DEVELOPEMEMT OF A GENERIC INTERACTIVE MODEL FOR E-LEARNING CONTENTS/TOOLS FOCUSED TO EVALUATE LEARNING OF THE SYUDENTS ACCORDING TO BLOOM'S TAXONOMY

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DECLARATION

I, Md.Mynuddin Saleh, University ID: - 02101086 have modified and completed some modules of my proposed Thesis, “Development of a generic interactive model for E-Learning contents/tools focused to evaluate learning of the students according to Bloom’s Taxonomy”, and Under CSE 400 course based on the result found by me.

I therefore declare that this project has been published previously neither in whole nor in part of any degree except this publication. I also mentioned work found by other researcher by reference.

Signature of Supervisor

Signature of Author

ACKNOWLEDGEMENT

Firstly, I’m grateful to almighty Allah for providing the strength and energy to start such a project and finally finish it successfully.

I am sincerely thankful to our supervisor Mr. Zillur Rahman, Lecturer, faculty of Engineering, BRAC University for his guidance, constant supervision and constructive suggestions. He helped me with valuable tips about the project along with solutions to some problems, for that I came across while writing this report. Without his help it would have been impossible for me to prepare this report.

My special thanks go to my Co-Supervisor Mr. Jakir Hossain , Lecturer, faculty of MATH department, for his useful and important suggestions. Without his supportive consultancies my research will never have fulfilled the requirements.

I would like to thank the senior brothers of University and friends who helped me in every possible way.

I would also like to give thanks to my respectable parents, who not only patiently listened to us but also helped us to complete this report properly within the due time.

Finally I feel deepest admiration to my department for giving me the honor to perform the Thesis a partial fulfillment of the requirement for the Degree of Bachelor of Computer Science and Engineering.

ABSTRACT

Within the past few years, researchers and educational institutes have introduced and incorporated a number of e-learning technologies to increase flexibility in learning and to enhance students' learning experiences. However, little systematic research has been conducted to assess the value of e-learning tools to the students. Particularly measuring the effectiveness and/or efficiency of any e-learning content or tool considering the quality and quantity of learning of the students was an area of research that is seldom addressed. We propose and test an e-learning model that incorporates interactive testing system to evaluate the students' command over the topic of interest according to Bloom's taxonomy. Thus a model is to be designed to be criticized and adopted if found satisfactory by the designers/developers of e-learning contents and tools. While previous research indicates that e-learning technology can support higher-order thinking by engaging students in authentic, complex tasks, our e-learning model seeks to understand the factors and processes essential to student education and development (i.e., achieving the multiple learning goals of exploration, communication, collaboration, and assessment). We incorporate and examine factors that may influence a student's ability to achieve his or her learning goals and objectives.

TABLE OF CONTENTS

SECTION FOUR: EVALUATION AND RESULT

Sample

Evaluation with reasons

Future implementation

REFERENCE

INTRODUCTION

This paper discusses about some E-Learning contents/tools to evaluate learning of the students according to Bloom's Taxonomy. The first section describes about current e-learning software and the drawbacks in terms of Bloom's Taxonomy. The second section explains what would be the ideal situation and the solution. The third section describes the design and the development of the software. The forth section contains the evaluation and results of the proposed solution and the future implementation.

SECTION ONE

CURRENT E-LEARNING SOFTWARE

❖ Current Software

There are many learning software in the market for graduate and undergraduate educational system. From my survey I found that, education based on learning software is not flourished . (In Bangladesh). Most of the software in the market is for A-level and o-level. There are

some Software for learning mathematics both for English medium and bangle medium.

Mathematics software

Trigonometry for class 9 & 10

Math age 9 to 12

jump star Math For Second Grade

jump star Math For Second Grade

Math Blaster Pre algebra

Math Master

OTHERS

SAT and ACT

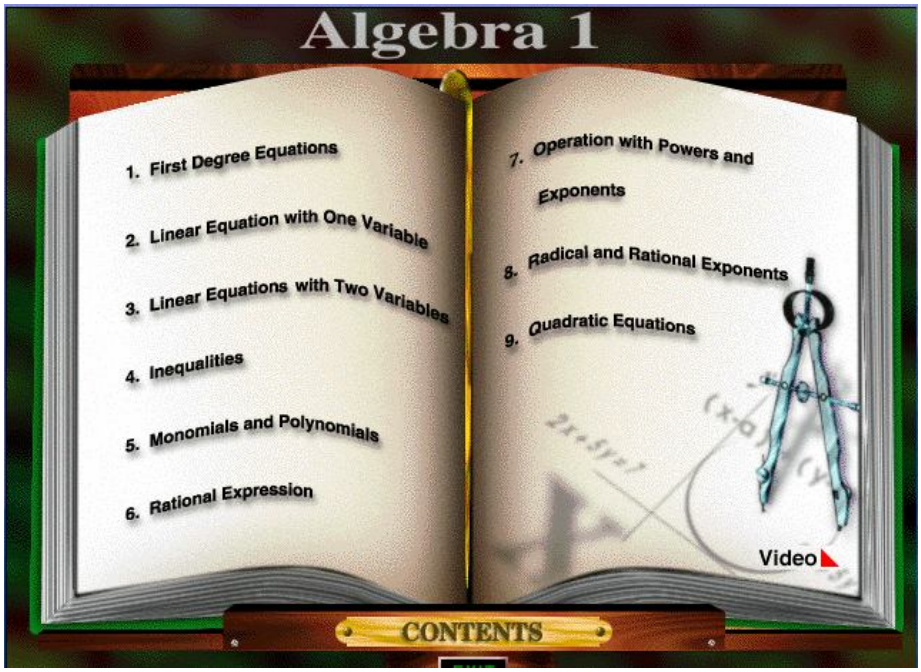
KAPLAN GMAT 2.0

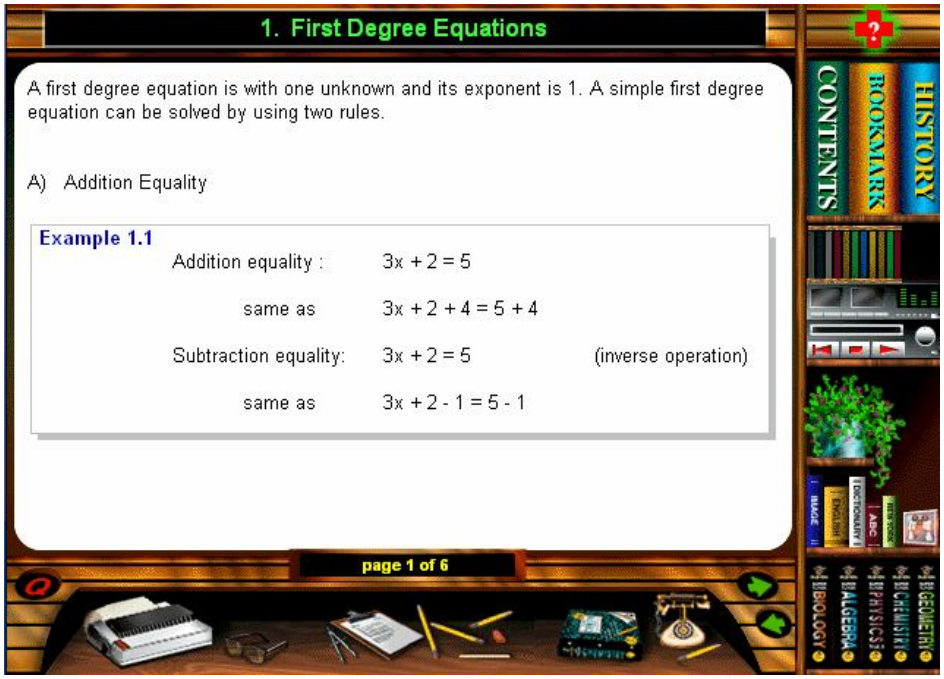
Reading Blaster (Vocabulary)

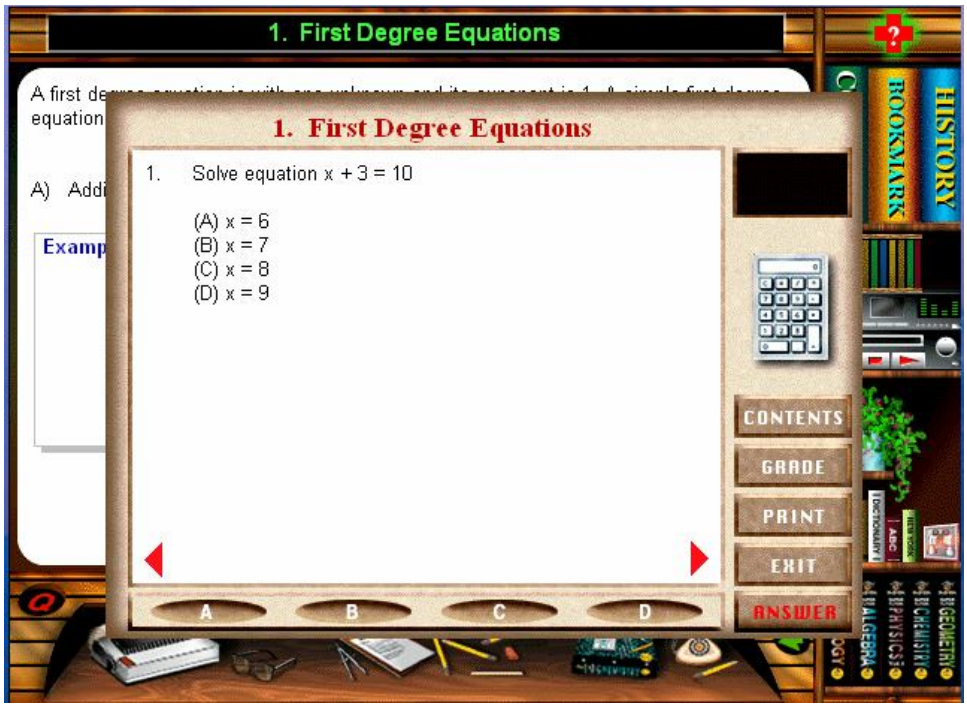
so no.

➢ **Example of a software called Math Master**

Here is a example of a software called Math Master. This software is basically used for undergraduate education. This software is for learning ALGEBRA 1. This software deals with first degree equation, linear equation, inequality etc.




1. First Degree Equations
A first degree equation is with one unknown and its exponent is 1. A simple first degree equation can be solved by using two rules.
A) Addition Equality
Example 1.1
Addition equality : 3x + 2 = 5
same as 3x + 2 + 4 = 5 + 4
Subtraction equality: 3x + 2 = 5 (inverse operation)
same as 3x + 2 - 1 = 5 - 1
page 1 of 6
CONTENTS
BOOKMARK
HISTORY


1. First Degree Equations
1. First Degree Equations
1. Solve equation x + 3 = 10
(A) x = 6
(B) x = 7
(C) x = 8
(D) x = 9
CONTENTS
GRADE
PRINT
EXIT
ANSWER
A
B
C
D
BOOKMARK
HISTORY

❖ Discussion

After testing the software, we have found that this is good learning software. It provides some criteria which is essential for the learners to learn something properly. Others learning software are also providing this sort of Criteria more or less.

Most of the educational software for the children is game based. Children can learn something by playing games.

❖ Drawbacks in terms of learning

Thoughtful college and university faculty can ordinarily articulate the goals of their teaching. But they most commonly express their goals in terms of subject matter , not in terms of what the students will learn to do with or by means of that subject matter .

“How will you be able to tell if the learners have achieved these learning outcomes or not?” this question is called, in this approach, the assessment question. If a teacher cannot answer, of a proposed learning outcome, how he or she will tell whether the learner has achieved it or not, then obviously the description of the learning outcomes is not yet practically useful.

So the listed software may be helpful in learning process. But we cannot evaluate the level of the learning condition by using these soft wares. That means we cannot evaluate whether the learner has achieved the learning outcomes or not.

SECTION TWO

❖ Ideal situation

Consider, for example, the following as a possible learning outcome: “The students will understand Aristotle’s theory of virtue.”This is an admirable goal ; but it gives us no clue about how the teacher will know if the students have achieved the goal or not . More informative outcomes for this learning activity might be stated thus : (a) the students will be able to state Aristotle’s description of virtue correctly as the teacher has described it ,”or (b) “The students will able to state Aristotle’s description of virtue in their own words, ” or (c) “The students will able to correctly identify an instance of (Aristotelian) virtue using Aristotle’s description of it ,”or (d) “The students will able to identify the essential component of virtue in Aristotle’s account and explain their relationship,” or (e)” The students will able to create narrative (from their own experience or from other sources) about which Aristotle’s description of virtue is helpful in answering ethical questions ,”or (f) “The students will able to give reasons for holding that Aristotle’s description of virtue is superior to the claim that a virtue merely an habitual pattern of human behavior. ”

All of these , even (a), which is the least demanding of the students, are example of learning outcomes that include or imply an answer to the assessment question as well. Because of this , they are likely to be far more helpful in guiding the teacher to teach effectively than learning outcomes that do not do so .

❖ Proposed solution

We are proposing to lunch software that will fulfill all the criteria which are needed for the learners and also can generate assessment questions as well according to **Bloom's Taxonomy**, so that the learners can evaluate themselves.

➢ Bloom's Taxonomy

The **Taxonomy of Educational Objectives**, often called **Bloom's Taxonomy**, is a classification of the different objectives and skills that educators set for students. The taxonomy was proposed in 1956 by Benjamin Bloom, an educational psychologist at the University of Chicago. Bloom's Taxonomy divides educational objectives into three "domains:" Affective, Psychomotor, and Cognitive. Within each domain are different levels of learning, with higher levels considered more complex and closer to complete mastery of the subject matter. A goal of Bloom's Taxonomy is to motivate educators to focus on all three domains, creating a more holistic form of education.

- **Cognitive**: mental skills (*Knowledge*)
- **Affective**: growth in feelings or emotional areas (*Attitude*)
- **Psychomotor**: manual or physical skills (*Skills*)

Since the work was produced by higher education, the words tend to be a little bigger than we normally use. Domains can be thought of as categories. Trainers often refer to these three domains as KSA

(Knowledge, Skills, and Attitude). This taxonomy of learning behaviors can be thought of as "the goals of the training process." That is, after the training session, the learner should have acquires new skills, knowledge, and/or attitudes.

The committee also produced an elaborate compilation for the cognitive and affective domains, but none for the psychomotor domain. Their explanation for this oversight was that they have little experience in teaching manual skills within the college level (I guess they never thought to check with their sports or drama department).

This compilation divides the three domains into subdivisions, starting from the simplest behavior to the most complex. The divisions outlined are not absolutes and there are other systems or hierarchies that have been devised in the educational and training world. However, Bloom's taxonomy is easily understood and is probably the most widely applied one in use today.

- ✓ **Affective**

Skills in the **affective domain** describe the way people react emotionally and their ability to feel another living thing's pain or joy. Affective objectives typically target the awareness and growth in attitudes, emotion, and feelings.

There are five levels in the affective domain moving through the lowest order processes to the highest:

- Receiving - The lowest level; the student passively pays attention. Without this level no learning can occur.
- Responding - The student actively participates in the learning process, not only attends to a stimulus, the student also reacts in some way.

- Valuing - The student attaches a value to an object, phenomenon, or piece of information.
- Organizing - Students can put together different values, information, and ideas and accommodate them within their own schema; comparing, relating and elaborating on what has been learnt.
- Characterizing - The student has held a particular value or belief that now exerts influence on their behaviour so that it becomes a characteristic.

✓ **Psychomotor**

Skills in the **psychomotor domain** describe the ability to physically manipulate a tool or instrument like a hand or a hammer. Psychomotor objectives usually focus on change and/or development in behavior and/or skills.

Bloom and his colleagues never created subcategories for skills in the psychomotor domain, but since then other educators have created their own psychomotor taxonomies. Development of these skills requires practice and is measured in terms of speed, precision, distance,

procedures, or techniques in execution. The seven major categories listed the simplest behavior to the most complex:

- ✓ **Cognitive**

Skills in the **cognitive domain** revolve around knowledge, comprehension, and "thinking through" a particular topic. Traditional education tends to emphasize the skills in this domain, particularly the lower-order objectives.

There are six levels in the taxonomy, moving through the lowest order processes to the highest:

Knowledge

Exhibit memory of previously-learned materials by recalling facts, terms, basic concepts and answers

- Knowledge of specifics - terminology, specific facts
- Knowledge of ways and means of dealing with specifics - conventions, trends and sequences, classifications and categories, criteria, methodology

- Knowledge of the universals and abstractions in a field - principles and generalizations, theories and structures

Questions like: What is...?

Comprehension

Demonstrative understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas

- Translation
- Interpretation
- Extrapolation

Questions like: How would you compare and contrast...?

Application

Using new knowledge, Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way

Questions like: Can you organize _____ to show...?

Analysis

Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations

- Analysis of elements
- Analysis of relationships
- Analysis of organizational principles

Questions like: How would you classify...?

Synthesis

Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions

- Production of a unique communication
- Production of a plan, or proposed set of operations
- Derivation of a set of abstract relations

Questions like: Can you predict an outcome?

Evaluation

Present and defend opinions by making judgments about information, validity of ideas or quality of work based on a set of criteria

- Judgments in terms of internal evidence
- Judgments in terms of external criteria

Questions like: Do you agree with.....?

- **Sample Question pattern and Potential activities and products**

Knowledge

Useful Verbs	Sample Question Stems	Potential activities and products

tell list describe relate locate write find state name	What happened after...? How many...? Who was it that...? Can you name the...? Describe what happened at...? Who spoke to...? Can you tell why...? Find the meaning of...? What is...? Which is true or false...?	Make a list of the main events.. Make a timeline of events. Make a facts chart. Write a list of any pieces of information you can remember. List all the .... in the story. Make a chart showing... Make an acrostic. Recite a poem.

Comprehension

Useful Verbs	Sample Question Stems	Potential activities and products
explain interpret outline discuss distinguish predict restate translate compare describe	Can you write in your own words...? Can you write a brief outline...? What do you think could of happened next...? Who do you think...? What was the main idea...? Who was the key character...? Can you distinguish between...? What differences exist between...? Can you provide an example of what you mean...? Can you provide a definition for...?	Cut out or draw pictures to show a particular event. Illustrate what you think the main idea was. Make a cartoon strip showing the sequence of events. Write and perform a play based on the story. Retell the story in your words. Paint a picture of some aspect you like. Write a summary report of an event. Prepare a flow chart to illustrate the sequence of events. Make a colouring book.

Application

Useful Verbs	Sample Question Stems	Potential activities and products
solve show use illustrate construct complete examine classify	Do you know another instance where...? Could this have happened in...? Can you group by characteristics such as...? What factors would you change if...? Can you apply the method used to some experience of your own...? What questions would you ask of...? From the information given, can you develop a set of instructions about...? Would this information be useful if you had a ...?	Construct a model to demonstrate how it will work. Make a diorama to illustrate an important event. Make a scrapbook about the areas of study. Make a paper-mache map to include relevant information about an event. Take a collection of photographs to demonstrate a particular point. Make up a puzzle game suing the ideas from the study area. Make a clay model of an item in the material. Design a market strategy for your product using a known strategy as a model. Dress a doll in national costume. Paint a mural using the same materials. Write a textbook about... for others.

Analysis

Useful Verbs	Sample Question Stems	Potential activities and products
analyse distinguish examine compare contrast investigate categorise identify explain separate advertise	Which events could have happened...? I ... happened, what might the ending have been? How was this similar to...? What was the underlying theme of...? What do you see as other possible outcomes? Why did ... changes occur? Can you compare your ... with that presented in...? Can you explain what must have happened when...? How is ... similar to ...? What are some of the problems of...? Can you distinguish between...? What were some of the motives behind...? What was the turning point in the game? What was the problem with...?	Design a questionnaire to gather information. Write a commercial to sell a new product. Conduct an investigation to produce information to support a view. Make a flow chart to show the critical stages. Construct a graph to illustrate selected information. Make a jigsaw puzzle. Make a family tree showing relationships. Put on a play about the study area. Write a biography of the study person. Prepare a report about the area of study. Arrange a party. Make all the arrangements and record the steps needed. Review a work of art in terms of form, colour and texture.

Synthesis

Useful Verbs	Sample Question Stems	Potential activities and products

create invent compose predict plan construct design imagine propose devise formulate	Can you design a ... to ...? Why not compose a song about...? Can you see a possible solution to...? If you had access to all resources how would you deal with...? Why don't you devise your own way to deal with...? What would happen if...? How many ways can you...? Can you create new and unusual uses for...? Can you write a new recipe for a tasty dish? can you develop a proposal which would...	Invent a machine to do a specific task. Design a building to house your study. Create a new product. Give it a name and plan a marketing campaign. Write about your feelings in relation to... Write a TV show, play, puppet show, role play, song or pantomime about...? Design a record, book, or magazine cover for...? Make up a new language code and write material suing it. Sell an idea. Devise a way to... Compose a rhythm or put new words to a known melody.

Evaluation

Useful Verbs	Sample Question Stems	Potential activities and products

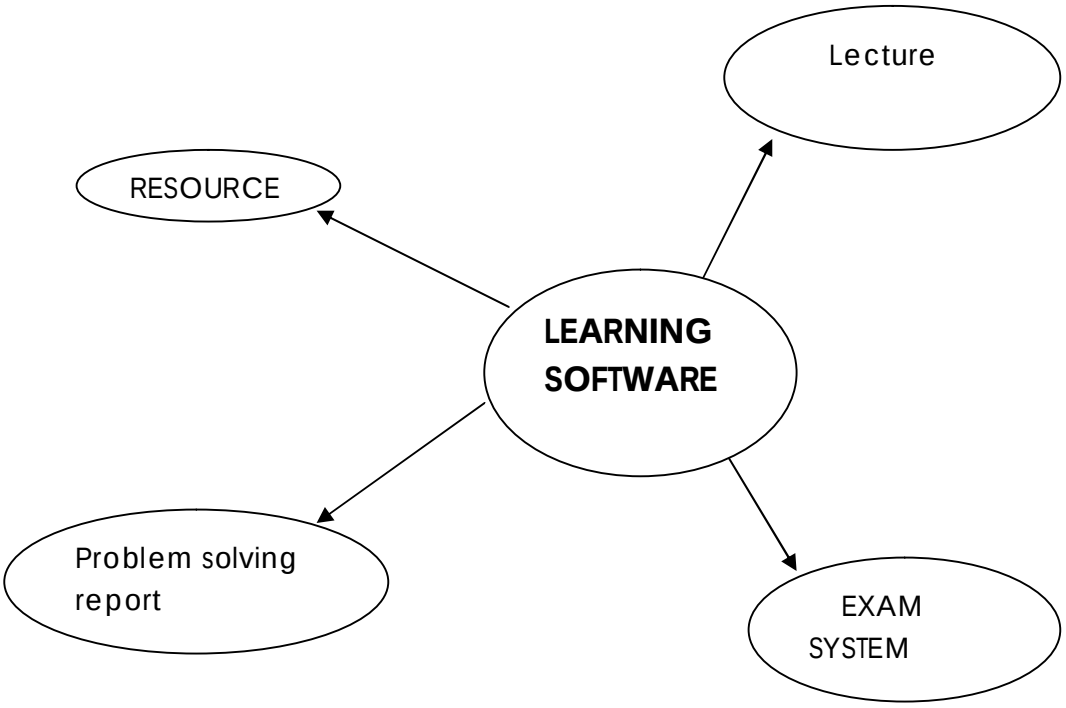
judge select choose decide justify debate verify argue recommend assess discuss rate prioritise determine	Is there a better solution to... Judge the value of... Can you defend your position about...? Do you think ... is a good or a bad thing? How would you have handled...? What changes to ... would you recommend? Do you believe? Are you a ... person? How would you feel if...? How effective are...? What do you think about...?	Prepare a list of criteria to judge a ... show. Indicate priority and ratings. Conduct a debate about an issue of special interest. Make a booklet about 5 rules you see as important. Convince others. Form a panel to discuss views, eg "Learning at School." Write a letter to ... advising on changes needed at... Write a half yearly report. Prepare a case to present your view about...

SECTION THREE

DESIGNING AND DEVELOPEMENT

❖ Basic design

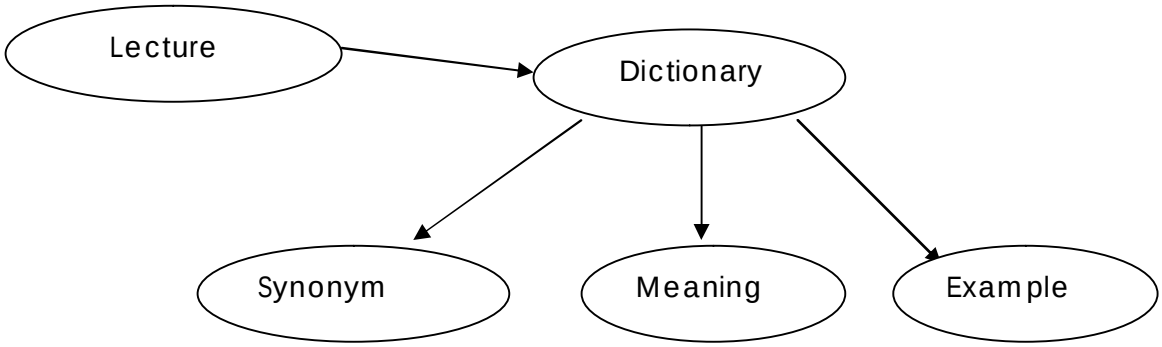
This is design of the software which will fulfill all the criteria of the BLOOMS taxonomy.



➢ Attribute description

✓ LECTURE

We can see the lecture of particular topics. It will provide the dictionary facility.



- ✓ **RESOURCE**

The software will provide all the information and data of any particular topic. If necessary, learners can search more information through internet.

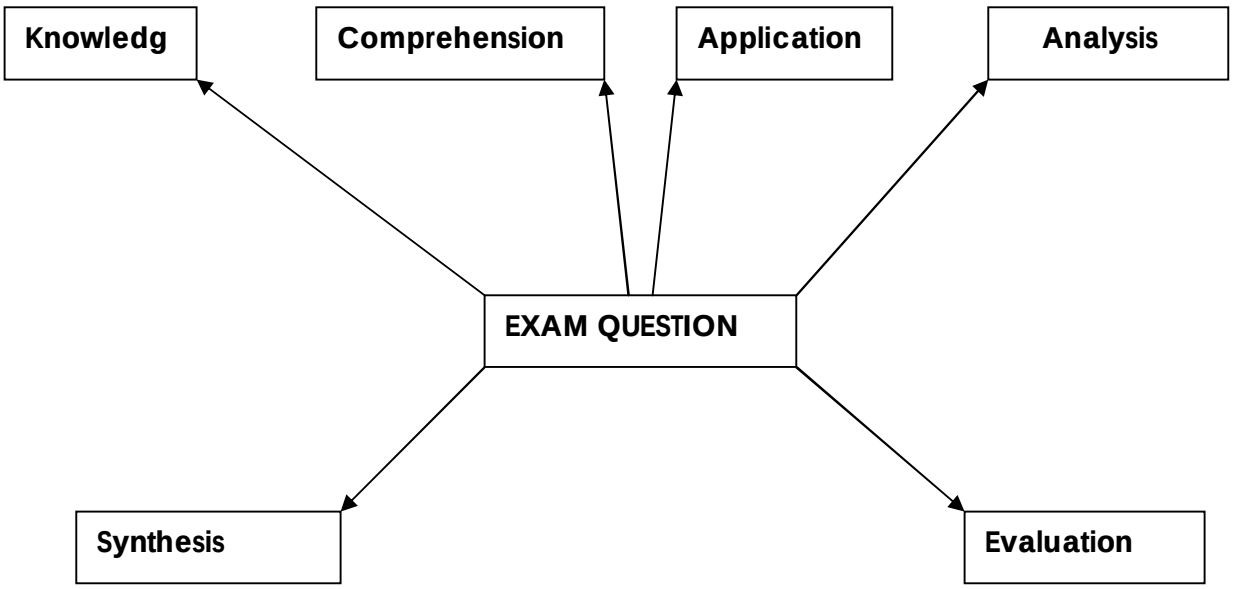
- ✓ **PROBLEM SOLVING REPORT**

The software may contain some solved problem , which will help the learners.

- ✓ **EXAM SYSTEM**

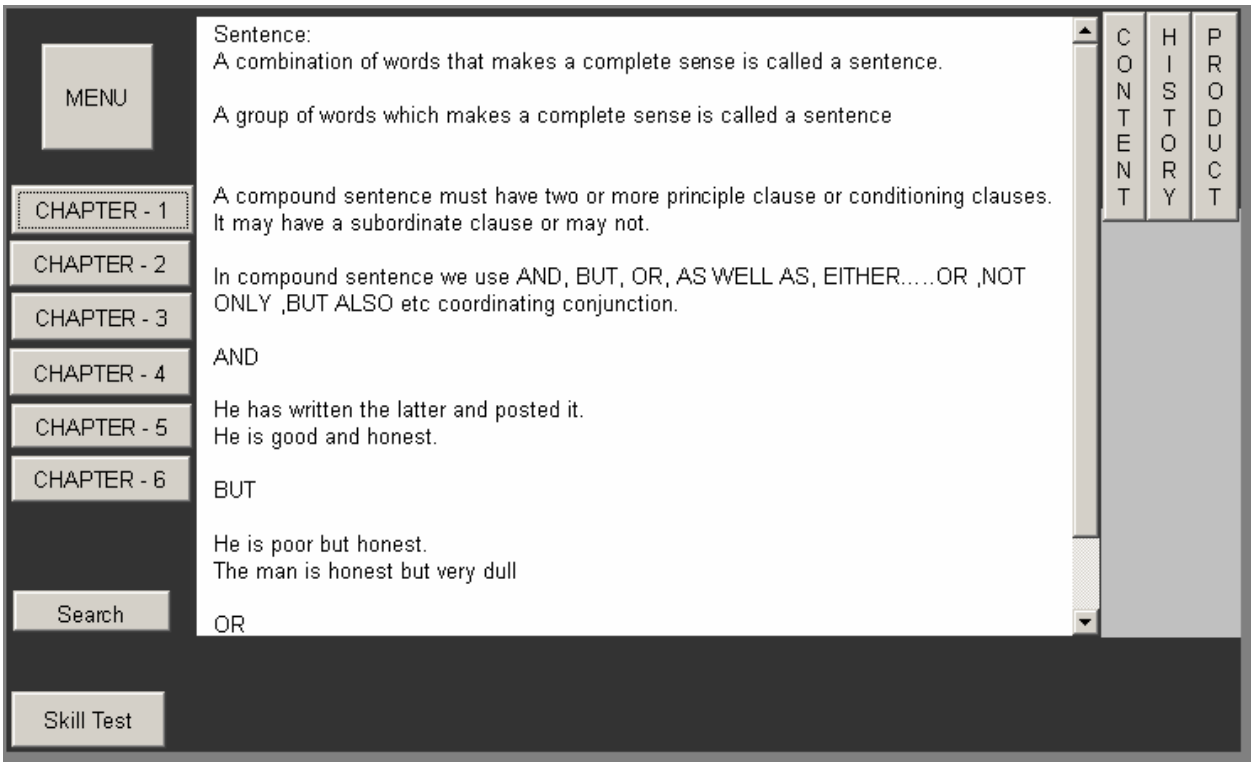
This is the most important part of the software, because through this attribute the learner can evaluate himself.

For this, we divide the question pattern in six classes according to Bloom's taxonomy. So the learners can evaluate themselves according to the six categories in Bloom's taxonomy of cognitive activities.

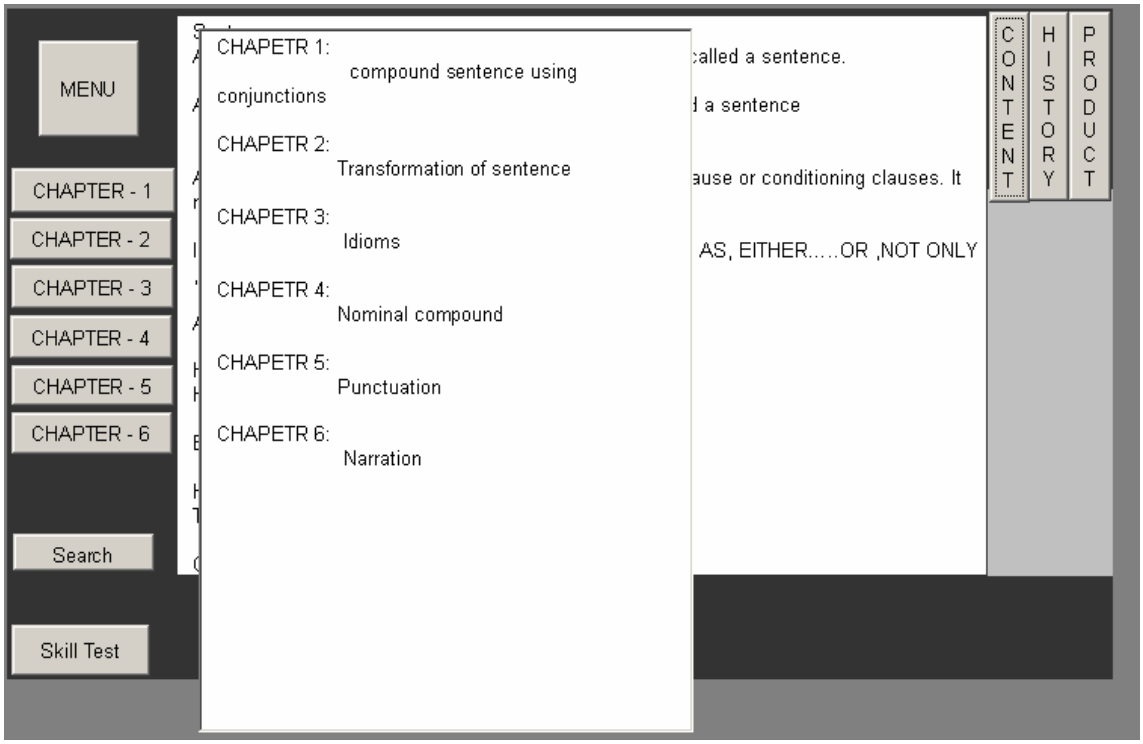


PROTOTYPE OF THE PROPOSED SOFTWARE

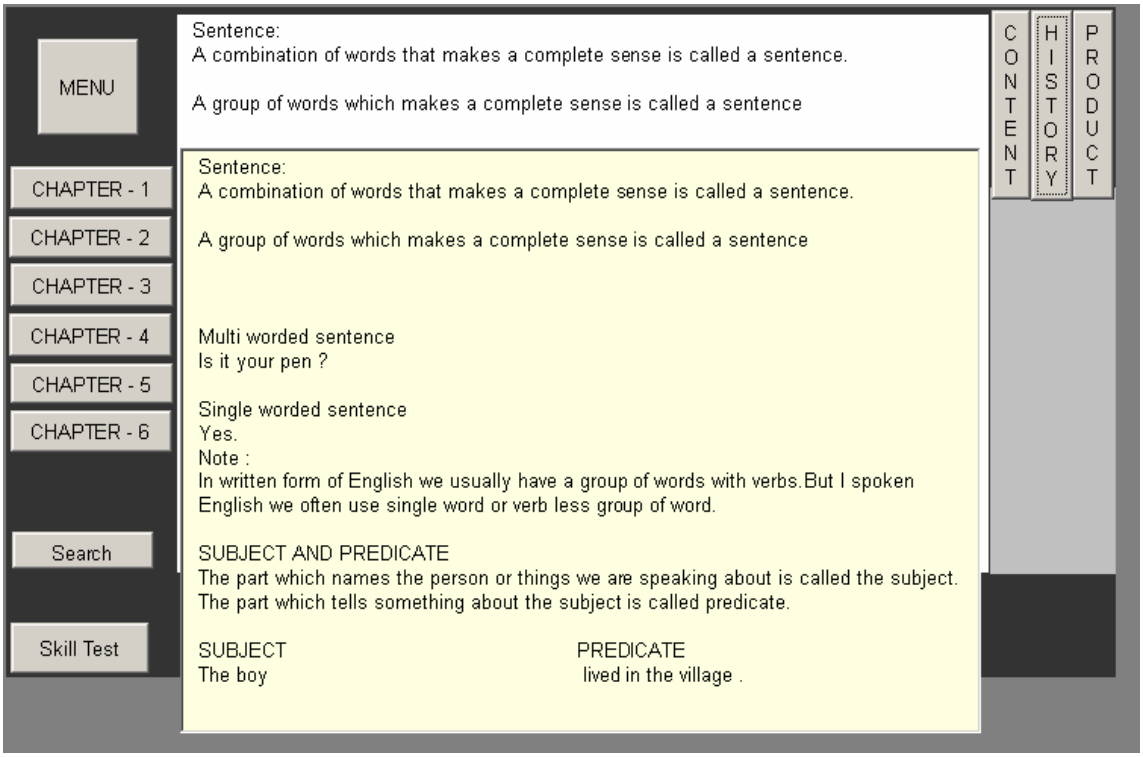
This is the interface of the software. Here Chapter 1 to Chapter 2 contains the lecture of a particular topic



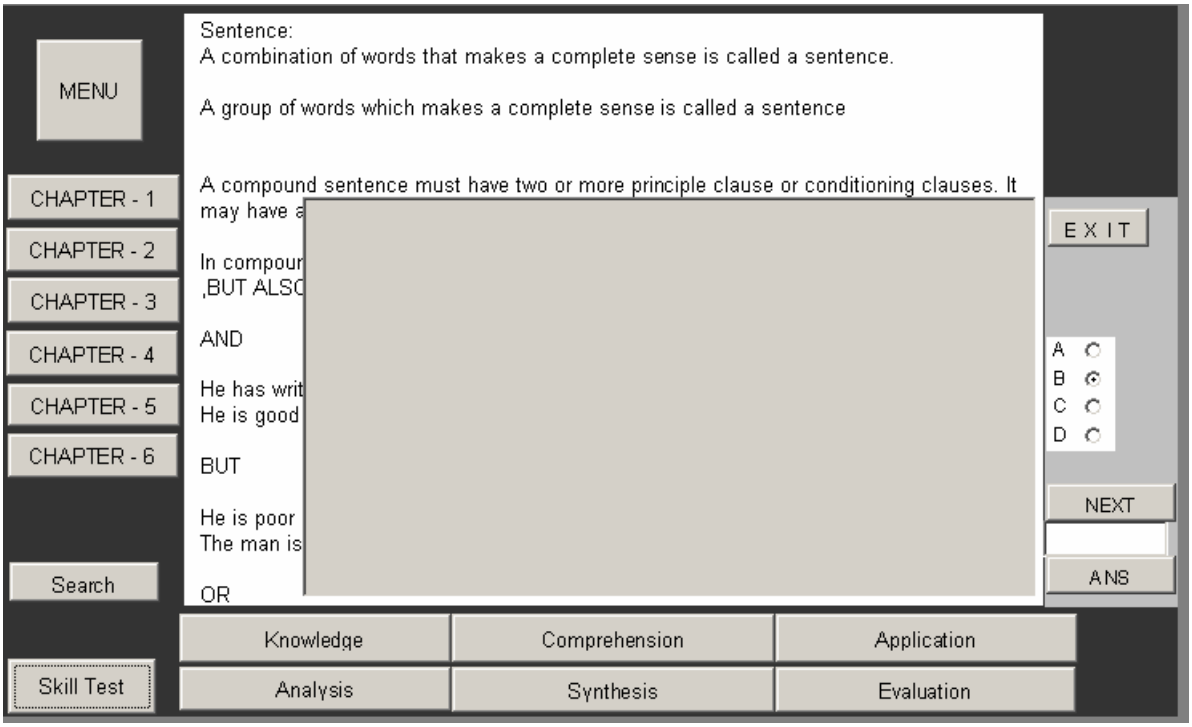
Here lecture of chapter one has been shown. If we click Chapter 2 or any other button corresponding lecture will be shown.



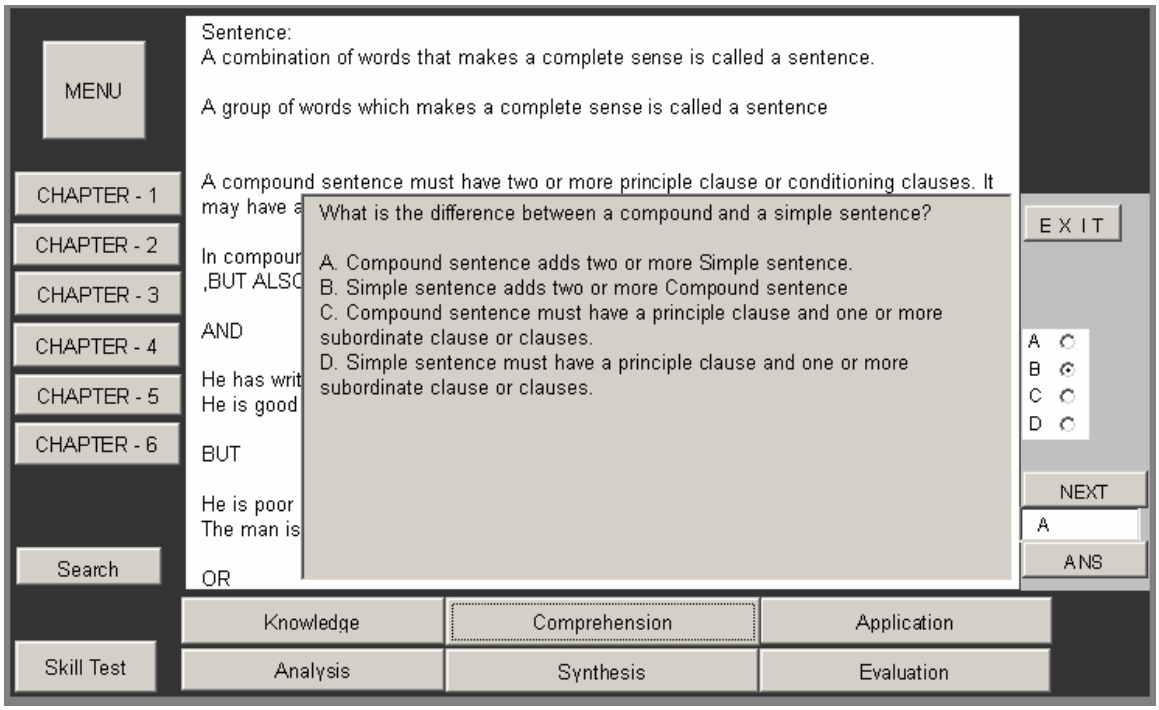
CONTENT button will show the entire chapter's content with brief description.



If we click History button , it will show all the information of a particular topics which are not in the lecture .



If we click the SKIL test button, six categories of question pattern option will come. (Knowledge, comprehension, Application, Analysis, Synthesis, Evaluation) which will help the learners for assessment.



Here comprehension type question has been shown. Learners can answer the question by selecting A/B/C/D. ANS button will generate the correct answer.

SECTION FOUR

EVALUATION AND RESULT

❖ Sample

Example of taking an objective and creating questions and activities from each of the different levels:

Objective: The student will write a compound sentence using conjunctions. Questions and Activities that might follow:

Knowledge

1. What is a compound sentence?
2. List the conjunctions that you could use to combine sentences into a compound sentence.

Comprehension

1. What is the difference between a compound and a simple sentence?
2. Create a compound sentence from two given simple sentences.

Application

1. Write one example of a compound sentence.
2. Use the conjunction "and" to form a compound sentence.

Or

Which one is a compound sentence?

Analysis

1. Identify reasons for using conjunctions to form compound sentences.
2. Compare the three conjunctions "and", "or", and "but" and explain the differences between each.

Synthesis

1. Write a paragraph that uses each of the three conjunctions to form a compound sentence.

Or

Which one is the correct paragraph?

Evaluation

1. Trade paragraphs with a partner and look for 3 compound sentences using "and", "or", and "but".
2. Determine whether or not your partner understands writing with compound sentences and be prepared to defend your answers.

- **Evaluation with reasons**

CATEGORY	KEY WORDS	EXAMPLE
Knowledge: Recall data or information.	**Key Words**: defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.	**1. What is a compound sentence**? (Here we are define / describe / identify a compound sentence.) **2. List the conjunctions that you could use to combine sentences into a compound sentence.** (Here we are listing the conjunction.)
Comprehension: Understand the meaning, translation, interpolation, and interpretation of instructions and problems. State a problem in one's own words.	**Key Words**: comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives **Examples**, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates	**1. What is the difference between a compound and a simple sentence?** **2. Create a compound sentence from two given simple sentences.** For question 1 & 2 we have to Understand what is a simple and compound sentence and what is the difference.
Application: Use a concept in a new situation or unprompted use of an abstraction. Applies what was learned in the classroom into novel situations in the work place.	**Key Words**: applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.	**1. Write one example of a compound sentence.** **2. Use the conjunction "and" to form a compound sentence.** We are using our concepts that is the knowledge of simple sentence, compound sentence and conjunction and applying them by forming a sentence using “and”.

CATEGORY	KEY WORDS	EXAMPLE
Analysis: Separates material or concepts into component parts so that its organizational structure may be understood. Distinguishes between facts and inferences.	**Key Words**: analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.	**1. Identify reasons for using conjunctions to form compound sentences.** **2. Compare the three conjunctions "and", "or", and "but" and explain the differences between each.** Here we have to understand the organizational structure of a compound sentence and distinguish between facts and inferences of conjunctions ("and", "or", and "but").
Synthesis: Builds a structure or pattern from diverse elements. Put parts together to form a whole, with emphasis on creating a new meaning or structure.	**Key Words**: categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes	**1. Write a paragraph that uses each of the three conjunctions to form a compound sentence.** Here we have to build a structure of a compound sentence and categorizes the conjunctions ("and", "or", and "but") and create a new structure of using conjunction to form a compound sentence.
Evaluation: Make judgments about the value of ideas or materials.	**Key Words**: appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports	1. **Trade paragraphs with a partner and look for 3 compound sentences using "and", "or", and "but".** **2. Determine whether or not your partner understands writing with compound sentences and be prepared to defend your answers**.

Future implementation

A learning process will be more efficient if the learners can apply it during learning something. So if the software can provide some real life base problem then the learning process will be more effective.

Another thing is, if it is possible to get fast feed back other than searching technique, the learning process will be faster.

In future we will provide these sorts of facilities so that the learners would be more benefited .

References

Bloom's Taxonomy

http://www.teachers.ash.org.au/researchskills/dalton.htm#Application

http://www.skagit.com/~donclark/index.html

http://www.officeport.com/edu/bloomq.htm

http://www.coun.uvic.ca/learn/program/hndouts/bloom.html

http://www.learningandteaching.info/teaching/contents.htm

http://www.coun.uvic.ca/learn/program/hndouts/bloom.html

http://faculty.washington.edu/krumme/guides/bloom1.html

http://en.wikipedia.org/wiki/Bloom's_Taxonomy

http://eduscapes.com/tap/topic69.htm

http://www.learningandteaching.info/learning/bloomtax.htm

http://web.uct.ac.za/projects/cbe/mcqman/mcqappc.html

E-learning resource

http://www.aace.org/default.htm

http://www.alt.ac.uk/

http://www.jiscmail.ac.uk/lists/ELEARNING.html

http://www.jiscmail.ac.uk/lists/EVALUATION-OF-ONLINE-LEARNING.html

http://www.jiscmail.ac.uk/lists/NETWORKED-LEARNING.html

http://www.british-learning.com/

http://www.e-learningcentre.co.uk/

http://www.epsrc.ac.uk/CMSWeb/Downloads/Other/E-learningResearchAgenda.doc

http://www.le.ac.uk/cc/rjm1/ened/

http://mime1.marc.gatech.edu/MM_Tools/evaluation.html

http://www.accessart.org.uk/immersive_learning/ilplaunch.htm

http://www.learninglab.org.uk/asp/homepage.asp?ses

http://www.masie.com/masie/default.cfm?page=default

http://www.brookes.ac.uk/services/ocsd/4_resource/t&lonlin_eval.html