
An investigation into the Factors Influencing Educational Progress Aimed at Developing an Expert Consultant System in Schools; Case Study: High Schools Located in the 3rd Region of Tehran Municipality

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K E Y W O R D S: education, educational progress, expert system

ABSTRACT : The deployment of information and communication technology in education systems has resulted in a great evolution in the world. In current area, every country, depending on its political, socio-economic and cultural situations, looks for specific objectives aimed at improving its educational services quality. Being replaced school consultants by expert systems is an instrument for this. Application of this technology in education system can result in the progression and development of the system however, it can assist students in the course of achieving their targets. The shortage of expert consultants in schools highlights the need for a system with the ability of assisting students in achieving their targets. The purpose of this study is to design an expert system to assess educational progress. To this end, 95 teachers, consultants and managers of schools located in the 3rd region of Tehran municipality were invited to state their comments on the influential factors on students' educational progress. The results revealed that some factors like interests, learning, intelligence and family's economic status play a vital role in students' educational process of progression.

Introduction

The investigation of the developed societies' educational systems shows that most of them had an efficient and effective pedagogical system. The educational progress of students governed by an education system is considered as a measure for the success of such system. As the application of technology information develops, the decision-making system in general and computer-based decision-making in particular, gains significance. In expert systems, different kinds of decisions are made by the aid of a computer. Expert systems are knowledge-based systems where the competency of that knowledge is their core part. In expert systems, knowledge is transferred by the experts of a given science area to the computer [Oshloghi and Taheri, 2010]. Interactive learning is focused on the integrated e-learning and non-virtual learning to ensure that the process of learning can stimulate learners' interests, report their progress and have tutors to provide their feedback and guide learners to the expected targets (Victor Chang, 2016)

The systems have been introduced to the world of education as well. Some programs like decision-making, designing, planning, administration, identification of educational activities and different models have been drawn for making educational decisions [Hwang. Y, 2011].

Teaching of skills through E-Systems is a modern method. The main purpose of this is to assist learners to achieve high level skills [Asheghi, 2011]. For example, Macsyma system has been designed and implemented to assist engineers and mathematicians in solving math problems [Yui Chi Lai, 2011]. From frequent studies as well as investigations of internal and external backgrounds in educational progress and failure filed, it appears that educational failure has still remained as an important challenge and several factors like family problems, educational planning problems, students' mental and physical health, education management problems and education capabilities have affected it. To this end, conducting the current study aimed at recognizing factors with the maximum impact on educational progress is necessary. It demands the identification of key effective factors. To assess educational progress and students' success level, a system can be designed to analyze students' educational progress factors and assist them in this way.

Educational progress

E-learning system on the virtual learning environment, which is an environment to teaching and learning activities via the Web, focus is on teaching the students in order to participate in a virtual reality classroom to help enhance learning anywhere and anytime and to encourage formal learning. Besides, learning with e-learning system on a virtual learning environment can promote creative thinking to students by supporting communications between students and instructors, students and students, reflecting of tacit and explicit knowledge both learners and instructors, collaborating and acquiring knowledge, which there are online tools to support instruction. Thus, in designing of e-learning system, model of

e-learning is very important to enhance creative thinking by including instructing techniques, teaching methods, innovation creation, and pedagogy in the model of learning(Noawanit Songkrama,2015)

Educational progress is a process. That within every process, several factors and variables interact with each other. The type and intensity of interactions result in different changes. It is impossible to study all factors affecting students' educational progress and success. Therefore, only a few examples with a clear impact on educational progress of students are introduced here:

Preparation: A student should sufficiently grow in physical and mental dimensions in order to be able to learn well.

Motivation and Target: Learning is the effect of different motivations. The interest of a student to learning is one of the motivations with the very important effect on learning process.

Teaching Method: Human resource, especially teachers, is undoubtedly an important friction of educational environments. The factor can directly affect students' educational progress. One of the key elements of e-learning platforms is the content provided to the students. Content creation is a time-demanding task that requires teachers to prepare material taken into account which will be accessed on-line. In addition, the teacher is restricted by the functionalities provided by the e-learning platforms (Pau Xiberta, Imma Boada, 2016)

Studying in Education Field: According to Lie's studies, students of those teachers with higher education degrees are more successful than those with lower ones [Yui Chi Lai, 2011].

Intelligence and Mental Power: According to psychologists, intelligence is the ability of showing adoptive or creative behaviors. It is generally considered as the base of learning capacity.

Family Factors: Family is considered as one of the most important institutes affecting the education and behavior of human as it is the first and the most durable factor in the evolution of adolescents' personality and is an infrastructure for their physical, ethical, emotional and mental growth.

Economic Factors: economic factors affect students' educational progress and failure.

School Factors: There are some factors impressing students' educational progress and success including teacher-student relation, teachers' skill, education-circumference, desirable education capabilities, score and assessment. [Nazarian, 2011].

According to studies, those soft wares developed for education can improve education status more than traditional education methods. The mere show of the improvements provides no sufficient data, as the employed one in technology components or the characteristics of the improved education are not transferred. As an education method, experts are very effective factors. Since intelligent teachers make a kind of individual education they are generally compared with human individual-individual teacher and they show the same or even more efficiency compared with human-teachers [Ibrahim, 2009]. The e-learning training system is becoming increasingly extended as a form of training organization for various sort of professions and occupations [Monica Stănescu a *Nely Musatb, 2014]

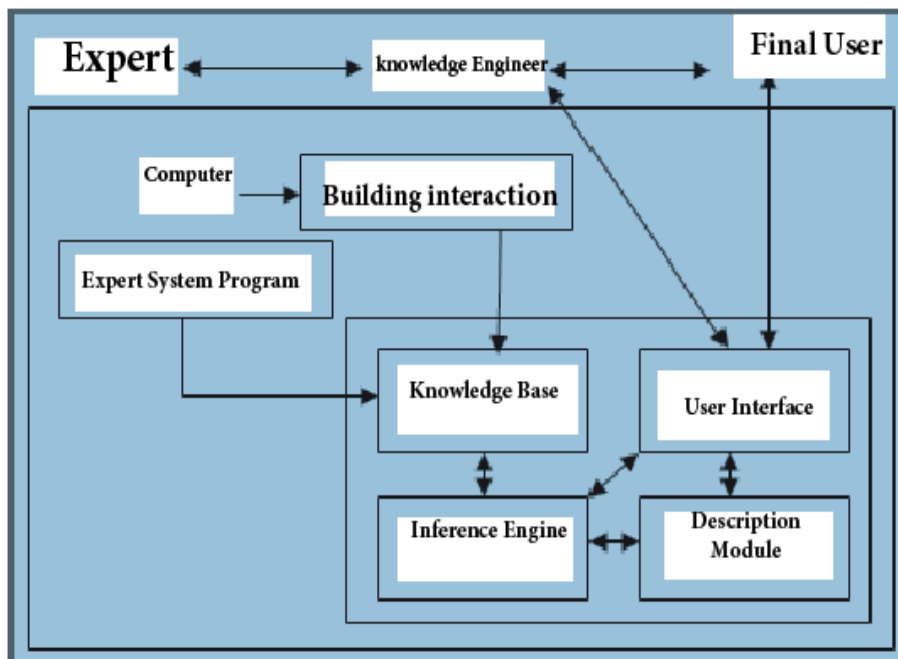


Figure 1. shows a schematic view of an expert system

Fig. 1 The relationship between different components of expert systems [Kazemi and Ghazanfari, 2003]

Knowledge-based contains the knowledge by which the inference engine concludes. The results derived from the engine, are the expert system answers to users' questions [Kasalkhe, 2009].

Knowledge-based systems are designed in a manner that can serve as an intelligent assistant for experts. The intelligent assistants are designed by expert systems technology to provide the possibility of their future development. The more knowledge is added up to an expert system the more it serves as an expert. Development of an intelligent assistant system can be considered as, the very important stage of creating an expert system. VP-EXPERT was introduced by US Wortech Systems Company in 1993 in case of an instrument for developing formula-based expert systems [Kazemi and Ghazanfari, 2003].

The following items are some characteristics of the software:

- The possibility of describing activities during consultation
- Automatic generation of questions
- Quick run of knowledge base
- Having an inference engine
- Possibility of chaining for knowledge base linkage purposes
- A text editor with different options
- Having relatively diverse mathematical functions

Sustainability, along with higher performance, rapid response time, and appropriate reliability, being exoteric, flexibility, duration and existence of multiple experts are the advantages of expert systems [Yiu Chi Lai, 2011].

Expert Systems

Expert systems are smart systems made by extracting the specialists knowledge and encrypting it in a manner that a computer can use it to solve similar problems. Within the systems, knowledge and expertise of an specialist is transferred to computer in order to promote unaccessible facilities like consulting with different experts. The systems preserve knowledge in an organization, in promoting productivity, solveing expert shortage problem and running work capacities in dangerous environments.

The systems serve as consultants in management analysis and decision making also they are able to analyze subjects which are based on strong arguments and experts' thought layout that are formulated and model-based subjects [Hamidzade, 2009].

By many accounts, these technologies offer opportunities for having innovation in education by promoting self-directed learning, creativity, and collective intelligence. [Kimberly S. Scott *, Keeley H. Sorokti, Jeffrey D. Merrell, 2016]

An expert system consists of three main components [Turban, 2005] as follow:

- A) Knowledge-based management subsystem
- B) User management subsystem
- C) Inference engine subsystem

Methodology

The mains scope of this study was the expert teachers and professors. Since our time scope did not let us use opinions and comments of all expert teachers and professors, study's population was selected from the connoisseur teachers and professors of the 3rd region of Tehran municipality. The main reason of this selection was that they were accessible to the researcher. For such aim, samples were selected by purposive sampling method. Pre-examination and the following formula were used to calculate required sample size as well as validity and reliability of the study's questionnaire. First of all, 25 questionnaires were distributed as trial and its validity was obtained as 86% using SPSS software and Chronbach's alpha indicating high validity of the questionnaire.

$$n = \frac{N * \left(\frac{Z}{2}\right)^2 * pq}{(\epsilon)^2 * (N-1) + \left(\frac{Z}{2}\right)^2 * pq} \quad (1)$$

Where

Z=1.96 = confidence factor of the sample coefficients

ε=0.05=estimation accuracy or maximum allowable error

N= number of population

P=50%=success ratio

q=1-p-50% failure ratio

Number of population was determined as 95 based on Morgan table. Then, variables were identified using the questionnaire. Following three times run of Delphi panel, the most influential four variables were selected out of all variables. Table 1 indicates the score of variables:

interest of students in lessons or keeping on education

intelligence

learning rate

economic status of family

Since the preference of the above four variables are higher than others, they were used to assess students of this study.

Table 1: selection of variables based on their influence

Question No.	Very low	low	moderate	high	Very high
anxiety	15	30	42	5	3
Parents' education level	30	50	15	10	5
School type	33	34	14	6	6
Intelligence rate	0	0	14	16	65
Parents-child relation	40	30	15	5	0
Teaching method	43	15	22	18	7
learning	5	8	12	7	63
Income and economic status	5	2	13	17	58
interest	0	0	5	24	66
motivation	13	22	50	5	5

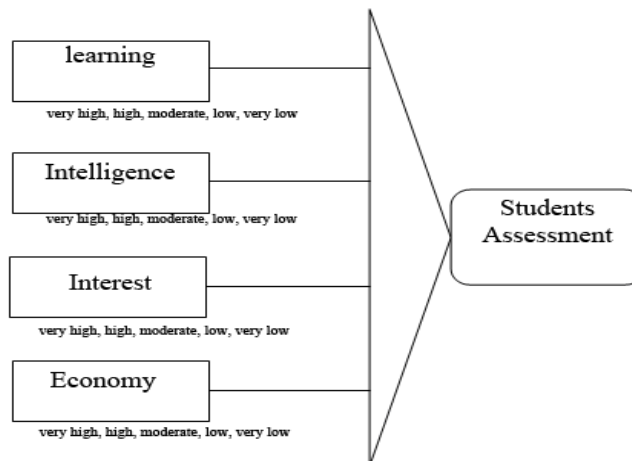
Table 2 shows descriptive results of the questions assessing students' educational progress. According to the tables, the calculated error for each of the five variables has been reported below 0.05 it has been implying that the test is significant and the factors can be considered positive in the course of assessing students' educational progress. Therefore, with 95% reliability, it could be claimed that the mentioned four variables have a positive effect in the assessment process.

Table 2: descriptive results of questionnaire's questions

item	Influential factors	Average score	population	Frequency	error
1	Intelligence level	Group 1 $\bar{x} <$	32	34%	0.002
		Group 2 $> \bar{x}$	63	66%	
		Sum	95	100%	
2	Learning rate	Group 1 $\bar{x} <$	22	23%	0.001
		Group 2 $> \bar{x}$	73	77%	
		Sum	95	100%	
3	Interest rate	Group 1 $\bar{x} <$	23	24%	0.001
		Group 2 $> \bar{x}$	72	76%	
		Sum	95	100%	
4	Income and economic status	Group 1 $\bar{x} <$	20	21%	0.001
		Group 2 $> \bar{x}$	75	79%	
		Sum	95	100%	

Knowledge Base

Following the development of the main framework of information (questionnaire and identification of variables), in this section Mockler chart (see chart 1) was used to obtain the knowledge-based of the studied system. Unlike block charts, Mockler chart is a beneficial instrument describing and explaining the interactions between factors and target. The chart identifies the target via questions asked from students then demonstrates the built description by the initial sample.



Graph 1: Mockler chart used for students assessment

This chart specifies the questions and items to be answered by users and then investigates all probable options which may be answered by users.

Expert System Design

Vp-expert is a typical shell which is based on C-programming language. First of all the required rules were introduced to the knowledge due to the expert system using procedures and commands of C programming language. Then, the base was used in the design of the expert system so that like a human, it can simulate a correct and logic decision. They are rule-based systems and their inference engine works as follows. First of all it selects a rule for examination purposes and then investigates that whether the condition of the rule is correct or not. The condition may be asked as a question from users or may be extracted from realities obtained during interview. Were the condition of a rule is true, the result will be au then and correct as well which in turn will activate the rule and as a matter of fact the result will be added to the knowledge base. Therefore, it can be argued that the design and development of an expert system is a simple process. The shell is a user interfacing in which systems ask questions from users based on the knowledge base rules and then concludes based on users' answers and then present an appropriate response to users.

Assessment of an Expert System

The following items may arise in the process of assessment and comparison of available expert systems and consultant performance:

In schools consultants should speak with a student for hours in order to assess his/her status. Sometimes this is ill-practiced due to no collaboration of the student. However, some students may feel shy and recluse and cannot properly collaborate with the consultant while in the case of expert system the student will answer questions lonely and easily which in turn yields better results.

Since every school has a consultant and every consultant has his/her own method for assessing a student, there is a kind of non-integrity in such an educational system which can affect students' educational future while by a unique system, the integrity will be achievable with single method and target.

The development of such an expert system is a simple task, thanks to the nature and role of computer. This means that the system can be developed, if necessary, across a region or a city and it could be shared between schools through web networking while regarding the consultants, this seems a difficult or even an impossible task.

An expert system has a short assessment time and is based on short questions while in the case of consultants achieving a correct result demands more times.

Table 3 briefly compares the performances of current expert system and consultants in the assessment of the same student.

Table 3: comparison of expert system and consultant

	required time	explanation capability	multiple expertise	promotion of reliability
Consultant	low	low	N.A	low
expert system	high	high	N.A	high

Discussion and Conclusion

Expert systems rely on rules and logics which are the fundamentals of the systems' thought, make them enabled to argue and make a decision. Since every school has a consultant and every consultant has his/her own method for assessing students, there is a kind of non-integrity in such an educational system and this can affect the educational future of individuals. Also, regarding the shortage of consultants across Iran's schools, an expert system should be replaced with consultants in order to assess students' progress and help them in achieving their targets.

According to the results of this study, the system can serve as a useful instrument in educational systems and play a vital role in the promotion of scientific level of schools.

Since an expert system is easily developed, regarding the nature and role of computer, it can be easily deployed across a region or a city, if necessary. The system can assess and guide students more easily and quicker than a consultant, which in turn it can save time and cost. Unlike consultants, the system is able to describe the argument pathway led to a solution. It be noted that an expert system uses the knowledge of several people at the same time to solve a problem. Clearly, the level of knowledge and expertise which is a combination of the knowledge in different people is higher than that of a consultant.

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