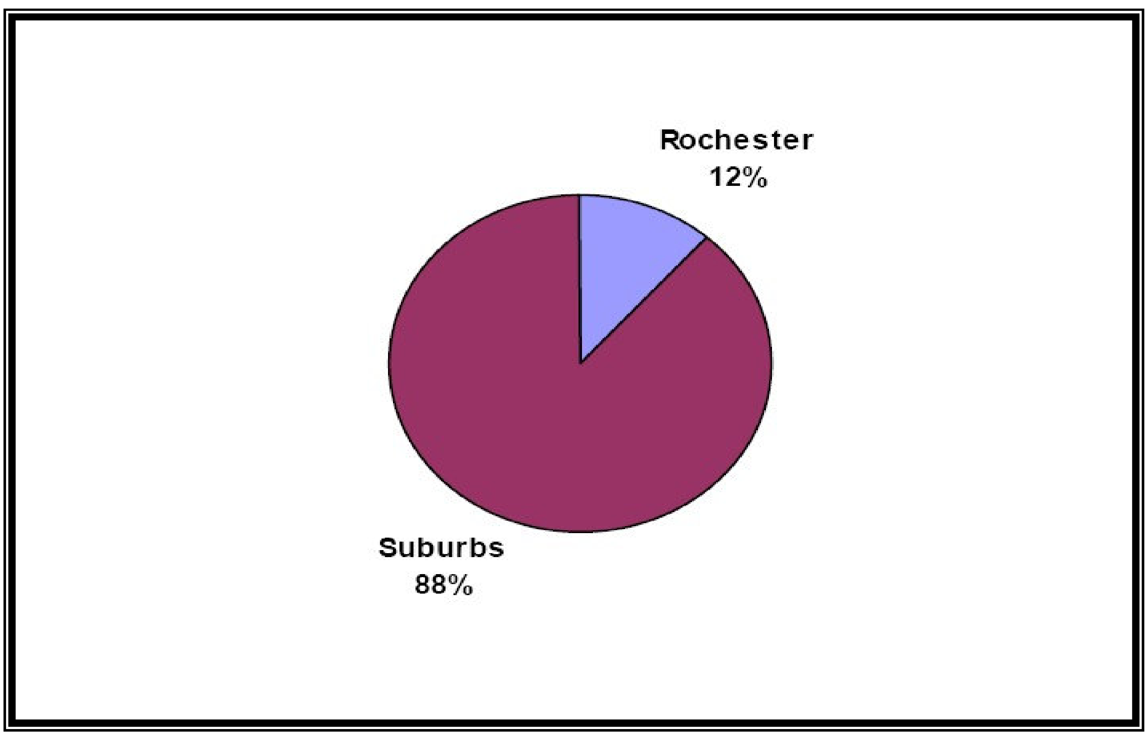


Figure 17. Where did yr.2000 High School come from in Monroe County? (Adapted from http://www.rit.edu/~jmkgcj/research/OtherStudies/School.pdf)

For the tutorial point your browser to the following:

1. http://www.rit.edu/~wbo6788/Animation/Flash_animation/Thesis_project/RolloverTestbcdefg_3b.swf

For Type and name of Shapes: Hold control button and Click on the URL

2. http://www.rit.edu/~wbo6788/Animation/Flash_animation/Movie/Filing_in.swf

For Geometrical Movie: hold control button and Click on the URL

3. http://www.rit.edu/~wbo6788/Animation/Flash_animation/Movie/Geom-4.swf

For Geometrical figures and shapes: Hold control button and Click on the URL

4. http://www.rit.edu/~wbo6788/Animation/Flash_animation/Geometrical_figures.swf

    a. Cylinder. Hold control button and click on the URL

    http://www.rit.edu/~wbo6788/Animation/Flash_animation/JPEGS/ACylinder.jpg

    b. Polygon. Hold control button and Click on the URL

    http://www.rit.edu/~wbo6788/Animation/Flash_animation/JPEGS/APolygon.jpg

    c. Sphere. Hold control button and Click on the URL

    http://www.rit.edu/~wbo6788/Animation/Flash_animation/JPEGS/Ball.jpg

    d. Cylinder. Hold control button and Click on the URL

`   http://www.rit.edu/~wbo6788/Animation/Flash_animation/JPEGS/Circle3.jpg

    e. Cube. Hold control button and Click on the URL

    http://www.rit.edu/~wbo6788/Animation/Flash_animation/JPEGS/Cube2.jpg

    f. Rectangle. Hold control button and Click on the URL

    http://www.rit.edu/~wbo6788/Animation/Flash_animation/JPEGS/Rectangle.jpg

    g. Rectangle. Hold control button and Click on the URL

    Quicktime: Hold control button and Click on the URL

    http://www.rit.edu/~wbo6788/Animation/Final_project/Rectangle/Solid_rockc.avi

    Media Movie: Hold control button and Click on the URL

    http://www.rit.edu/~wbo6788/Animation/Final_project/Rectangle/

Quiz. Hold control button and Click on the URL

5. http://www.rit.edu/~wbo6788/Animation/Flash_animation/Thesis_project/Quiz.swf

Evaluation. Hold control button and Click on the URL

6. http://www.rit.edu/~wbo6788/Animation/Flash_animation/barChart.swf

Chart: 1

Students who took the test:

Number	Subject Geometry	Grade	Timed	No Timer	Remark
1		9	70-100	60-100	
2		9	30-100	20-100	
3		10	30-100	10-100	
4		10	10-100	45-100	
5		9	45-100	25-100	
6		10	10-100	20-100	
7		9	35-100	5-100	
8		10	-5-100	55-100	
9		12	-10-100	20-100	
10		11	45-100	35-100	
11		11	-25-100	55-100	
12		12	-10-100	20-100	
13		10	-5-100	60-100	
14		10	20-100	10-100	
15		10	5-100	30-100	
Others: Instructor, Graduate, Student, and College Students					
15 Instructor			40-100	20-100	
16 Graduate			30-100	20-100	
17 College			20-100	30-100	
18 Other			30-100	20-100	

Chart 2.

Observation: GED candidates and random group:

Random Groups:

2 GED instructor got between. 40% in quiz with timer
20% in quiz with no timer

2 Graduate got between. 30% in quiz with timer
20% in quiz with no timer

2 Undergraduate got between. 20% in quiz with timer
30% in quiz with no timer

2 Other. 30% in quiz with timer
30% in quiz with no timer

Controlled Group:

1 GED Student 70% in quiz with timer

1 GED student 60% in quiz with no timer

2 GED student	55% in quiz with no timer
2 GED student	45% in quiz with timer
1 GED student	45% in quiz with no timer
1 GED student	40% in quiz with timer
0 GED student	40% in quiz with no timer
1 GED student	35% in quiz with timer
1 GED student	35% in quiz with no timer
2 GED student	30% in quiz with timer
1 GED student	30% in quiz with no timer
0 GED student	25% in quiz with timer
1 GED student	25% in quiz with no timer
1 GED student	20% in quiz with timer
4 GED student	20% in quiz with no timer
2 GED student	10% in quiz with timer
2 GED student	10% in quiz with no timer
1 GED student	5 % in quiz with timer
1 GED student	5% in quiz with no timer
1 GED student	-25 % in quiz with timer
0 GED student	-25 % in quiz with no timer
1 GED student	-10 % in quiz with timer
0 GED student	-10 % in quiz with no timer
2 GED student	-5 % in quiz with timer
0 GED student	-5 % in quiz with no timer

Relevant Selected Reading

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3. U.S. Congress, Office of Technology Assessment. (1995). *Teachers and technology: Making the connection*. (OTA-HER-616). Washington, DC: Author.
Valdez, G., McNab, M., & Foertsch, M., et al. (1999). *Computer-based technology and learning: Evolving uses and expectations.* Oak Brook, IL: North Central Regional Laboratory.
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6. J. Michael Spector, *Trends and Issues in Educational Technology: How Far We Have Not Come* http://suedweb.syr.edu/faculty/spector/publications/trends-tech-educ-eric.pdf

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http://www.cesc.ca/pceradocs/2001/papers/01Laferriere_etal_e.pdf

11. Patricia Deubel, Ph.D. *An Investigation of Behaviorist and Cognitive Approaches to Instructional Multimedia Design*, Retrieved December 24, 2005 from
http://www.ct4me.net/multimedia_design.htm

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APPENDIX

Appendix 1.Read Me First

Appendix 2. Instructor Guide

Appendix 3. Student Guide

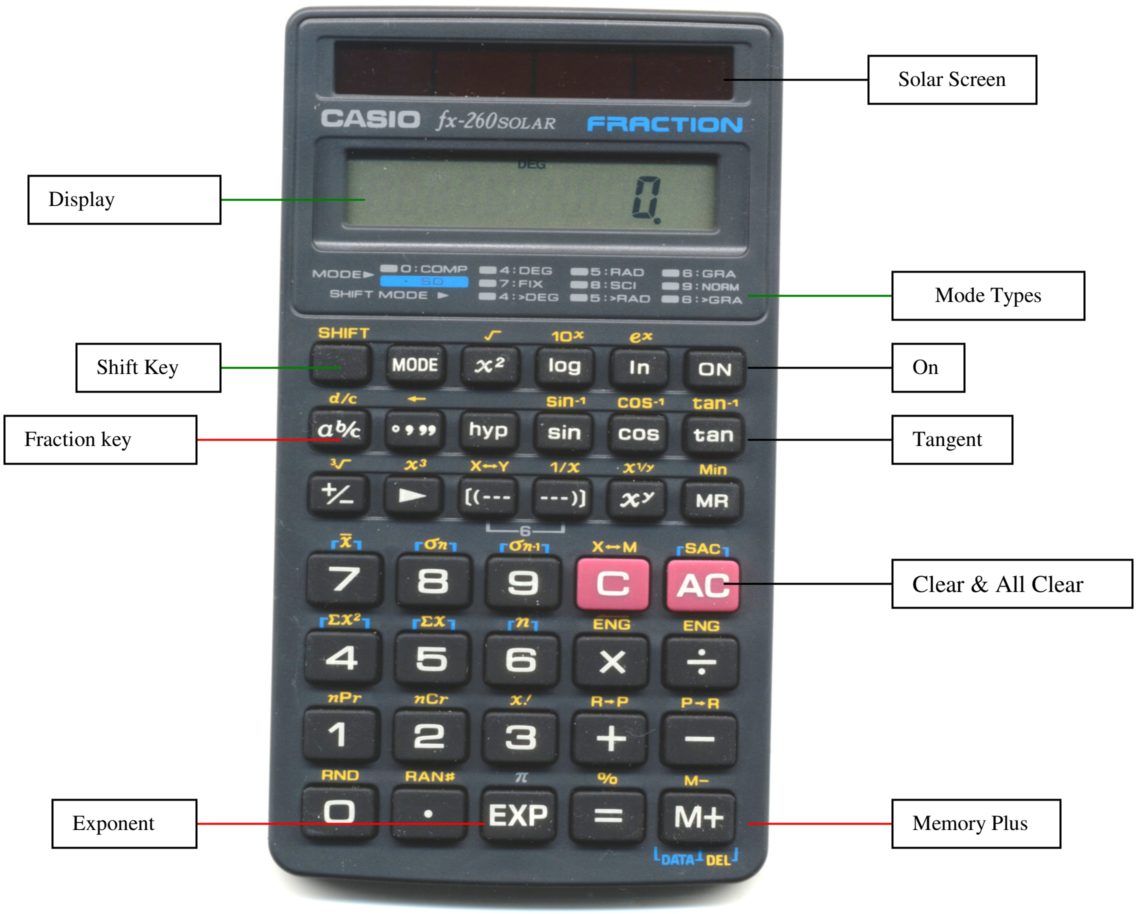
Appendix 4.Screenshot of the animation interface.

Appendix 5. Power point Version

READ ME FIRST

Diagram below shows the 3D Graphic representation of the Casio 260- Solar calculator Study the features before you start using the calculator. For this modules. You will be introduced to the basic calculation. The next module will cover Scientific Calculation.

CASIO *F*x-260 SOLAR Calculator



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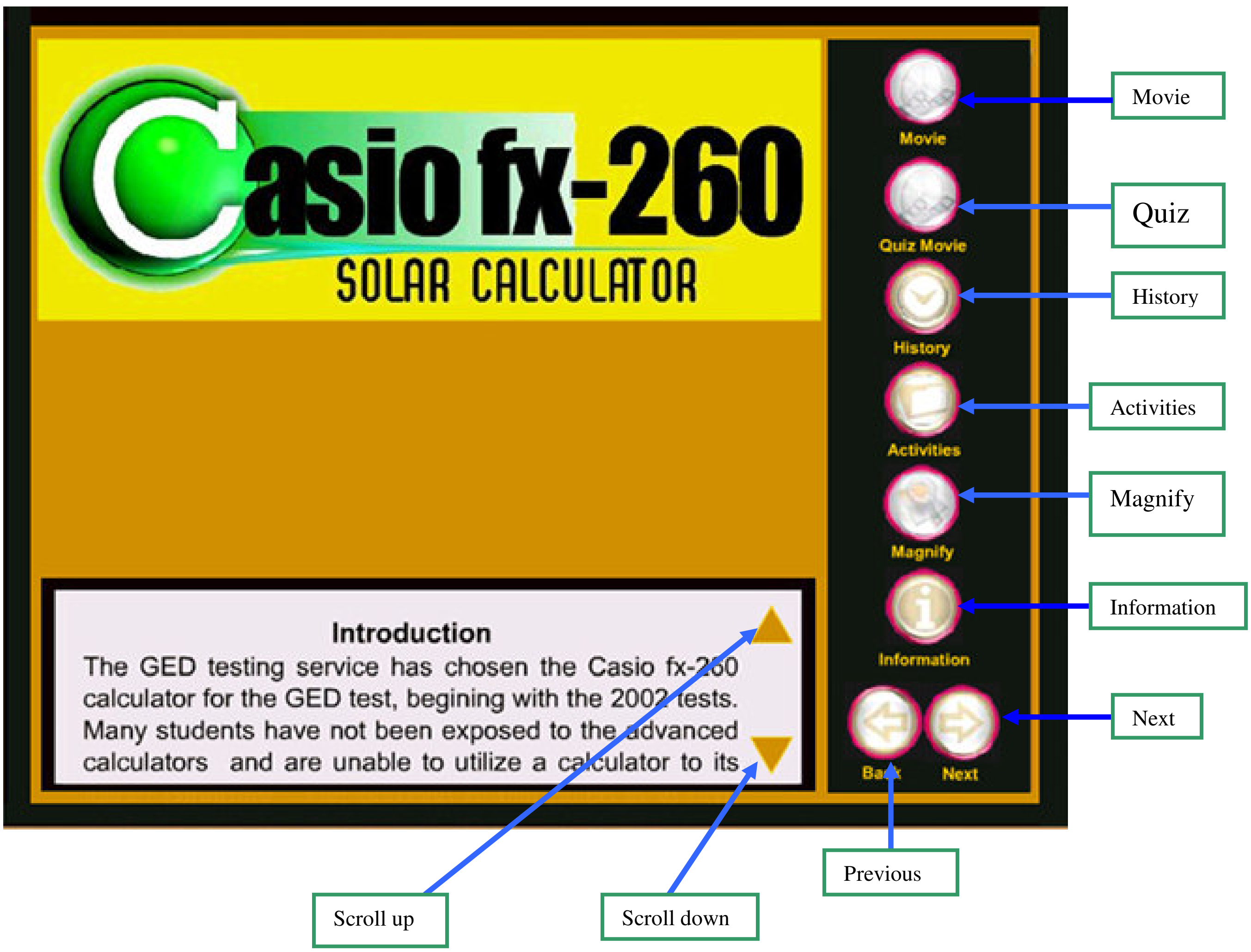
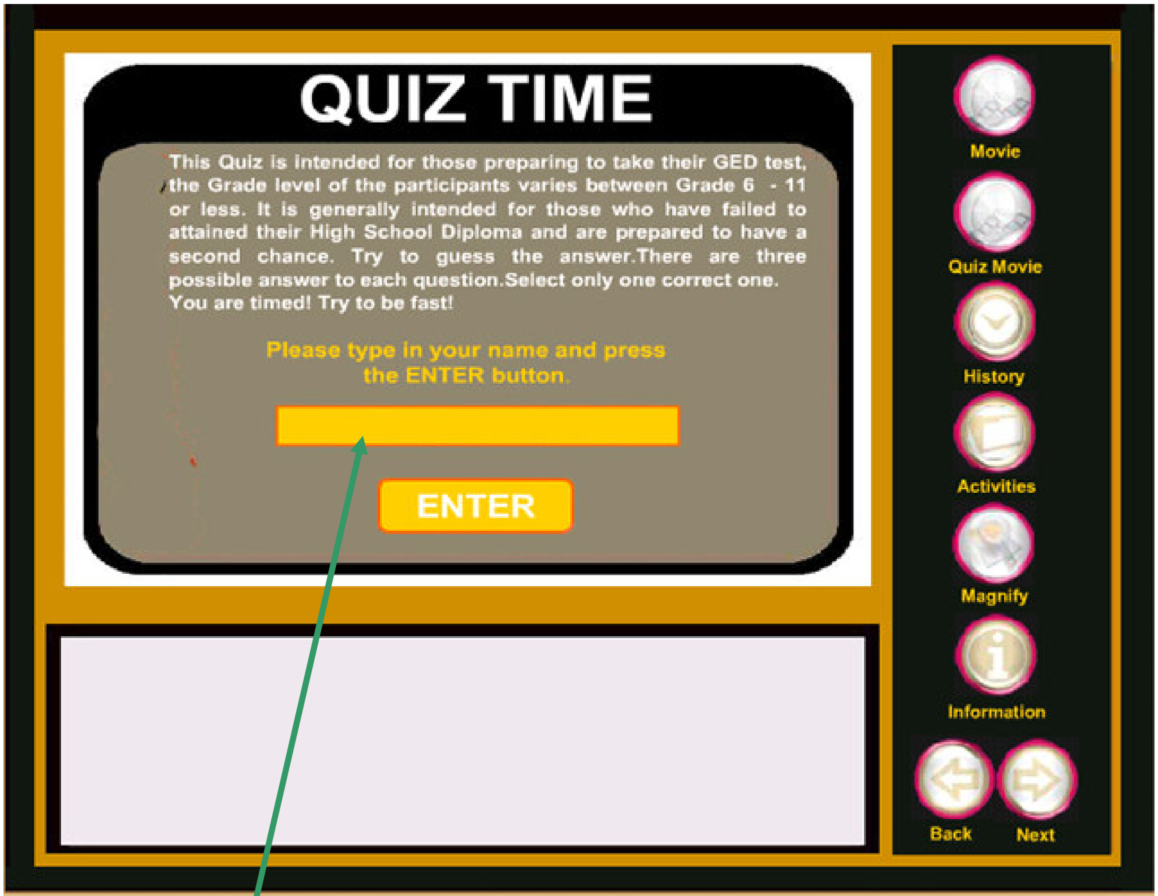
Read me first: Be familiar with the following screenshots of the module: User interface



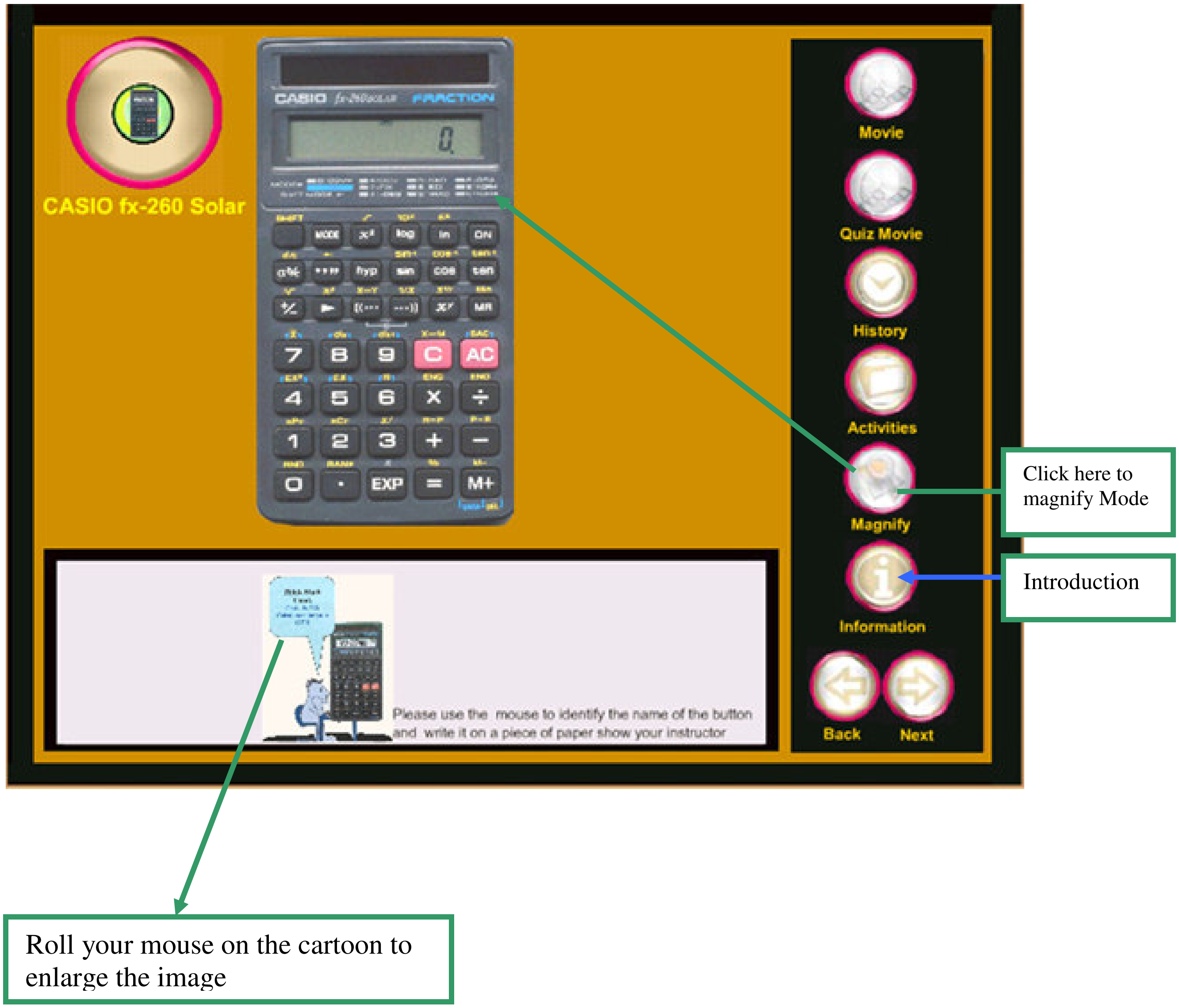
Screenshot and

GUIDE TO USER INTERFACE



Type your name here and click enter to start the quiz

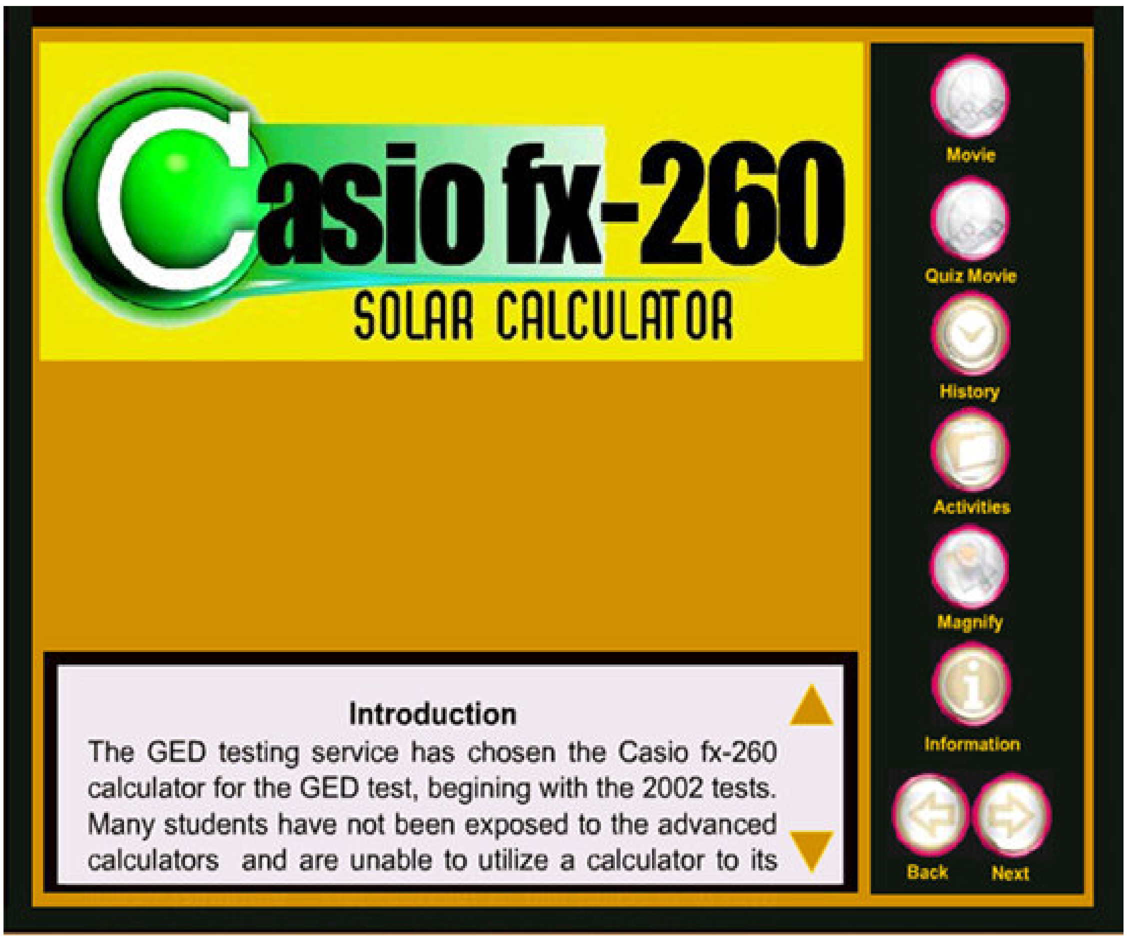
Read me first Screenshot and GUIDE TO USER INTERFACE



Read me first Screenshot and
GUIDE TO USER INTERFACE

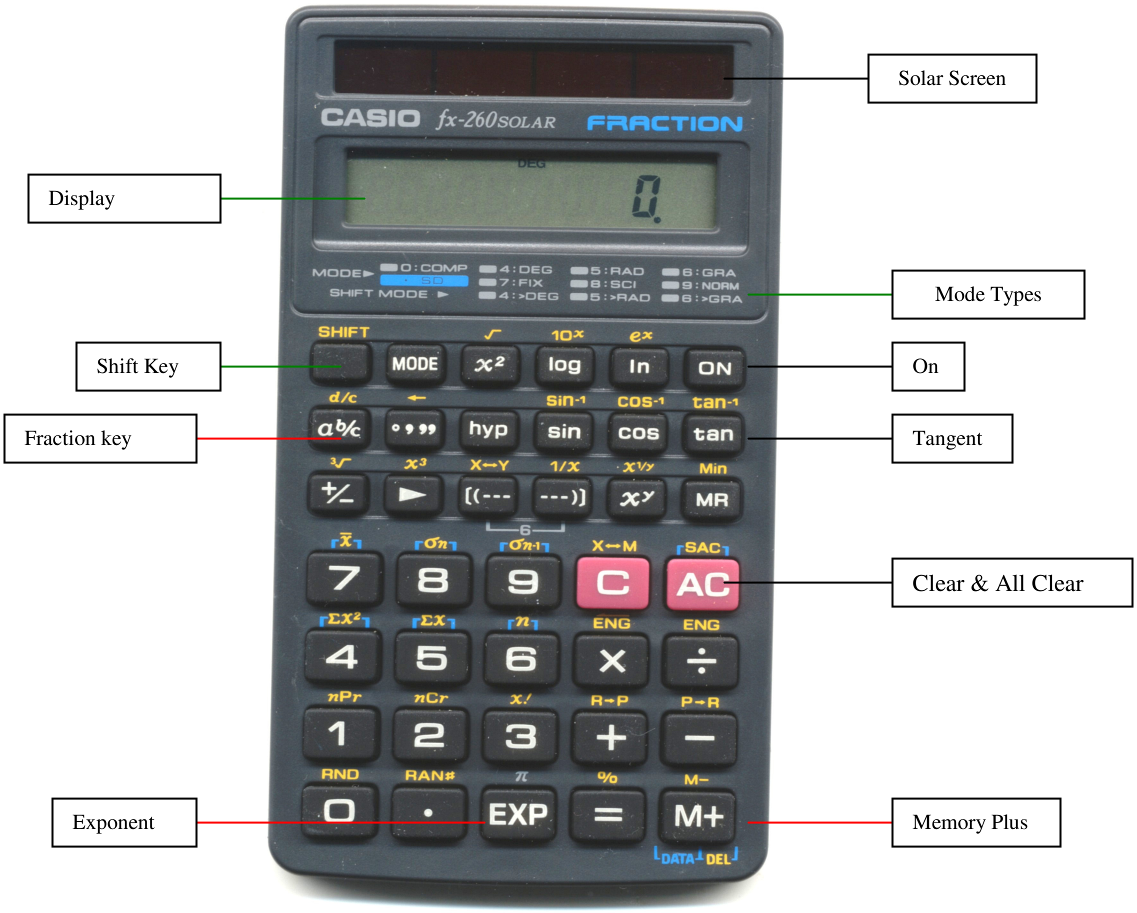
Appendix1

INSTRUCTOR GUIDE



MODULE ONE

By Willy Benson Ochaya



Instructor Guide

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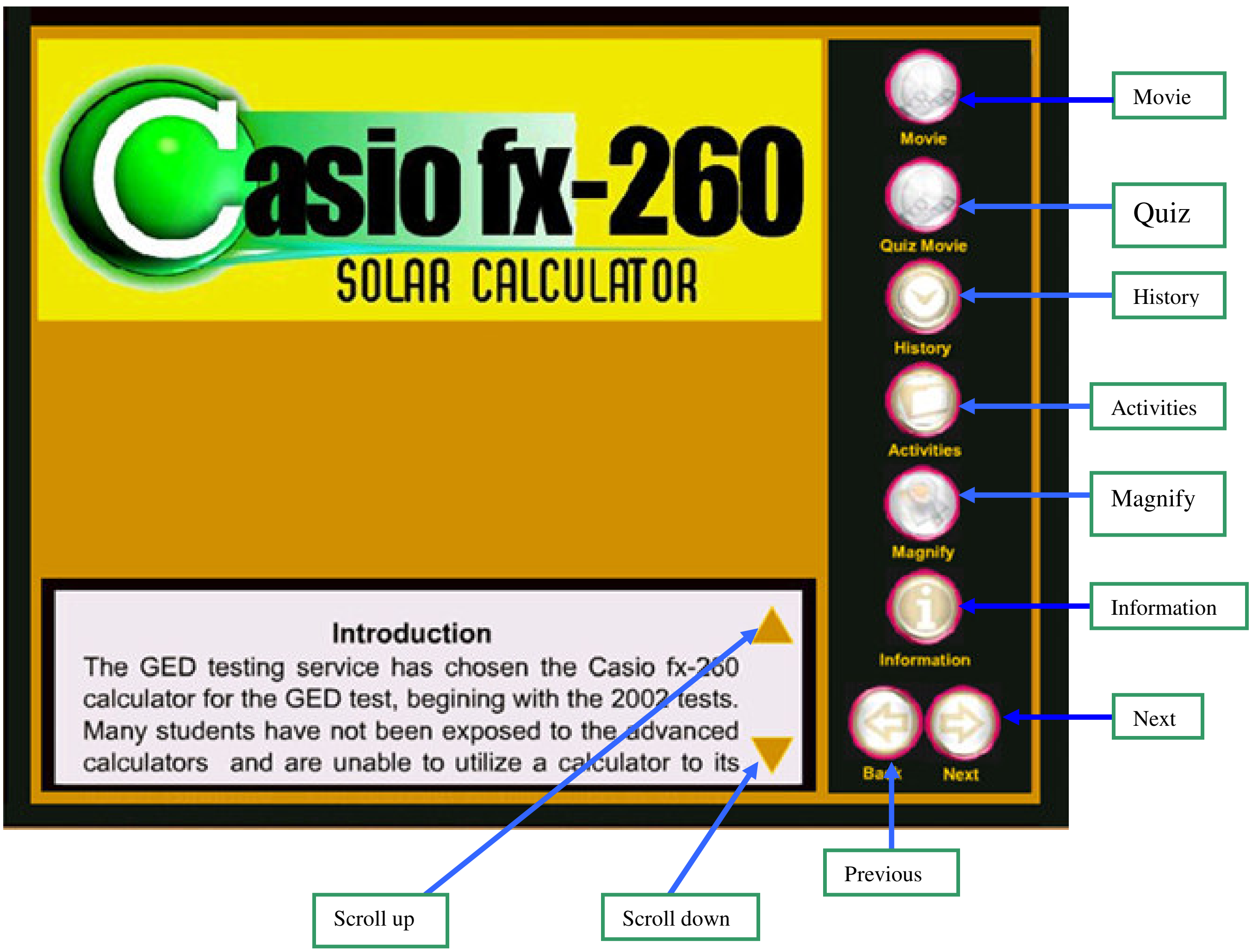
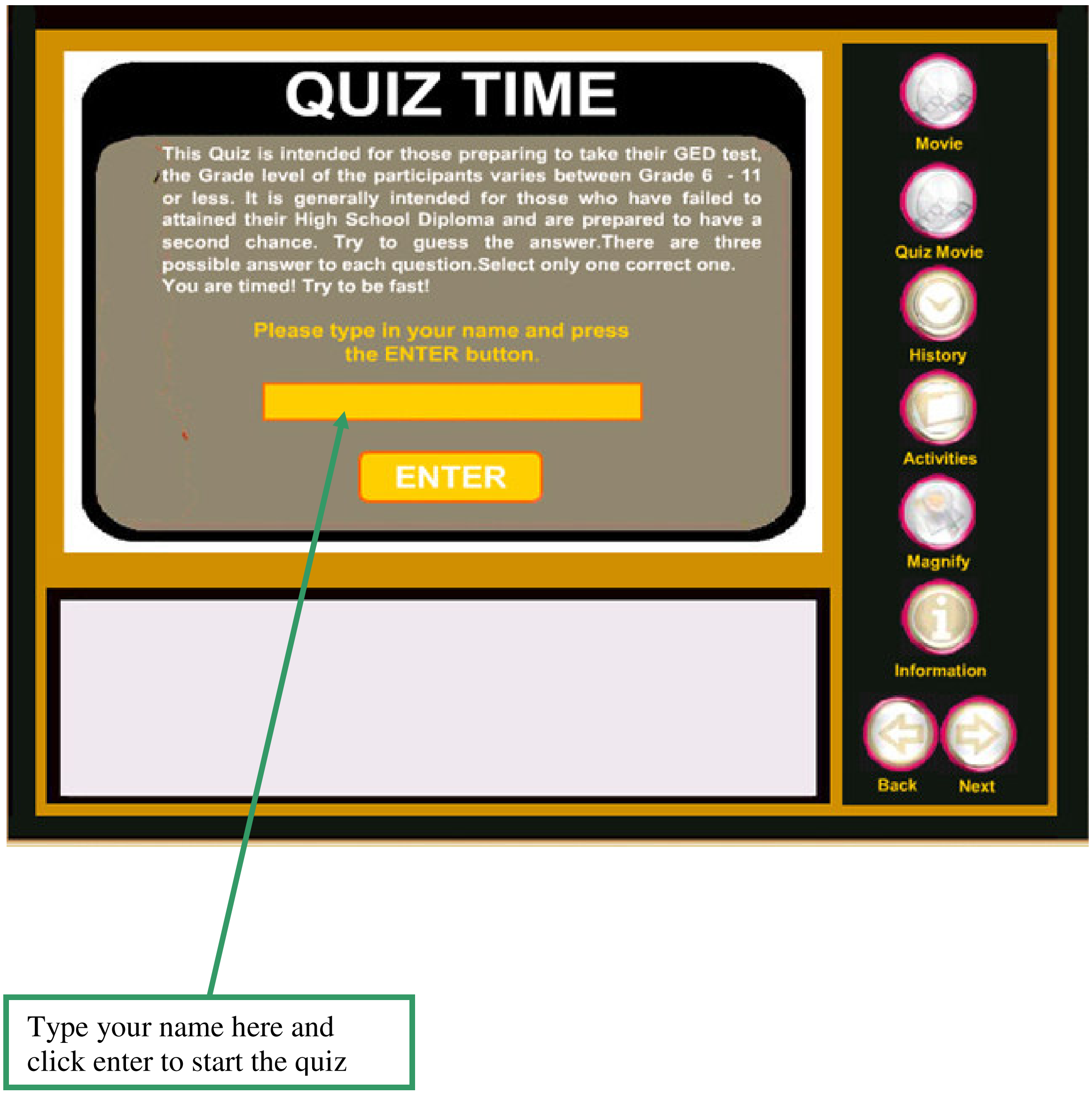
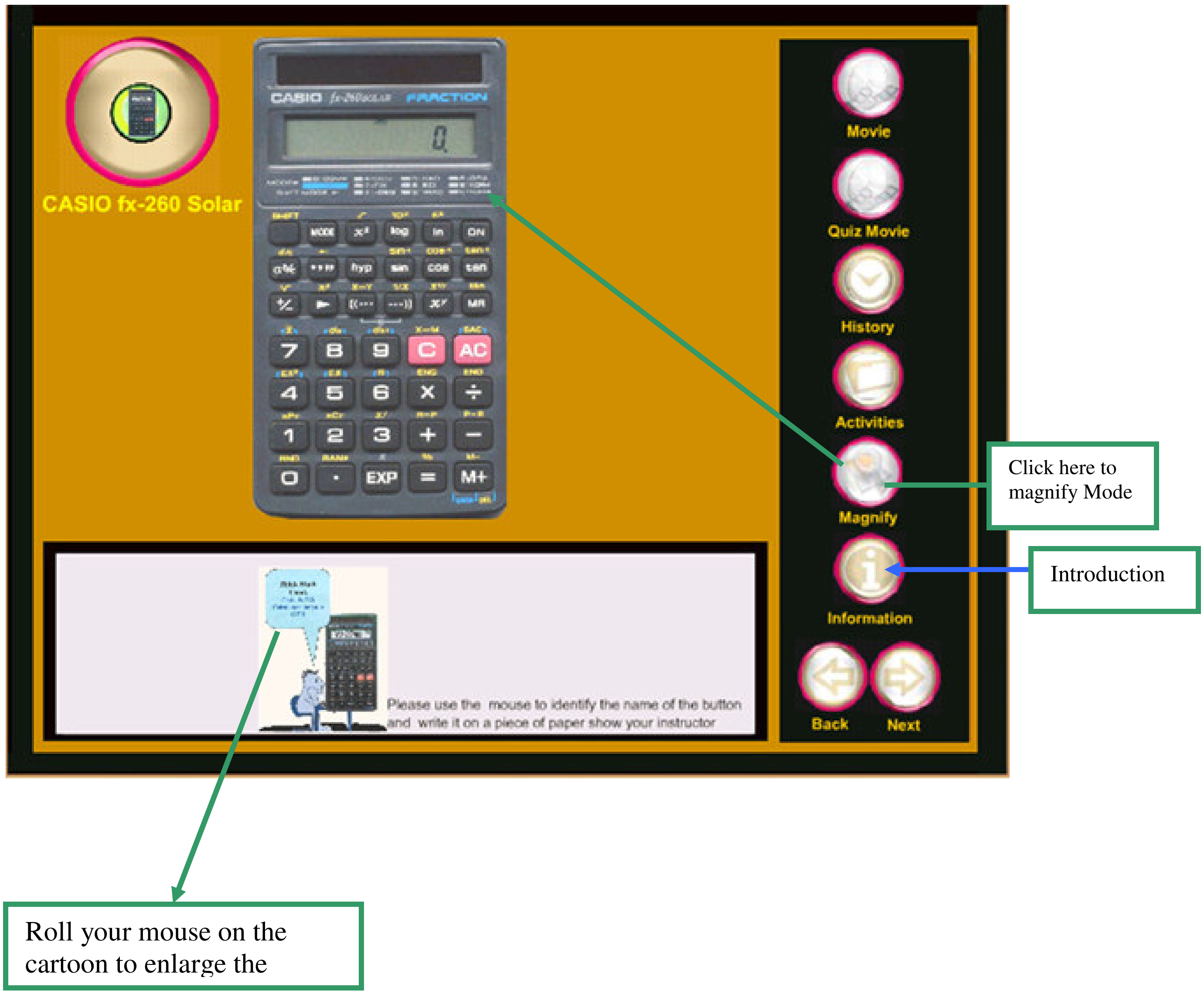


Screenshot and

GUIDE TO USER INTERFACE



Read me first Screenshot and GUIDE TO USER INTERFACE



Read me first Screenshot and
GUIDE TO USER INTERFACE

Geometry Activities

1. Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, area, and volume are affected by changes of scale:

- 1 Use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and volume of basic three-dimensional figures, including rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms, and cylinders.

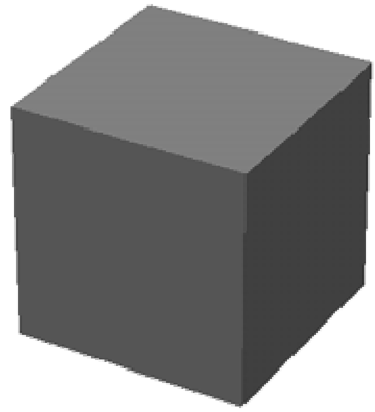
- 2 Estimate and compute the area of more complex or irregular two- and three-dimensional figures by breaking the figures down into more basic geometric objects.
- 3 Compute the length of the perimeter, the surface area of the faces, and the volume of a three-dimensional object built from rectangular solids. Understand that when the lengths of all dimensions are multiplied by a scale factor, the surface area is multiplied by the square of the scale factor and the volume is multiplied by the cube of the scale factor.
- 4 Relate the changes in measurement with a change of scale to the units used (e.g., square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches or [1 ft 2] = [144 in 2], 1 cubic inch is approximately 16.38 cubic centimeters or [1 in 3] = [16.38 cm 3]).

2. Students know the Pythagorean Theorem and deepen their understanding of plane and solid geometric shapes by constructing figures that meet given conditions and by identifying attributes of figures:

- 1 Identify and construct basic elements of geometric figures.
- 2 Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement.
- 3 Identify elements of three-dimensional geometric objects and describe how two or more objects are related in space

- **Simple plane figures**
    - identify the following plane figures:
        - triangles: isosceles triangles, equilateral triangles, right-angled triangles, acute-angled triangles, obtuse-angled triangles and scalene triangles
        - special quadrilaterals: squares, rectangles, parallelograms, rhombuses, trapeziums and kites
        - polygons: pentagons, hexagons, octagons and decagons
- **Simple solid figures**
    - identify the following simple solid figures: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres

Cube



Vertices: 8
Edges: 12
Faces: 6
Edges per face: 4
Edges per vertex: 3
Sin of angle at edge: 1
Surface area: 6 * edgelength^2
Volume: edgelength^3
Circumscribed radius: sqrt (3) / 2 * edge length
Inscribed radius: 1 / 2 * edge length

Glossary of Geometrical Terms

Planes, lines, cones, and cylinders extend infinitely in both (or all) directions. A cone, in particular, is not shaped like an "ice cream cone" but rather like two such objects, attached at their pointy ends, and extending infinitely in both directions. Shapes that are bounded are called "line segments", "frustums", "solid cones", "prisms", etc. So read the definitions carefully.

Area - the surface enclosed within a closed plane figure; the measure of the surface, expressed in equivalent square units, such as square inches.

Axis - a straight line about which a body or a geometric figure rotates or may be supposed to rotate; a straight line with respect to which a body or figure is symmetrical -- called also axis of symmetry; one of the reference lines of a coordinate system

Ball - a "solid sphere"; the interior of a sphere (open ball); a sphere and its interior (closed ball);

Chord - In general, a straight line joining two points on a curve; often, *chord* is used to mean a straight line segment joining and included between two points on a circle;

Circle - a closed *plane* curve every point of which is equidistant from a fixed point, called the center (the center is not part of the circle)

circular - having the shape of a circle; a circular cylinder is one in which its defining shape is a circle, and most often is used to mean a *right circular cylinder*; a circular cone is one in which its defining shape is a circle, and most often is used to mean a *right circular cone*;

cone - in general, a cone is the locus of (i.e. surface traced by) the surface formed by lines joining every point of the boundary of a fixed planar closed curve (the base) to a common vertex; commonly, a right circular cone; a "solid cone" is a solid (or the space) bounded by the planar closed curve, called the base, and the line segments connecting the base to the vertex. The area of a solid cone is (1/3) Ah, where A is the area of the base, and h is the base.

constant width - of a bounded figure: having the same width in every direction. A Reuleaux triangle is an example of a figure of constant width. Other examples include the shape formed by an equilateral triangle of side s with circles of radius r around each vertex, and arcs of radius s+r centered on the "far" vertices that join these circles. The same construction can be made with an equilateral (but not necessarily equiangular n-sided star, with n an odd number.

cylinder - in general, a *cylinder* is the *locus* of (i.e. surface traced by) a *straight line* moving parallel to a fixed straight line and intersecting a fixed planar closed curve (the base); commonly, a right circular cylinder

plane - a flat surface of such nature that a straight line joining two of its points lies wholly in the surface;
a plane figure (or a planar figure) is a figure that is entirely within a plane

polygon - a closed *plane* figure bounded by *straight lines*;

polyhedron - a closed surface formed by polygonal plane faces, connected at the edges; a "solid polyhedron" is a solid (or the space) enclosed by a polyhedron.

pyramid - a polyhedron having for its base a polygon and for faces triangles with a common vertex;
A pyramid is a solid cone with a polygonal base, so its volume is (1/3)Ah.

quadrilateral - a *polygon* of four sides

radius - of a circle, the distance from the center to the circle; of a regular polygon, the distance from the center to a vertex, which is the radius of the circumscribed circle

sphere - a closed surface in three-dimensional space, every point of which is equidistant from a fixed point, called the center (the center is not part of the sphere)

spheroid - an ellipsoid in which two of the three axes are equal. (Contrast to an ellipsoid, in which all three axes may have different lengths.) A spheroid has the equation $(x^2+y^2)/a^2 + z^2/c^2 = 1$

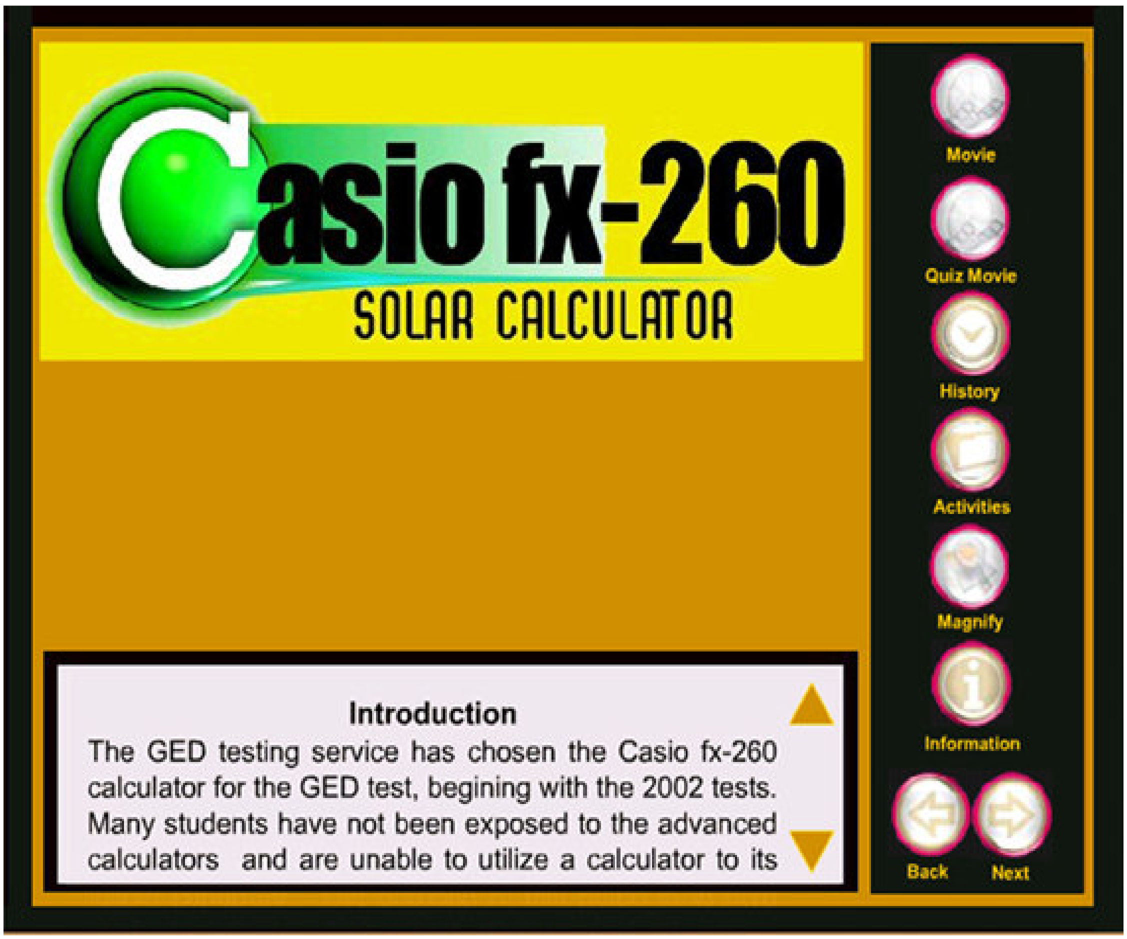
straight line - a collection of points of such a nature that if one picks any three of them, A, B, and C, the distances AB, AC, and BC will be such that the sum of two of them will equal the third.

triangle - a polygon having three sides.

width - of a bounded shape: the distance between two parallel lines, each touching the boundary of the shape but not its interior. This is called "the width of the shape in the direction of the lines". Note that figures of constant width (such as a Reuleaux triangle) have the same width in every direction:http://mcraefamily.com/MathHelp/GeometryGlossary.htm

Appendix. 2

STUDENT GUIDE



MODULE ONE

By Willy Benson Ochaya

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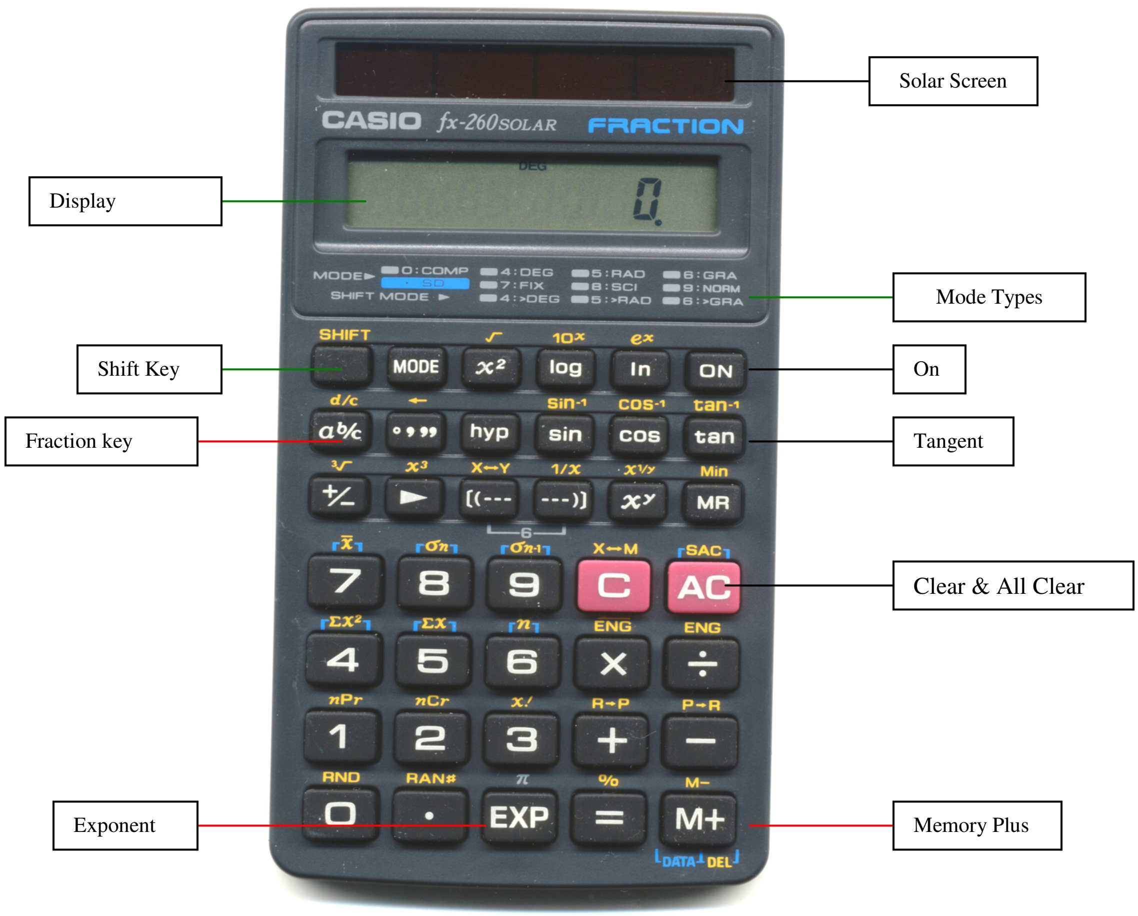

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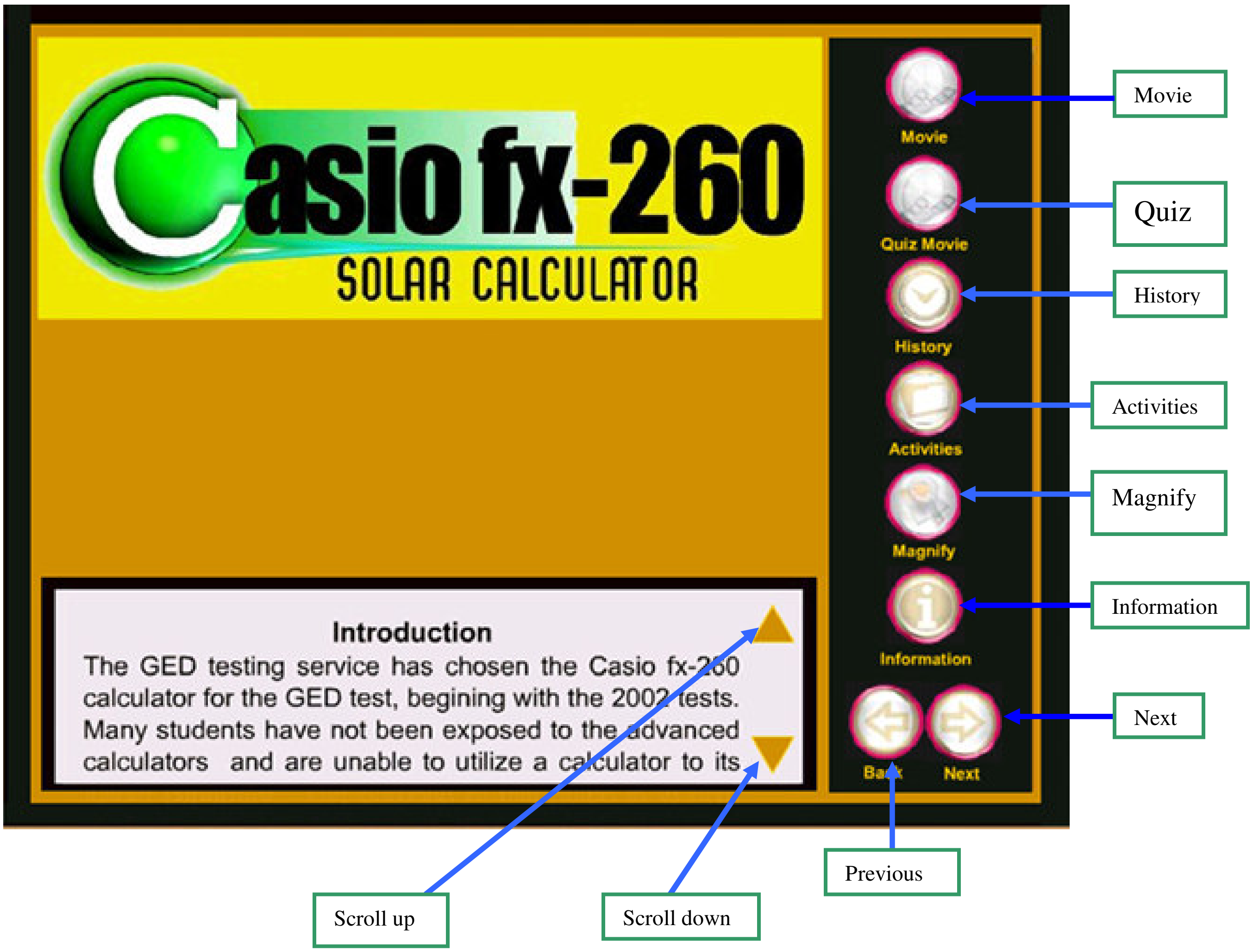
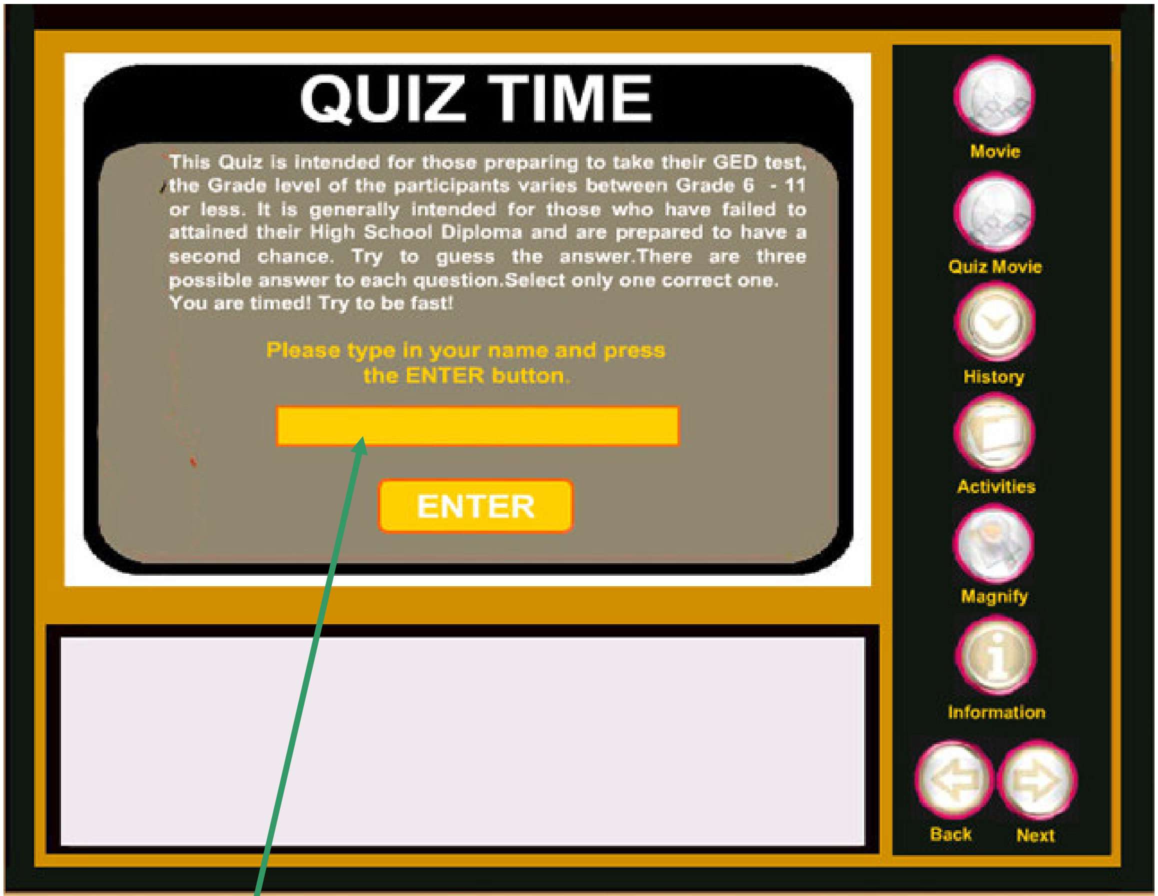


Screenshot and

GUIDE TO USER INTERFACE



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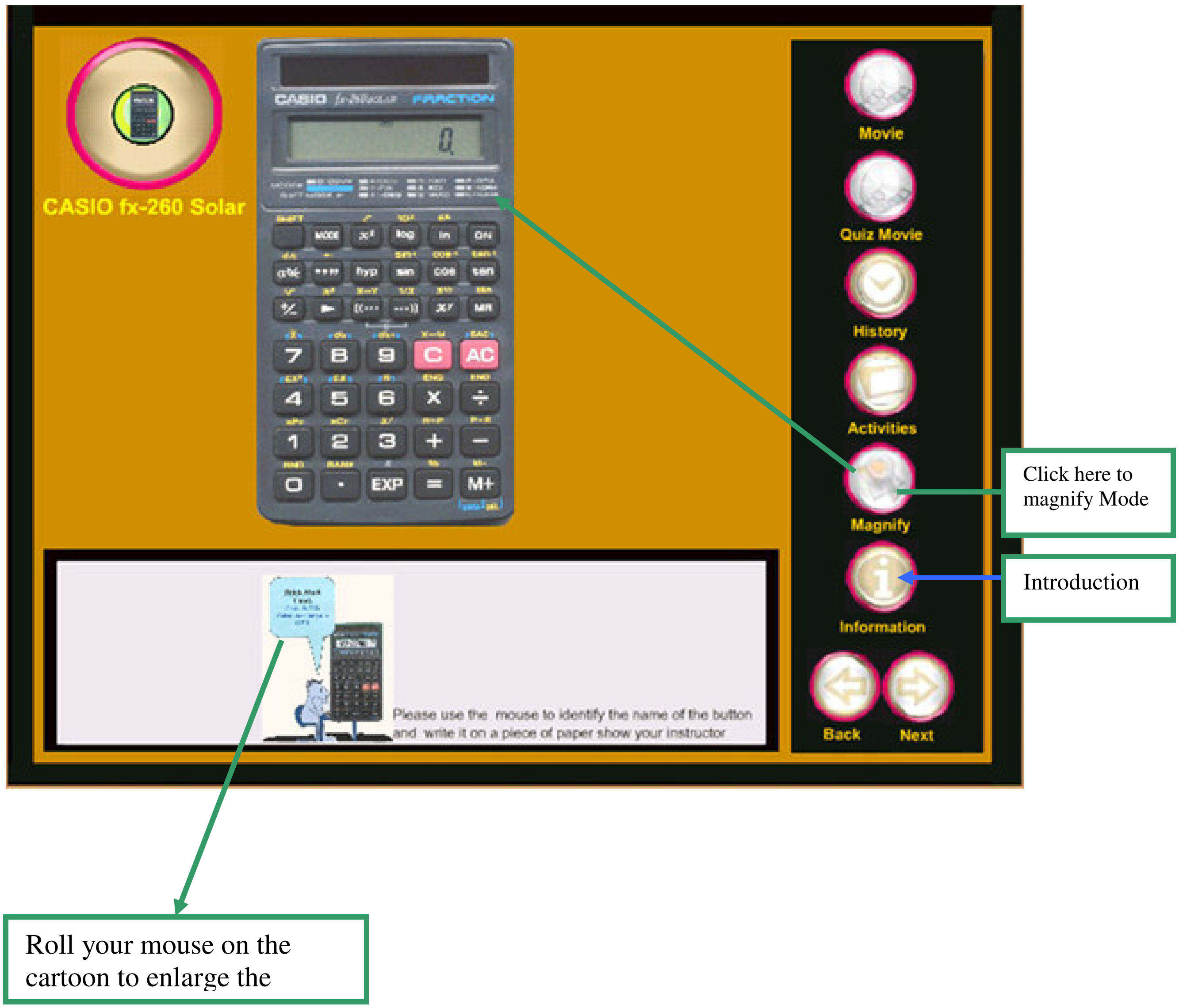
Read me first Screenshot and GUIDE TO USER INTERFACE



Read me first Screenshot and
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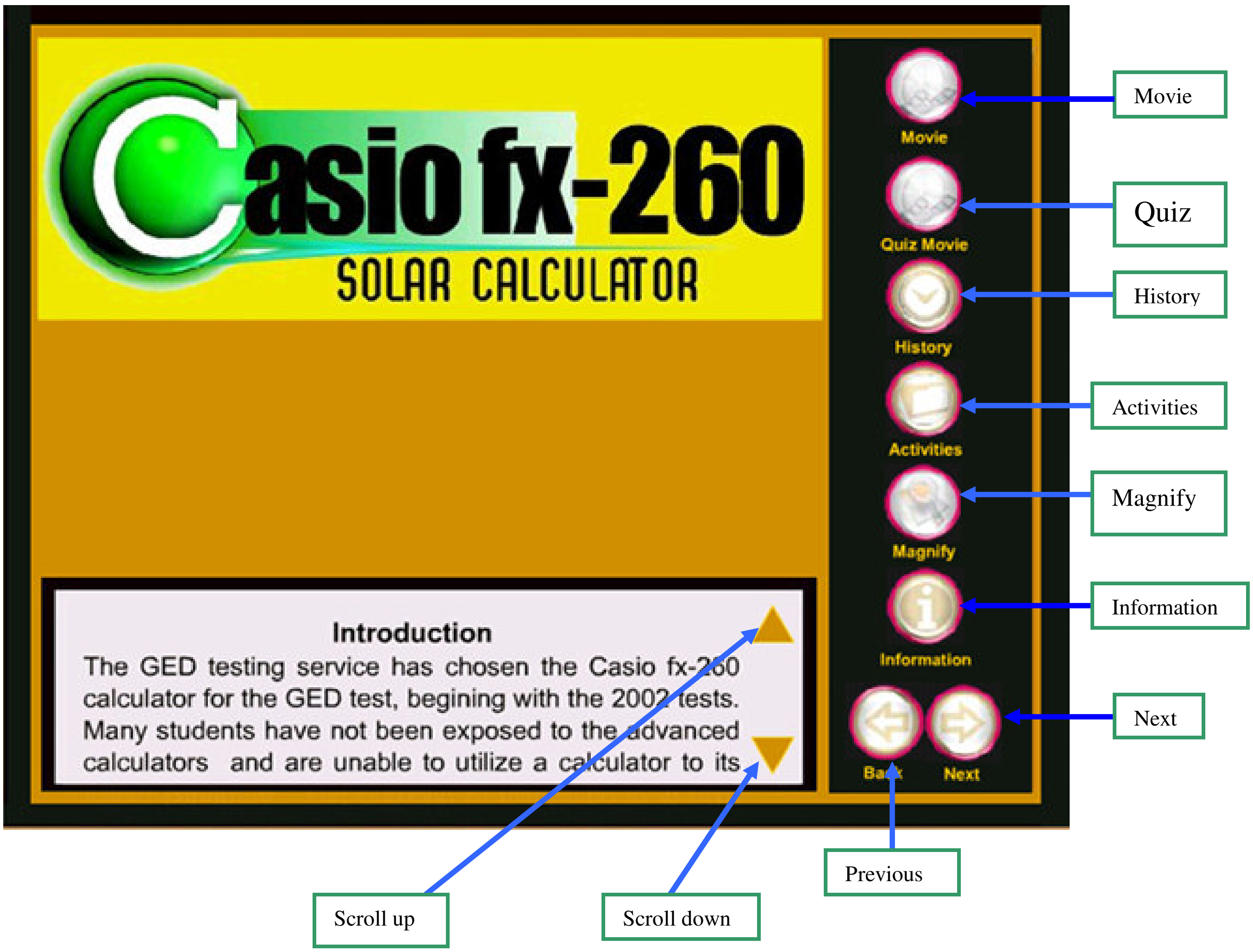
Appendix 3.

Read me first: Screenshot of the module: User interface



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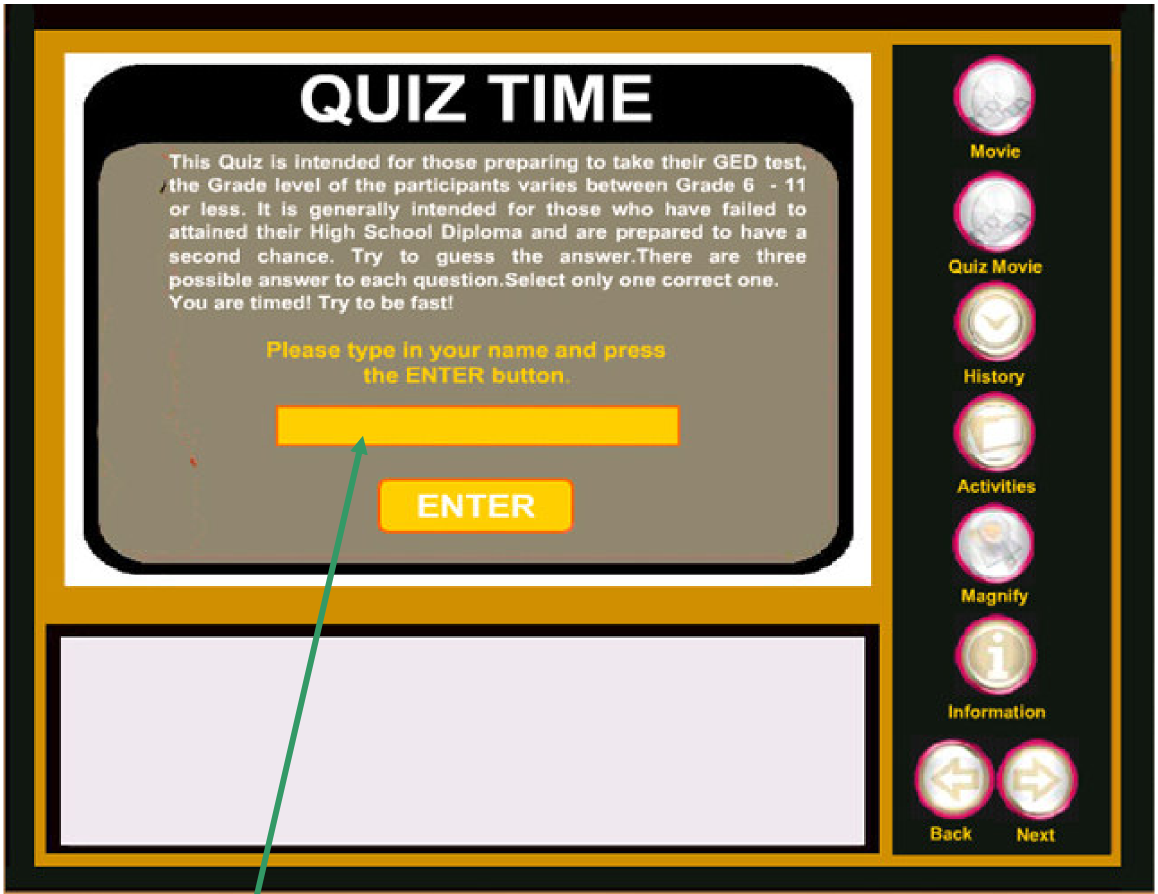

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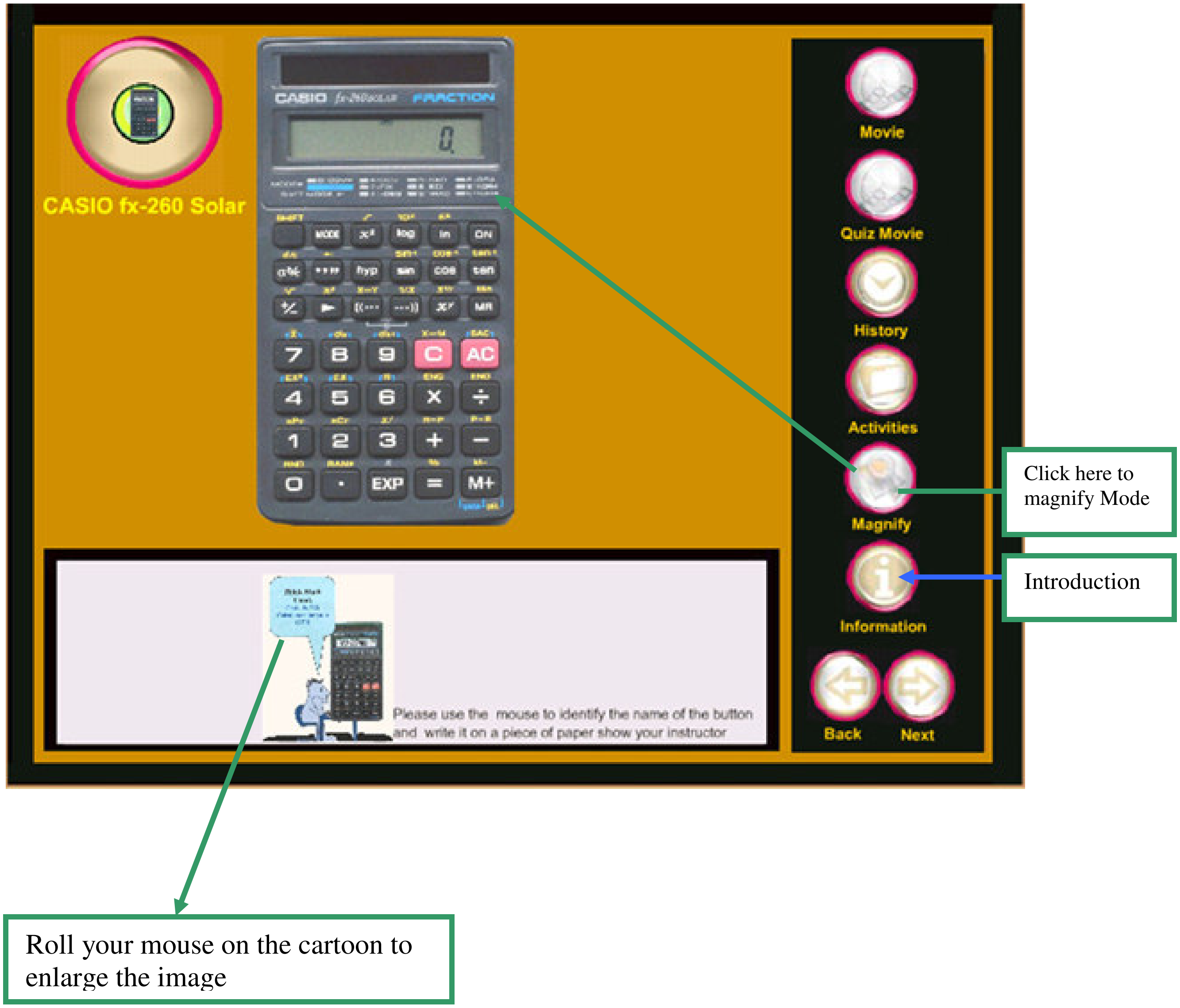

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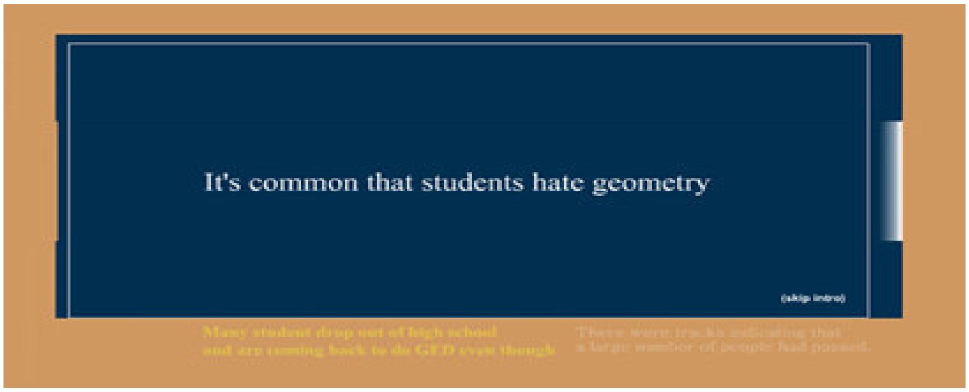
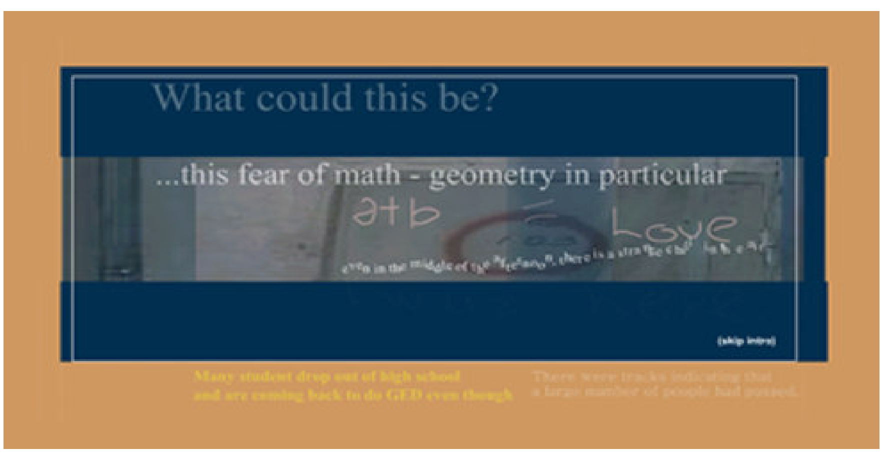
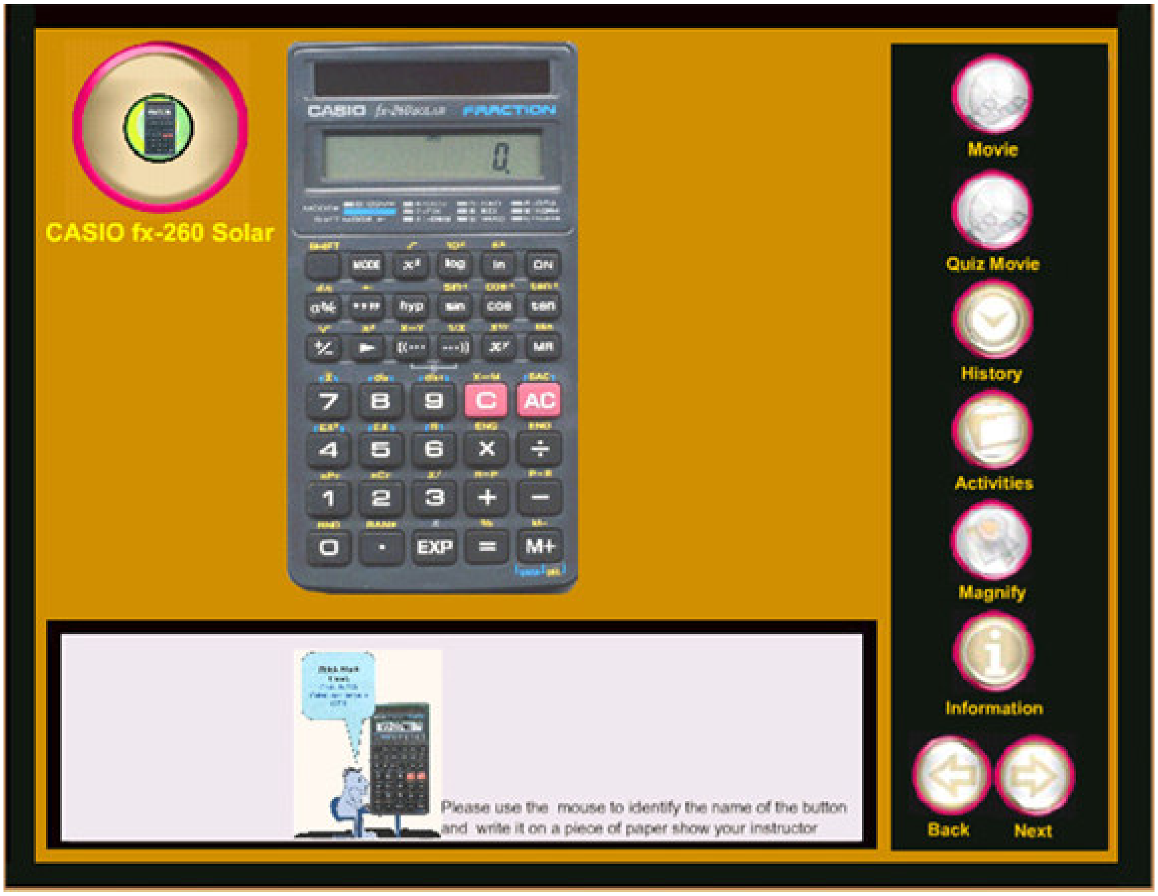


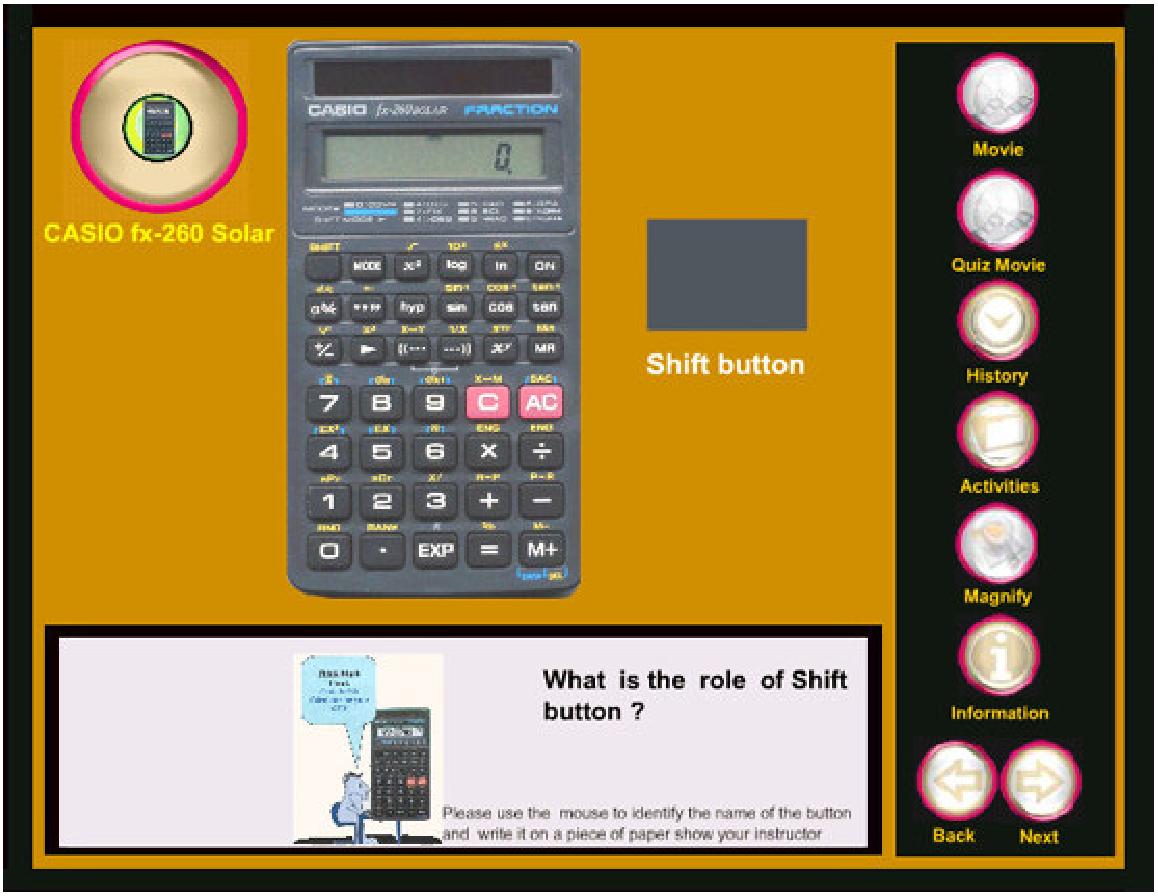


Screenshot of the attract loop and interface

Screenshot of the module and interface for Introduction



Screenshot of the module and interface for rollover


CASIO fx-260 Solar
Shift button
Movie
Quiz Movie
History
Activities
Magnify
Information
Back
Next
What is the role of Shift button ?
Please use the mouse to identify the name of the button and write it on a piece of paper show your instructor