Considering and Choosing the Best Applied Methods of Information Technology in Educating Process by Using Decision Making Techniques

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Abstract: These days information technology (IT) plays an important role in many fields. Education is one of the fields that has reformed by IT. There are many innovating applied methods of using IT in teaching-learning process. In this paper, the applied of information technology in teaching-learning process for Primary, Secondary and Vocational school sections will be discussed. First, twenty three different methods of application have been extracted and categorized into five main approaches. Then, these methods have been evaluated for above-mentioned three educational sections based on ten different criteria by achieving the opinion of information technology experts in field of education. Finally, the obtained data have been analyzing by using TOPSIS and Fuzzy LINMAP decision making techniques in order to rank applied methods. By ranking the methods, the most applied methods for each section were obtained. Multimedia and game software for Primary, Multimedia and Internet approaches for Secondary and Internet approaches and designing software for Vocational are the most suitable as result.

Key words: Information technology · Instructional technology · Group decision making · TOPSIS · Fuzzy LINMAP

INTRODUCTION

New approaches of education, new technologies of information and communication, has caused to huge changes in education and learning parameters; such as role of teachers and students in learning process and interaction between student and teacher [1].

It can be said that information technology by changing the education methods, has directed the traditional "memory based learning" to "creativity and dynamic learning" [2].

It is expected that information technology can provide teachers with education material such as: texts, images, sounds, etc. with a better quality than before [3].

There are many studies in order to explain applying computers and IT in education. The aim of these studies was to evaluate the effects of IT on study promotion and improvement of student's learning in schools. Some fields such as applying computers in research, word processing and programming have been considered in these studies [4].

Wellington [5] categorized the instructional programs in schools into instructional games, adventure games and simulators [5].

Pachler [6] submit one of the best concepts regarding conception based on Ellis studies [6] for 4 special learning techniques and applying learning methods with information technology tools [6].

Potter [7] categorized methods of applying IT in primary schools. This study includes software approach of using IT.

Evaluation of the learning outputs by using information technology is another research which was done by Filsell and Barnes [8] in Australia during 1999 to 2001.

There is a universal study that was done during 1999 to 2002 by "International Association for Evaluation of Educational Achievement" that evaluated results of 174 case studies in field of applying information technology in schools. By surveying these case studies, it was found that the 174 instructional innovations could be categorized into 8 groups or patterns [9].

MATERIALS AND METHODS

By study the literature of this research, it is found that applying methods of information technology in schools are very various. The reasons are as follows:

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Table 1: Different approaches for applying IT in teaching-learning process

Approach	Target
Multimedia	Deeper teaching-learning by using interactive multimedia software
Applied software	Simplification the teaching by using available applied software
Internet	Simplification in teaching-learning by using internet
Content producing	Producing appropriate educational content by content producer software
Research oriented	Research oriented education using information technology tools

- High efficiency of IT especially in producing educational content.
- Simplicity in using IT by teachers and students because of sufficient interfaces in hardware and software tools.
- High flexibility of IT in producing and presenting data in different forms.
- Achieving efficient methods in teaching methods by using information technology.

Methods Extraction: By studying the applying methods of IT in teaching-learning process, It is found that these methods follow some main approaches which can be classified in five groups. In table (1), applying approaches of information technology in teaching-learning process are presented.

According to table 1, it is clear that each approach covers a part of teaching-learning media. Some of theses approaches overlap each other; for example in research oriented approach, internet methods/tools may be used, But because research oriented is one of the important field in education and information technology has a lot of application in this field, so this subject has been categorized as a separated approach.

Each approach contains some methods. By reviewing the literature of applying IT in education, 23 methods have been extracted. The methods related to each approach are presented in Table (2).

Ranking the Methods: At first, twenty three Methods of applying IT in teaching-learning evaluated by ten experts based on ten following criteria:

- Being interactive.
- Increase in dominance on lesson concepts.
- Increase in creativity.
- Make interest and motivation for learning.
- Increase in transferring the concepts.
- Increase in access to information resources.
- Simplicity in communication methods.
- Simplicity in collaborative learning.
- Possibility in individual learning.
- Possibility of group learning.

Table 2: The methods related to each approach

Approach	Related Methods
Multimedia	1. educational game
	2. adventure game
	3. teacher assistance multimedia
	4. self educating multimedia
	5. simulated
	6. e-book
Applied software	7. encyclopedia
	8. word processor
	9. information management software
	10. presentation software
	11. e-publisher (desktop publisher)
	12. computer aided design (CAD) software
Internet	13. e-mail
	14. explore/search by internet
	15. teaching by simple web pages
	16. internet groups/forums
	17. discussion board
	18. e-learning
Content producing	19. programming languages
	20. graphic software
	21. content producer multimedia software
Research oriented	22. individual research
	23. group research

Table 3: Ranking results for Primary

Rank	No.	Method
1	1	educational game
2	4	self educating multimedia
3	5	simulated
4	2	adventure game
5	3	teacher assistance multimedia
6	10	presentation software
7	20	graphic software
8	6	e-book
9	23	group research
10	7	encyclopedia
11	13	e-mail
12	14	explore/search by internet
13	15	teaching by simple web pages
14	21	content producer multimedia software
15	16	internet groups/forums
16	8	word processor
17	11	e-publisher (desktop publisher)
18	9	information management software
19	17	discussion board
20	22	individual research
21	12	computer aided design (CAD) software
22	19	programming languages
23	18	e-learning

Table 4: Ranking results for secondary

Rank	No.	Method
1	23	group research
2	10	presentation software
3	21	content producer multimedia software
4	14	explore/search by internet
5	5	simulated
6	3	teacher assistance multimedia
7	4	self educating multimedia
8	15	teaching by simple web pages
9	9	information management software
10	8	word processor
11	19	programming languages
12	16	internet groups/forums
13	2	adventure game
14	6	e-book
15	17	discussion board
16	18	e-learning
17	22	individual research
18	20	graphic software
19	11	e-publisher (desktop publisher)
20	1	educational game
21	13	e-mail
22	12	computer aided design (CAD) software
23	7	encyclopedia

Table 5: Ranking results for vocational

Rank	No.	Method
1	23	group research
2	12	computer aided design (CAD) software
3	21	content producer multimedia software
4	5	simulated
5	14	explore/search by internet
6	4	self educating multimedia
7	10	presentation software
8	16	internet groups/forums
9	15	teaching by simple web pages
10	6	e-book
11	3	teacher assistance multimedia
12	19	programming languages
13	2	adventure game
14	1	educational game
15	20	graphic software
16	17	discussion board
17	13	e-mail
18	18	e-learning
19	9	information management software
20	11	e-publisher (desktop publisher)
21	7	encyclopedia
22	8	word processor
23	22	individual research

Then by using Fuzzy LINMAP (Linear Programming for Multidimensional Analysis of Preferences) and TOPSIS (Technique for Order-Preference by Similarity to Ideal Solution), the two methods for ranking, analyzing and ranking IT applying methods were done. In these two methods, some points are supposed in a space that should be ranked according to their distance to an ideal point.

In group Fuzzy LINMAP, distance between all points to ideal point is imaginary and ranking is done according to the shortest distance to ideal point [10] and [11]. In this method, quantitative Likert scale results extracted from questionnaires were reformed into triangular fuzzy numbers. The mathematic calculations were done by "LINDO" software.

In TOPSIS method, an imaginary point is considered as final positive ideal point and another imaginary point is considered as final negative ideal point; and distance of all points from these two points are measured. The final selected point must have the shortest distance to positive and the longest distance to negative ideal point. This point is the best method in ranking. another points (methods) determine with similar calculation [11].

RESULTS

Ranking is done by above mentioned two techniques and three ranked result (for Primary, Secondary and Vocational schools) have been selected by using experts' opinion. The results are shown in tables (3) to (5).

CONCLUSION

According to results and final ranking of methods for Primary schools, IT applying is most based on non-internet approaches such as: educational games, simulations and self educating multimedia. While appropriate methods for Secondary and Vocational, are based on internet approach and especially "group research" that can be done by internet or another tools. For Vocational in compare with Secondary, designing software such as: computer aided design (CAD) and graphic software are more useful, because these are more appropriate for Vocational activities.

The applications based on multimedia in all three levels have been recognized as good ones and this relates to it's low cost, accessibility and easy usage of them. Nowadays multimedia software is wide spread and most applied tool using for IT based education. Because of their simplification usage, they can be used by students without need to teacher or others help.

Among the methods related to "applied software", the "presentation software" especially in Secondary and Vocational has been recognized as an ideal method. In Vocational, computer aided design has been recognized as a very useful method.

Internet based methods are evaluated very appropriate for all levels, but for Secondary and Vocational are more useful than Primary.

It seems that methods based on "content producer multimedia software" approach have the lowest sufficiency among other methods. Although output of these software is very valuable because of the active role of teacher and student to make them, but they need professional designer and long time to be made.

Group researching has the best efficiency in Secondary and Vocational levels. Although individual researching is less ideal than group researching, but in lower level (Primary) its efficiency become brighter. For group researching the opposite of this condition is seen: for higher level the group researching is more sufficient. The reason can be because of evolution of group working skills along with age increasing.

In a general view, it is obvious that many of high efficiency methods need simple and accessible tools. So education planners and teachers must pay more attention to simpler methods which are sufficient for students.

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