

Implementation of Different Tutoring System to Enhance Student Learning

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Abstract: - There exists an effective relationship between teaching, learning and technology. Teaching and Learning are two complementary and overlapping activities so whatever has been learned by student should be taught in very effective way and vice versa. Tutoring can be done in three ways such as No Tutoring, Computer Tutoring and Human Tutoring. No Tutoring can be achieved by student on its own without feedback. Computer Tutoring can attain by Intelligent Tutoring System (ITS). Human Tutoring implements the concept of scaffolding. Scaffolding seeks the answers to questions 'What' skills has been learnt on the 'How', 'Why' and 'When'. In this paper, the tutoring system has been discussed.

Keywords: - Computer Tutoring, Intelligent Tutoring System (ITS), Human Tutoring, Scaffolding.

I. INTRODUCTION

In 1996 various researchers concludes, after performing a research, based on cost effectiveness, learning effectiveness and design of computer based instructions that, "future research will include the study of the relationship persists between the teaching, learning and technology". In the current scenario, the technology had made a remarkable progress from last few decades. Still the use of technology in the teaching and learning process is a challenge. Teaching and learning has been considered as two complementary and overlapping activities which makes a great impact on the quality of higher education. The enhanced learning of the student depends on two factors which are institutional structures and support and the quality of student. A model of learning includes factors organized into three categories such as inputs, processes and outputs. Inputs include the factors like the variation of characteristics in students and teachers both. Student variation can be observed in the difference of the background, ability and motivation of the various students. The pedagogical beliefs held by teachers and students are also different. Processes includes the

construction of knowledge when opportunity meets, quality and structures of the learning resources came across, teacher support, collaborative support, metacognition support and ownership of the task. Outcomes include the higher order thinking skills, mental models and knowledge acquired. The ultimate success of the student highly depends on the motivation and commitment to the learning. The learning process can be accomplished by three types of effective teaching process such as human tutoring, computer tutoring and no tutoring. No tutoring refers to the knowledge acquired by various means such as reading, problem solving etc. without feedback. [1]

II.COMPUTER TUTORING

One of the basic implementation of computer tutoring is the development of the Intelligent Tutoring System (ITS). ITS can be defined as computer learning environments which is capable to direct the students along a particular domain of knowledge through task solving ability customized according to the needs of the student. It incorporates the computational model in the learning sciences, cognitive sciences, artificial intelligence, computational linguistics, mathematics and various other fields. The ITS employs an educational software which incorporates the concept of artificial intelligence comprehends the students' work, generates the feedback and the hints along the track. This software collects the information on a specific students' performance, infers about strengths and weakness and recommends the additional work. The elementary functions of the Intelligent Tutoring system are as follows:

- To exhibit the information, to be learned.
- To interrogate or assigns learning task.
- To provide feedback and hints.
- To solve the queries posed by students.
- To offer prompts to provoke motivational, cognitive or metacognitive changes.

To accomplish the specified functions, it has been categorized in four modules which are as follows:

- Domain model
- Teaching model
- Student model
- User Interface or Learning Environment

The relationship between these models can be depicted as:

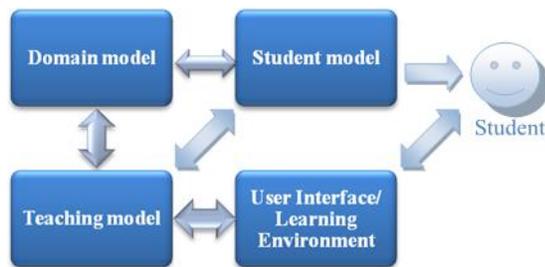


Figure 1 Components of Intelligent Tutoring System

The major issues of the IT ARE which is to be resolved can be stated as: "What to teach?" and "How to teach?" All the models, which constitute the Intelligent Tutoring System, are concerned with these two issues. The domain model deals with the solution of the issue "What to teach?". It depicts the knowledge which is inspired by the student in order to learn it. This model contains set of logical propositions, natural language statements, production rules or any valid knowledge representation format. It can be inferred that the domain model is representation of domain knowledge. Thus, good design principles encompassed while designing the model will leads the system to adopt appropriate teaching methods. The domain model seeks the solutions to novel or complex problems so that it assists the students to practice the new problems. The Student model deals with the issue "How to teach?". It comprises the analysis of the relevant learning parameters of the student knowledge on the basis of the response to the questions or other interaction with the learning environment. It is the abstract representation of the student. The student cognitive ability should also be incorporated in the student model. The transparency of the model should be maintained with the students, as it enhances the performance of the student by making them aware of the performance. The outcome of the student model should be disclosed to the students in very

expressive, understandable and elaborated way. This model should be loosely coupled and must be highly cohesive. The teaching model also deals with the same issue as Student model "How to teach?". This model plays an important role in Intelligent Tutoring System. It is responsible for the entire decision making process by communicating with the other models of the system. This model is composed of various teaching strategies which can be applied to different students appropriate to them. Basically, the teaching model is fixed and can only be amended by the system developers. It consists of three components: Topic Planner, Material Selection Module, and Result Analyzer. Topic Planner selects the best course plan i.e. different order of the topics is termed as course plan suitable for different student. Material Selection Module helps to retrieve the suitable learning material for the selected topic and can be transformed to the document for the presentation of the study to the student. Result Analyzer examines the feedback obtained in terms of students' tests results. User Interface is the Graphical User Interface (GUI) can be considered as the entrance to the system. All the study materials, test sets, results can be presented using the interface designed. The student can interact with the system through this interface [2].

III. HUMAN TUTORING

Scaffolding is applied commonly in human tutoring. It is techniques which encourages the student to optimize the learning process with the support of the teacher. The students involved in learning process, are supported by the instructors until they are capable enough to apply new skills and strategies to solve the complex problems. According to educationist strategist Verna Leigh Lange in 2002 defined scaffolding, "Development of instructional plans to lead the students from what they already know to a deep understanding of new material". The figure below depicts the implementation of scaffolding in teacher-student relationship: According to Saye and Brush in 2002 expressed the scaffolds in two forms such as Hard and Soft scaffolds. Hard scaffolds can be explained as "The static supports provided to the student to solve typical difficulties of the attempted task, which is anticipated and planned in advance." Soft scaffolds can be described as "The dynamic and instant support offered to the student based on student's responses". Hannafin et. al.

has stated four types of scaffolds such as: Metacognitive scaffolding, Procedural scaffolding, Strategic scaffolding and Conceptual scaffolding.

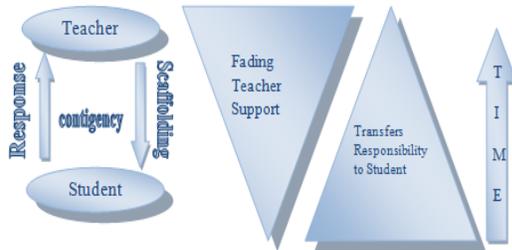


Figure 2 Role of Scaffolding in Teacher Student Relationship.

Metacognition is a type of Self-Regulated Learning, which deals with the ability of reasoning, managing and redirecting personal knowledge for the learning. Metacognition can be decomposed into two components such as knowledge and regulation. Metacognitive knowledge refers to the comprehension of the working of the mind. In other words, it is awareness and knowledge about cognition metacognitive can be categorized into three components: knowledge of person variables, knowledge of task variables and knowledge of strategy variables.



Figure 3 Types of Scaffolding

Knowledge of person variables refers to the knowingness of individual's thinking abilities as well as thinking abilities of others, at the same time the relationship between the thinking abilities of individual and others so that the person can make the best decision. Knowledge of task variables deals with the knowingness of information loads, abilities and methods of explaining the content and limitation of abilities so that complex problems can be comprehended in easier way. Knowledge of strategy

variables includes knowingness of the various techniques for solving the complex problems and choosing the best technique for that specific problem [3]. Metacognitive regulation refers to the individual procedural knowledge in order to control the process of learning which comprises of four components: Planning, Monitoring, Evaluating and Revising. [3] Thus, Metacognitive scaffolding is implemented to cause the activation of metacognitive thinking and process which includes metacognitive regulation components. So, the metacognitive scaffolding comprises of three stages which are Setting, Construction of new knowledge and Evaluation phase. Setting phase deals with the learner discovers the knowledge representation inadequate to solve the problem when encountered with the complex problem situation. Construction of new knowledge is the alteration caused in the mental structures of the learner during attempting the complex problem. Evaluation phase requires the feedback on the action implemented which makes the strong foundation for new adaptation. Metacognitive scaffolding is helpful for the learners to develop problem solving plans, monitor and evaluate their progress [3]. Procedural scaffolding deals with efficient utilization of the resources and tools for the students learning to accomplish a given task. According to Echevarria, Vogt and Short (2000), educationist must follow a procedure of explicit teaching, modeling, practice and application which constitutes a procedural scaffolding. Procedural scaffolding can also be attained by grouping configurations, so that learner can develop proficiency and skills in specific task. The student independence can be achieved gradually, initially the whole class is guided, and then the small group of the class so that more specified guidance can be given. After this paired groups are formed so that guidance can be more focused and finally individual can perform the work independently. Conceptual scaffolding directs the students to grasp the knowledge related to the context during learning process. The concepts developed while learning are responsible to create structures like outlines, knowledge maps, hints and clarifying examples. This structure can be formed from the following concepts like:

- The persistence of the relationships among the concepts.

- The outline of feature of the ordinate-subordinate relationships.
- The information and hints provided by the experts.

The benefits of knowledge maps are as follows:

- The cognitive load is reduced.
- The higher order learning such as analysis, synthesis and evaluation is facilitated.
- The various paths for knowledge retrieval are provided.
- The communication of knowledge is supported.
- The students having low prior knowledge and verbal ability are benefitted [5].
- The students can easily remember the central ideas with the help of these maps as compared to the text

Strategic scaffolding is dynamic in nature, during the learning process, the learner can be supported by alternative learning pathways and tailored instruction to meet the diverse needs of the student. The main requirements of this type of scaffolding is that, educationist must be aware of the student learning preferences, level of prior knowledge and ability to make frequent communication with student. This type of scaffolding provides Just-in-Time supports to attain higher level of understanding. The Just-in-Time includes the following strategies such as:

- Use of alternative explanations.
- Hints
- Probing Questions
- Worked examples
- Expert advice
- Supplementary resources

IV. CONCLUSION

The Intelligent Tutoring System (ITS) plays a vital role in tutoring. The concept of artificial intelligence has been used in IT'S which involves Domain model, Teaching model, Student model and User Interface/ Learning Environment. Although Human Tutoring uses the concept of scaffolding but Computer Tutoring may also make use of scaffolding for the effective learning. The Intelligent Tutoring System can implement scaffolding. The four types of scaffolding which is metacognitive, procedural,

conceptual and strategic can be applied to IT'S to enhance the learning process.

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