ELEXS: E-Learning Based on Expert System Shell to Enhance Problem-Solving Skills

Osama M. AL-Kadurie

Ph.D. in AI & Expert Systems,
Asst Professor of computer science in United Arab Emirates University,
BUSA-MIS Department. P.O. 18426, AL-AIN,UAE,
Email: osama.alkadurie@uaeu.ac.ae

ABSTRACT

Computer assisted learning "student-to-terminal" remains a major challenge fur the educational policy makers. The computer plays an important role in the learning process if used in an encompassing learning environment individualized to the learner. The system _features and its design philosophy based upon the artificial intelligence technique. The primary aim is to provide tutoring, functions that achieved certain pedagogical aims. The overall motivation of the system developer is *to see how much could be achieved in educational terms by introduction of this type of trainee get maximum benefit from the system.* ***ELEXS*** *would seem to have the potential to help teachers manage their classrooms, design and plan instructional activities. improve teaching strategies, and diagnose student learning problems across all curricular areas. The process of* making explicit cognitive, strategies such *as these has been shown to enhance meta-cognitive functioning and promote increased problem-solving performance. The overall conclusion is that* **participants** *learn best when the software is a part of their learning environment as well as to provide consultative assistance to preserve teachers in science concept pedagogy and engender in participants an improved self-confidence toward their own ability to successfully teaching science content*

INTRODUCTION

Computer offers self study to learn specific content and provides immediate feedback as well as recording clinical experiences. It can provide a comprehensive literature review which can be broadened if linked to other learning institutions.
Mastery of model science-teaching strategies for enhancing learner science concept understanding. The computer plays a strategic role in enhancing the learning and recall

mechanism and promises to have an even more important role when more sophisticated software's are developed.

Some unique characteristics of the computer are:

1- Mastery learning
2- Individualized content
3- Self-paced instruction
4- Personalized evaluation
5- Opportunity for testing ideas
6- Privacy in the learning environment

HISTORICAL BACKGROUND

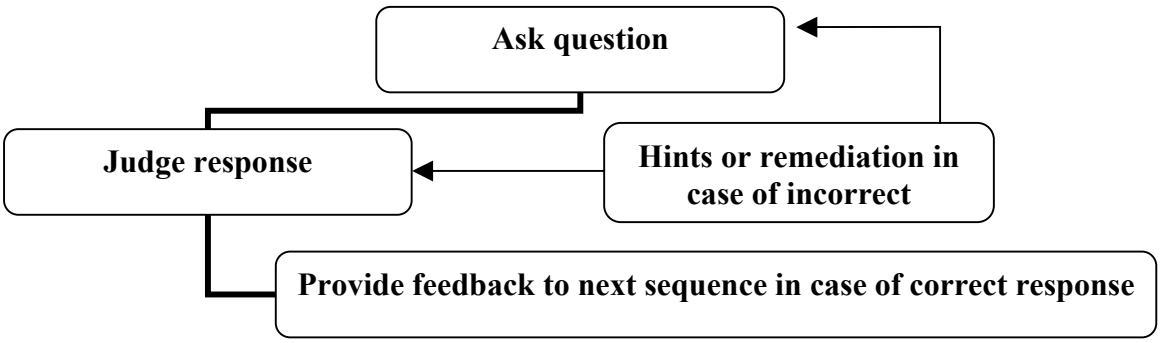
Traditionally, the following three categories of software's are well known:

CAI: computer assisted instruction which enables all learners to have an opportunity to learn by interaction with their tutor through a computer software, the tutor gives immediate feedback.

CMI: computer managed instruction attends to administer a whole course or part of it.

CAA: computer assisted assessment refers to formal assessment of learner performance there is no opportunity for self assessment or feedback.

Therefore, the typical procedure for a tutorial **CAI / CAL** consists of:



THE ART OF SCIENCE:

ICAI / ITS Intelligent Tutoring Systems domains includes:

ITS (Cognitive Science) = Computer Science (AI) + Psychology (Cognitive Science) + Education & Training (CAI)

METHODOLOGY

Typically, one procedure for measuring competence in basic sciences skills are testing constantly and routinely. The student to be tested uses various means and techniques to prepare him/herself for the test, including seminars, tutorials, self-testing, self-learning etc. This presentation will discuss the interaction between the learner and the computer the computer's role is in preparing and instructing the student. Before any computer can be used as an education tool, the learner must be computer literate. Basically, student is unprepared to handle the computer sphere. The implication of the preceding research in science teaching can be viewed alternately from the standpoint student. or teacher learning of science concepts and methods. Improving the quality of science instruction involves combining expanded science knowledge, concept teaching pedagogy, and classroom procedures that facilitate science process skills through the integration of hands on science activities with technology-based software environments focusing upon knowledge construction and application. ELEXS is based on a hierarchical set. of requirements. Work began an implementing ELEXS during the fall semester of 2002. a prototype of ELEXS and the user interface for the system will be implemented. We anticipate that a number of bugs and areas for improvement will be identified by these first uses of the preliminary system.

OBJECTIVES

l- Mastery of model science lesson teaching strategies incorporating student activities for enhancing science understanding.
2- To validate the use of an expert system designed to provide consultative assistance to preserve teachers in science concept pedagogy.
3- Mastery of enabling microcomputer software for lesson materials production.
4- To train presence participants to analyze and classify concepts in elementary science textbooks select the appropriate concept. teaching and expansion / application teaching sequences.
5- Demonstrated mastery of professional leadership strategies for science advocacy.
6- To engender in participants an improved self-confidence toward their own ability to successfully teaching science content.

STUDENT'S MODEL and STUDENT'S KNOWLEDGE BASE

Students should be able to interact with the expert system shell with considerable ease after a short period of familiarization. The student model we propose is incorporating both concepts buggy and overlay model. There is an environment which must be constructed for the student model and which consists mainly of same knowledge data bases:

1- **Knowledge data base** of the taught domain.

2- **Cognitive data base** containing the skills a student may have.

3- Bad knowledge data base containing the possible misconception that students may have.

The environment also contains:

1- Tutorial strategies.

2- Diagnostic rules.

3- Therapy rules.

4- Rules of intercommunication.

The description of the knowledge level of a student. for understanding the new domain. The identification of the student level for this identification the student is submitted to tests. By the answers given to these tests. the ability of the student to proceed to the new domain or not is clarified. The introduction of the student is the new domain and the linking of this to the already known.

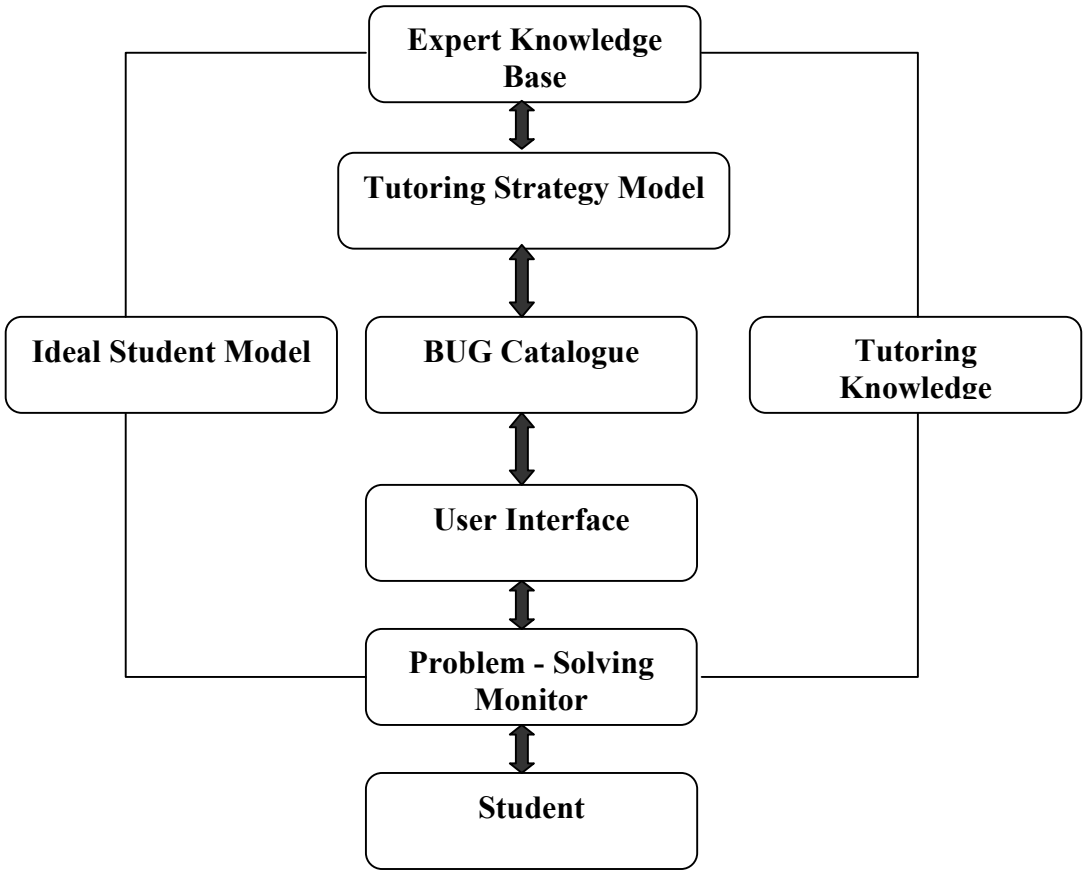
There are two main concepts of a student model:

1- The **buggy model** which encodes information about bugs and misconceptions.

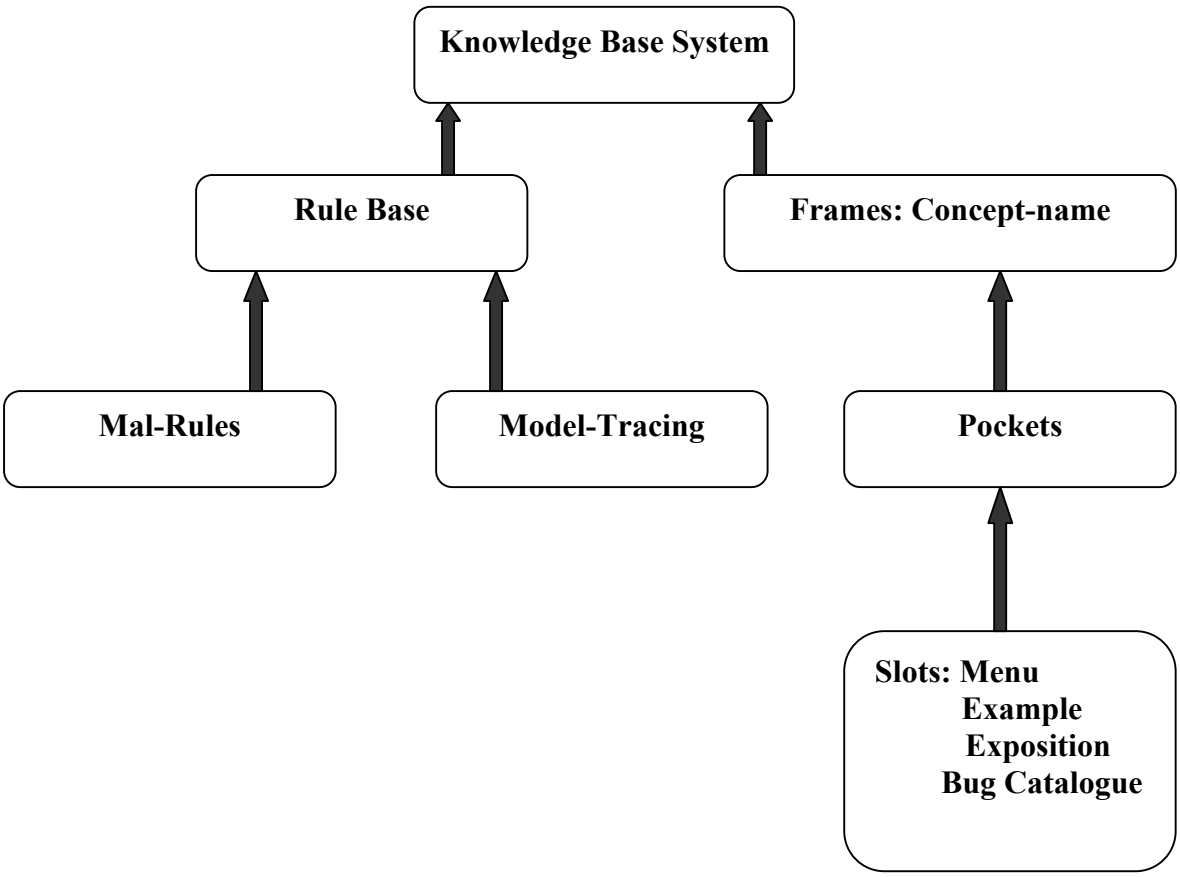
2- The **overlay model** the knowledge is presented and the student is tested on both correct and incorrect.

Students should create their own knowledge bases by using expert system shells, that expert systems do have available role to play in the classroom to help improve teacher productivity and to enhance student learning. .Meaning fully, recognizing student. flaws in intuitive thinking, and providing guidance toward a scientist's view of the discipline.

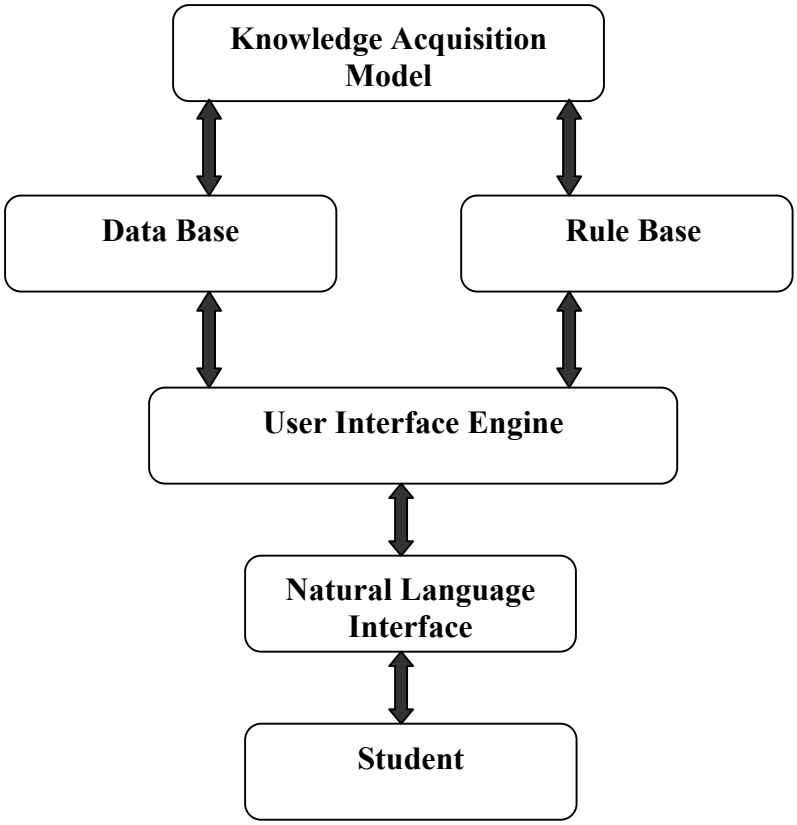
The Design of ELEXS Expert System Shell



ELEXS Knowledge Base Representation



The outline of the production-type knowledge system of ELEXS expert system:



ELEXS educational packages contains:

l- Drill and practice
2- Tutorial
3- Simulation programs
4- Discovery
5- Problem-Salving (either written by tutor or by the student)

***ELEXS Coaching Strategy module consists of f* our modes:**

1- Model-based remedial mode

2- Model-based re-teaching mode.

3- Model-based coaching mode.

4- Student profile mode.

Functions of ELEXS for the student Model could be Classified into Six Categories:

1- Corrective: to help eradicate bugs in the student's knowledge
2- Elaborative: to help correct 'incomplete' student knowledge
3- Strategic: to help initiate significant changes in the tutorial strategy other than the tactical decisions of 1 and 2 above.
4- Diagnostic: to help diagnose bugs in the student's knowledge.
5- Predictive: to help determine the student's likely response to tutorial actions.
6- Evaluative: to help assess the student or the ITS.

GENERAL CONCLUSIONS

1- The overall conclusion is that the student learns best in a human environment, and that software should be viewed as contributing to the human learning environment of the student.

2- The motivation of the system developer is to see how much could be achieved in educational terms by the introduction of this type of technology to the classroom/laboratory.

3- The overall philosophy of the design of ELEXS follows an **"EVOLUTIONARY"** strategy which cuts across four different tutoring strategies. These strategies are aligned in ascending order with regard to their teaching behaviour and levels of sophistication.

4- The **FUZZY TREE** stemming from the ELEXS enables the information present in the interaction with the student to be represented, in order for a knowledge model *of* the student to be subsequently built. As a consequence, it is possible to create a student's performance model by pinpointing a student's misconceptions, by which tutor could highlight the area of weaknesses, those areas which are *not* yet tackled, as well as areas which have been successfully tackled.

5- Recording of the problems and progress *of* individual students are maintained. These would serve as high quality data sources to be used in the development *of* student models for the tutor as well as being used to improve the teaching strategies, in order to give the student much more effective feedback and tutoring.

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