

DEVELOPING INTELIGENT TUTORING SYSTEM (ITS) FOR INSTRUCTIONAL MEDIA TO TEACH "GRAPH THEORY"

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Abstracts

Intelligent Tutoring System (ITs) is one of an interactive application programs used as a media to deliver informations or a media to evaluate the learning process. Furthermore, ITS can be used as a media for students to study independently. The application of ITS denotes one of the alternative methods that is attractive and interesting to assist students to learn independently. ITS used to teach Graph Theory is designed based on the needs of students and teachers using Macromedia Autoware. ITS provides informations in the forms of texts, sounds, visuals, and animations. Besides, this programs also provides the evaluations in the forms multiple choice to measure the understanding of the Graph Theory. In each step of the evaluation, the feedback is presented in the forms of true or false to respond the students' answer. This programs is implemented to 25 students. 96% of the respondents answer that this program is interesting and attractive to assist the teaching learning processs. Besides, 90% of teh respondents state that this program overcome from the boredom they found in the classroom.

Keywords: ITS, For Instructional Media

1. Introduction

The development of Indonesia has brought to new paradigms since the era of reforms blown since 1987. This situation forces to the new orientations in the educations to realize the newly-born Indonesia.

In line with the situation, the development of Information Communication Technology (ICT) has influenced all aspects of life, including the education field. This situation will support the needs of reforms and new education system.

One of the aspects that should be given attentions is the changing of paradigms in the learning process, from teacher oriented to learner oriented.

The use of computer (including internet) as a means to support teaching learning process based on the characteristics of computer itself in which it is interactive and connect the users in different locations when it is connected to the network stations. This will also provide communications facilities synchronically and unsynchronically, so that this will enable to conduct the learning process that is oriented to the students.

2. Theoretical Background

Intelligent Tutoring Systems (ITSs) is one of the computer-based instructional systems with instructional model of the materials given and the strategies used in teaching learning process (Wenger 1987, Ohlsson 1987). They make conclusions on the mastery of a student toward a certain topic or assignment assigned to the students dynamically. The content models (or basic knowledge, or expert systems, or simulations) provide the ITS scales, so that students can "learn by doing" realistically. These models enables the content to be arised "on the fly". ITS enables the teaching instructions to combine the ideas, where students are able to answer questions and they can control the learning process. The instructional model enables to get closed to the users through the individual instructions with competence paedagogics.

ITS can be defined as a system that implement a sophisticated technique, just like describing the revisions in the teaching or learning.

However, the current issue called ITSs as a "care" teaching system (Self, 1999). Self describes "care" because ITS is sensitive to what students want to know, to what students doesn't understand, and to what they want to do. In other words, ITS can be used by students to learn individually.

In this study, the writers is interested to design cognitive-based tutorial intelligent system. This will help the learning process by providing problem solutions. The main job of this program is to accomodate problems and to provide assistance in the forms of feedback to the progress of the students.

According to Kemp and Dayton (1985), there are 5 methods used to describe computer-assisted learning namely: tutorials, drill and practice, problem solving, simulations, and games.

Tutorial method is a learning method which encompasses suitable explanation, formula, principles, charts, tables, definitions of terms, exercises and branching. In this tutorial interaction, the information and knowledge are presented in communicative ways, as if there is a tutor which assists students and give direct instructions to them.

Drill and practice method assumed that the basic concepts have been mastered by students and now they are ready to implement the formulas, work on with concrete cases, and explore their memory toward the learning materials given. The main function

of drills and practices in the computer-assisted learning program is to give as many practices as possible to the students..

Problem solving is a high-form of drills. The tasks encompass steps and processes presented to the students who use computer as a tool or source to seek solution. In good problem solving program, computer works side by side with the students' approach toward problems, and analyzes their mistakes.

Simulation, with real life situation experienced by the students, aims to achieve global understanding concerning the process. Simulation may also be applied to train skills, such as learning how to fly plane or motorcycling, or to comprehend system in economy, ecology, and other fields of science.

Games when designed carefully may train students' competitiveness to motivate and to improve their learning. As simulation, the good learning games are difficult to design and the designer himself must be certain in the effort to propose the atmosphere of the game, integrity of learning objectives still retained.

Effectiveness of Computer-Mediated Learning Strategies

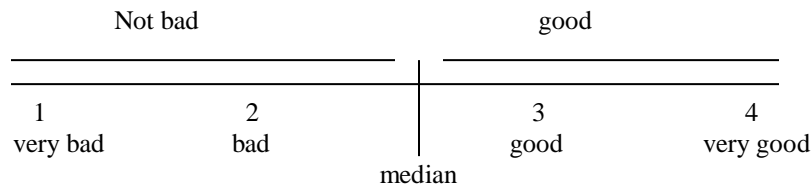
Roblyer and Hanafin (1988) classify the characteristics of computer-assisted learning as the following:

1. Computer-assisted learning program is effective since this program is assigned based on instructional purpose. It is easy to design in it and can be measured. Therefore it is readable by learning material designers, students, and lecturers.
2. Computer-assisted learning program is designed in accordance to students' characteristics. Computer-assisted learning program is specifically designed by determining the level of students' knowledge/skills.
3. Computer-assisted learning program is effective in maximizing interaction.
4. Individual computer-assisted learning program requires potency to organize the learning activities in accordance to students' needs.
5. Computer-assisted learning program is very effective in maintaining students' interest, since it is competent to combine various media, motion pictures as printed information.
6. Computer-assisted learning program is effective since it is able to approach students positively.
7. Computer-assisted learning program is effective in preparing various feedbacks.
8. Computer-assisted learning program is effective in evaluating adequate performance.
9. Computer-assisted learning program is effective because it fits with the learning environments
10. Computer-assisted learning program is effective since it uses maximum potency of computer resources.
11. Computer-assisted learning program is effective since it is designed in accordance to the principles of learning designs.
12. Computer-assisted learning program is effective since the whole program has been evaluated.

3. Methodology

The subject of the research are university of Gunadarma students. The Instrument that is used is likert scala questionnaire with the for kind of response, very good, good, not bad,

and bad. The aspect that is scored by the student are : performance quality, Material performance and the last is comment and suggestion. According to the research instrument which is set for this research, the qualitative data is analyzed descriptively, the interpretation that is shown is like the picture below



4. Data Analysis and Results

The try-out of the program is given to 29 students of Computer Science Department, Gunadarma University.

Based on the responses of the students, it is identified that from the quality point of view the average score is 2.8 (table 1). This score is in the above or in the right position of median in Likert Scale. So, it can be said that the quality of the program is good. Meanwhile, among other aspects, the clarity of the instructions, and the clarity of the voice or narration got the highest score.

Table 1. Students' Response on The Performance Quality of the Program

No	Statements	Average Scores	Median Scores in Likert Scale
1	Clarity of the instructions	3.0	2.5
2	Text readability	2.9	2.5
3	Quality of the pictures	2.7	2.5
4	Animation	2.6	2.5
5	Colour compositions	2.8	2.5
6	Clarity of the noise or narrations	3.1	2.5
7	Supporting music	2.5	2.5
	Average Score	2.8	2.5

In general, the presentation of the materials also got the 2.8 or very good (table 2). Although all aspects of the materials presentations are said to be very good, the researchers need to pay attention to the feedback made by students in each exercise. Some of the students propose that a feedback should be given right away for each wrong answer, and not at the end of exercises. Hence, students can make immediate corrections for the mistakes made. Certainly, this should be considered as a very good idea for the improvement of the future program design.

Table 2. Students' Response on The Material Presentations

No	Statements	Average Scores	Median Scores in Likert Scale
1	The clarity of the aims of the study	3.1	2.5
2	The existence of learning clues	2.8	2.5
3	The understandability of the sentence	2.7	2.5
4	The understandability of the	2.8	2.5

	program		
5	The accuracy of the performance	2.7	2.5
6	The appropriateness of exercises	2.7	2.5
7	The clarity of feedback or response	2.6	2.5
8	The availability of "Help"	2.8	2.5
	Average	2.8	2.5

Table 3. Students' Response on the User Interactive Point of View

No	Statements	Average Scores	Median Scores in Likert Scale
9	ITS is easily and independently operated	2.7	2.5
10	You frequently use ITS	3.1	2.5
11	The order can be forward and backward	2.8	2.5
12	There are various choices of menu	3.5	2.5
13	It has "Help" that can be accessed any time	3.1	2.5
14	The user may exit and start the program any time	3.1	2.5
	Average	3.5	2.5

An evaluation to the user interactive Point of view is done to identify whether or not the program has a program operating system that is easy and more interesting for the students to learn more active through various interactive strategies. In general, the aspect of this feature is responded to be good with the average score 3.5.

Table 4. Students' Response on the Program Interactions

No	Statements	Average Scores	Median Scores in Likert Scale
15	Each topic is completed with the exercises for the evaluation	3.1	2.5
16	This program provides scores of the formative test	3.1	2.5
17	The feedback to the response of the user	3.1	2.5
18	If the answer is wrong, the right answer will be provided.	2.9	2.5
19	Materials can be repeated anytime to improve memory skill	3.1	2.5
20	Program is able to provide display alternative/branch.	2.9	2.5
	Average	3.3	2.5

Evaluation of program interactive aspect has an objective to know whether or not ITS program has proper stimulus interactive system given by students with the

responds displayed by computer. So, students are motivated to attend the class lecturing. Table 4 shows that this aspect average score is 3.3. The score is in the above or at the right position of Likert scale median score. In general, this aspect is good.

Acknowledgments

1. The content of the program is designed in accordance with the syllabus of the graph in Gunadarma University. Therefore this program can be used as complement or supporting module in graph theory.
2. Based on the try-out conducted to the students of System Information Department, it shows that 96% of the samples recommend that this program to be implemented in the teaching learning process.

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