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Barriers of using ICTs in Teaching Students at High Schools as Perceived by Teachers in Alborz province of Iran

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Abstract

Engineering Education arena due to its' inherent complications needs more contemplation in knowing benefits, barriers and manners of developing new technologies. Using new communication and information technologies is necessary because of its impact on improving quality of teaching-learning process, providing equal learning opportunities, paying attention to individual differences, enhancement of individual talents of engineering students, possibility of interactive learning and so on. In the other words, information and communication technologies (ICTs) are imputed to all types of technologies used in processing, storage and data transmission electronically. The aim of this research was to investigate the relationship between use of ICT in teaching engineering students at high schools and the obstacles can affect using ICT from the perspective of their teachers in four areas of Karaj city in 2016.confirmatory factor analysis was used to determine the importance of different obstacle's dimensions. According to the analysis the main obstacles of applying educational technology can be categorized into six classes. According their importance they are Inappropriate application of educational technology (AT), Lack of knowledge of educational technology(ET), Lack of upgrading educational technology (MT), Low attention to problem solving and educational designing (DT), Inappropriate teaching methods (TM) and Lack of application of ICTs (IT) and respectively.

Keywords: Engineering education, Information and Communication Technology (ICT), Teaching-learning process, Obstacles of using ICT

Introduction:

Essentials of applying modern technology in education are not deniable. Something modern educational systems acts as a modern educational technology so that facilitate application of teaching materials in the classes to improve learning. Information and Communications Technology which consist of techniques and methods in knowledge acquisition, educational curriculum and curriculum implementation (Seif & Beiranvand, 2009). Achieving a knowledge-based society depends on a high qualified education. one of the most effective factors in developing the quality of learning process, is a true, effective and efficient use of educational technologies (Samari and Atashak, 2009).One of the priorities of the modern world is the creation of an educational system that has the capability to educate the people to live in a mobile world (Calin Lo, 2000, cited in Satari & Jafarnezhad, 2010).Today social Investment does not include equipment, buildings or technology. Where as information, expertise, efficiency, and workplace skills, are considered essential factorsin the development and improvement of diverse social, economic and cultural developmental areas.

Theoretical basis of research:

Educational Technology

A look to the development of the Educational Technology shows that this field of knowledge has three aspects or dimensions (Samari & Atashak, 2009): the first aspect focuses on the application of media (audiovisual equipment) and the application of them in learning and teaching, this also can be called a hardware dimension. The second aspect is permutation, or the software and educational material design that result in a better learning. In this point of view, Educational Technology is a collection of methods and permutation which are used in educational designing, implementation and evaluation. In fact, it analyzes the curricula systematically and after finding the problems and causes of them, gives solutions for the problems, limitations and adversities. The third dimension includes both the first and second one. It solves the educational problems by applying appropriate and timely methods.

Information and Communications Technology (ICT)

Teacher training agency considers ICT as a term that includes computer, related hardware and software, radio, television, video, camera and other equipment (Caple & Tony, 2000). As a rule, ICT helps the development of teaching-learning process and this way, increases joy and utility in education by: decreasing costs and duration of learning, increasing learning quality, providing diligent education, establishing equal learning opportunism, increasing mastery over learned material, convenience of the various information resources, training of the students for living in information age (Sarlak, 2004). Also the application of ICT in the class causes the increase of interaction, improvement of questioning attitude, teacher's improvement, and makes the teaching enjoyable (Malek, 2009).UNESCO believes that Information Technology includes scientific, technical, and engineering methods, managerial and processing techniques and the usage of information in social, economic and cultural contexts (ZareiZavaraki et al., 2001).

In the age of ICT, it is necessary that the educational systems on one hand, revise and rethink the curricula for the purpose of computer literacy and on the other hand, revitalize and enrich the learning

environment to have a better interaction between the learners and the learning resources. (Frajallahi et al., 2013). Hence, this study seeks the effective factors on the lack of true recognition and unwillingness of the teachers in use of this useful and practical knowledge (Information Technology and ICT) in teaching and learning processes

Research Background

In the study of Salehi et al. (2009) which evaluated the quality of the girls' high schools in Tehran, the results showed that the quality of the girls' high schools in Tehran is unsatisfactory.

Also the research of Khalkhali etal. (2011) demonstrated that the application of the Information and Communications Technology has had a significant effect on the teachers' development. The result of Satari and Jafarnezhad (2010)'s research proves that factors such as the teachers' negative attitude toward the co-teaching materials, lack or absence of co-teaching materials, class overcrowding, lack of teachers 'mastery in application of co-teaching materials, and failure classroom management have negative effects on the usage of co-teaching materials in teaching and learning processes. Clark and Salmon (1986)'s research concerns use of the co- teaching materials in teaching and how they can facilitate and improve student learning. The findings of the researches prove that the main limitations in use of school supplies are the following: the accumulation of the students in the class, the high amount of teaching materials, the negative attitude of the teachers and managers, the users' lack of knowledge and information, lack of facilities and equipment and inappropriate educational atmosphere. The answers of the research questions show that the teachers' information and awareness are in the low and medium level and this finding is in line by the findings of Yavooz, Salmoon (2005). The researches of Samari (2002)and Moosa Pour (1997) also show that the students of the schools which are wealthier in teaching materials and supplies and use them more efficiently, have better performances and improvements in education (Samari & Atashak, 2009). Sobhani Nezhad and RezaeeZarchi (2006) explains that, the most frequent prerequisites of using Information and Communications Technology in the educational system is categorized in four axes: removing limitations and creating new opportunities in different domains, changing the teaching-learning methods and a movement towards active learning, decreasing lack of knowledge and removing its irreparable side effects and training manpower who are in balance with the requirements of the knowledge and information age. The most frequent limitations in usage of Information and Communications Technology in the educational system can be discussed around two axes: the limitations inside the educational system and the environmental limitations (Salehi et al., 2011).

Enayati et al. (2011), identified the main limitations in applying Information Technology in high schools: motivational, technical, cultural, humanistic, financial, and social limitations, lack of equipment, educational infrastructures, and access to them, professional skills, and technical designing experts, also filtering. Abbasi (2013) in analyzing the limitations in the application of ICT in teaching-learning processes, identifies the factors: weak physical infrastructure, weak management infrastructure, weak supporting teacher service, teachers' lack of cognitive readiness, teachers'lack of training to teach in a modern way, no curricula based on technology, and teachers' lack of cultural preparation. Onal and Oztork (2012) found out that the main limitations of the application of ICT in teaching and learning are: lack of ICT resources, the inappropriateness of the teachers' in-service training, the effect of the traditional attitudes and functions on the teachers and the time limitation for teaching and learning. Gogtaz, yeeldrim and yeeldrim (2009, cited in Ajit and Asoatti, 2014), recounts the factors: 1. The

overpopulated classes, 2. Inadequate ICT related resources, 3. Lack of computer labs,4. Demotivated teachers in using modern technologies, 5. No efficient models in the evaluations of the teachers' functionin the application of ICT. BingiMalz (2009) has classified the limitations in application of ICT in two categories: the ones which are related to the teachers and the ones which are related to the schools. In his opinion, teachers' lack of self-confidence, weakness and problems in teaching abilities, resistance to change and their negative attitude toward technology and any kind of innovation in teaching and learning, are considered as the main limitations related to the teachers. The main limitations in the schools are things like: lack of time, limitations in ICT resources, lack of in-service training for the teachers and the shortcomings in the technical supporting systems in schools and classes (Asadi Far,2014).

Research methodology

The population, sample and sampling

The behavioural sciences' research methods based on the goal of the research and data collection can be divided to two groups (Bazargan et al., 2006). The participants of the study were all the teachers of the high schools in Karaj, area 4, in 2016 school year that based on the information from the ministry of education were 2588. The cluster one-stage sampling was used for the study and based on Morgan's table, 334 members were chosen who were 334 teachers.

Table 1- the number of high schools, teachers, and managers in different areas in Karaj in the second grade of high school

Area	Number of vocational schools	Number of students	Number of teachers
Karaj- Area 1	17	3544	614
Karaj- Area 2	15	4678	586
Karaj- Area 3	20	5687	735
Karaj- Area 4	16	5891	653

Research tools

The questionnaire with 60 items was designed in 7 sections. In the first section the questions were related to the educational technology perception; in the second section the questions were related to the

application of educational technology approaches. The third section contained the questions about cognition of the new educational technology and its' application. Forth section covers the questions about problem-solving approaches and educational technology instructional design. In the fifth section, the questions were about the preference of instructors' teaching method, and the final section included the supplementary questions related to the lack of educational technology usage and ICT. It should be mentioned that 60 questions were in this questionnaire in 3 parts. The four questions of the first part were allocated to personal information of the respondents, questions 6 to 52 in six parts were, subsidiary questions of the study and finally questions 53 to 60 were about the availability of the Information Technology and ICT's equipment, tools and essentials in high schools in 4 areas in Karaj. The material used in this research was a multiple choice questionnaire. The research-made questionnaire was based on Likert scale and had 5 choices (very frequently, frequently, occasionally, rarely, never). To make the questionnaire, first some information about the educational technology and its approaches, plus Information and Communications Technology and its essentials was gathered.

The reliability factor of the researcher-made questionnaire, was measured by Cronbach's alpha factor analysis, refer to table 2, and it was 0.94 and it shows that the questionnaire has considerable reliability.

Table 2- Cronbach's alpha factor analysis to measure the reliability of the questionnaire

The way of final measurement	**Number of Items**	**Cronbach's alpha factor**
teachers	56	0.94

And then for its validity, the researcher consulted two experts of teaching math and the questions which were vague, or unrelated to the subject of the study were omitted or modified.

The Analysis of Data

We have used Descriptive statistics and inferential statistics such as confirmatory factor analysis was used to determine the importance of different obstacle's dimensions.

Research Findings

Table 3, Sample Profile

Group	Frequency	Percentage
Age		
25-30 years	6	1.8
31-35 years	29	8.7
36-40 years	78	23.4
Above 41 years	221	66.2
Educational Level		
Degree	3	.9
Diploma	9	2.7
Bachelor	220	65.9
Master	99	29.6
PhD	3	.9
Educational Major		
Humanity Science	187	56.0
Fundamental Science	121	36.2
Technical Science	26	7.8
Teaching Experience		
Less than 5 year	2	.6
6 to 10 years	12	3.6
11 to 15 years	52	15.6
Above 16 years	268	80.2

The responders were asked to specify their age. As the result, 66.2% of the respondents stated that they have more than 41 years old, 23.4% have 36 to 40 years old, 8.7% have 31 to 35 years old and only 1.8% have 25 to 30 years old. The respondents were also asked to specify their educational level. As the results, majority of them 65.9% had bachelor, 29.6% had Master, 2.7% had diploma, 0.9% had degree and 0.9% had PhD. In specifying the educational major of the respondents, 56.0% of them studied in the field of Humanity Science, 36.2% studied in the field of Fundamental Science and 7.8% of them studied in the field of Technical Science. Finally the respondents were asked to specify their teaching experience. As the results, 80.2% of them had above 16 years of teaching experience, 15.6% had 11 to 15 years, 3.6% had 6 to 10 years and only 0.6% had less than 5 years of teaching experience.

A. Measures of dispersion and fit indicators

In order to prioritizing obstacles of applying educational technology and ICTs in teaching-learning process in six dimensions viz., lack of knowledge of educational technology, Inappropriate application of educational technology, lack of upgrading educational technology, low attention to problem solving and educational designing, lack of application of ICTs as well as teacher's Inappropriate teaching method coefficient of variation was used.

The findings of this section are depicted in Table (4). The results of factor analysis, t test and R^2 revealed the applied indicators were appropriate and precise in investigating obstacles of using educational technology in teaching –learning process.

Table (4) Obstacles of applying educational technology and ICTs

Dimension	**indicators**	**Model symbol**	**Factors loading**	**t**	**R^2**
Lack of knowledge of educational technology (**ET)**	Knowledgeof educational technology	ET1	0.74	-	0.55
	Hardware dimension	ET2	0.79	15.62	0.62
	Optimum transfer	ET3	0.85	16.35	0.72
Inappropriate application of educational technology (**AT)**	Using various methods	AT1	0.87	-	0.76
	Educational content	AT2	0.98	24.69	0.96
	Technology expert	AT3	0.78	20.10	0.61
Lack of upgrading educational technology (**MT)**	Accurate recognition of educational materials	MT1	0.91	-	0.83
	Lack of appropriate policy making	MT2	0.92	19.85	0.84
Low attention to problem solving and educational designing **(DT)**	Problem solving approach	DT1	0.78	-	0.61
	optimum Provision of content	DT2	0.92	18.82	0.84
	Use of consistent designing	DT3	0.78	17.26	0.61

Lack of application of ICTs (**IT**)	Physical infrastructure	IT1	0.52	-	0.27
	Budget and financial resources	IT2	0.77	4.76	0.60
Inappropriate teaching methods (**TM**)	Continuation of using teaching methods	TM1	0.70	-	0.49
	Modern methods and approaches	TM2	0.71	12.45	0.50
	Teachers attitude	TM3	0.82	12.90	0.68

Source: Research findings, Scale: 1-very low 2-low 3- medium 4- high 5- very high

ISDM was used to categorize obstacles for which the results are depicted in Table (5).

Effect levels	**frequency**	**percent**	**Cumulative percent**
low	88	26.34	26.34
medium	185	55.38	81.72
high	61	18.28	100

Source: research findings

The findings indicated in Table (5) shows that 88 people (26.34 %) evaluated obstacles at low level, 185 people (55.38 %) at medium level and 61 people (18.28 %) at high level. Accordingly, applying ICTs in teaching-learning process faces significant obstacles.

Since dimensions and indicators of obstacles are obvious, validation of model was done by structural equation modeling.it is because there is a predetermined hypothesis which has to be tested so that accuracy of model is confirmed.

B. Assessment of model fitting for obstacles of applying educational technology

Latent variable consisted of 16 indicators and 6 dimensions which were entered in the second level of confirmatory factor analysis. Table (6) indicates standardized factors loading of effect indicators along with their significance level and equivalent t values.

Table (6) standardized factor loading values and their significance levels for obstacles indicators

construct	indicator	Model symbol	Standard coefficient	standard error	t	R^2	α	CR	AVE
obstacles	Lack of knowledge of educational technology	ET	0.73	0.09	12.49**	0.53	0.78	0.88	0.66
	Lack of application of educational technology	AT	0.93	0.07	18.36**	0.87	0.72	0.78	0.54
	Lack of upgrading educational technology	MT	0.64	0.07	12.40**	0.41	0.72	0.80	0.53
	Lack of problem solving and educational designing	DT	0.53	0.05	9.73**	0.28	0.77	0.82	0.63
	Lack of application of ICTs	IT	0.44	0.08	4.61**	0.20	0.74	0.84	0.68
	Lack of teaching method	TM	0.49	0.08	8.18**	0.24	0.75	0.82	0.58

Significance at one percent level (Source: Research findings)**

Given the results as shown in Table (6) all the indicators had t value higher than 1.96. The same table indicates that indicators such as α, CR and AVE received acceptable and appropriate values. Therefore, all the used indicators were sufficiently precise to measure obstacles and their validity and reliability were confirmed.

There are different fitting indicators for confirmatory factor analysis. In the present research, indicators such as X^2/df, CFI, NFI, NNFI, GFI, AGFI, IFI, RMSEA and RMR were used.

The findings of this section is depicted in Table (7).

Table (7) Indicators of fitting model of measuring obstacles of applying educational technology

indicators	gauge	Reported value
X^2/df	**Up to 3**	2.48
RMR	**Less than 0.05**	0.047
GFI	0.9 and above	0.98
AGFI	0.9 and above	0.97
NFI	0.9 and above	0.98
NNFI	0.9 and above	0.98
IFI	0.9 and above	0.99
CFI	0.9 and above	0.97
RMSEA	**Less than 0.08**	0.059

Source: Kalantari (2009)

The fitting indicators in Table (7) show that the model is well fitted. In addition, and measured indicators are in conformity with theoretical construct of obstacles. The fitted model is depicted according to standardized factors loading in Figure (1) and based on significance level in Figure (2).

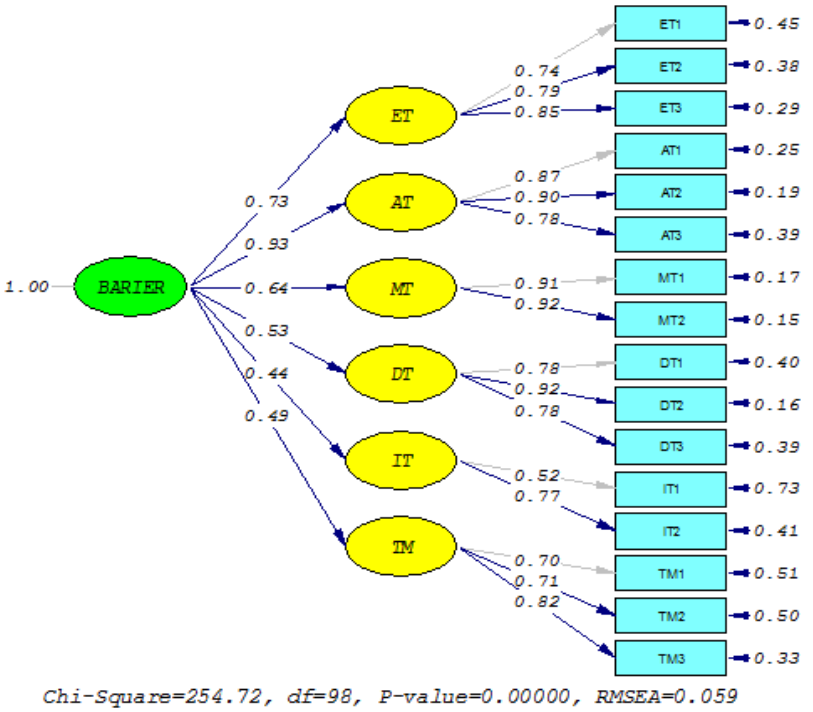


Figure (1) confirmatory model of educational technology obstacles in standard state

According to the figure (1) the main obstacles of applying educational technology can be categorized into six classes. According their importance they are Inappropriate application of educational technology (**AT),** Lack of knowledge of educational technology(**ET),** Lack of upgrading educational technology (**MT),** Low attention to problem solving and educational designing **(DT),** Inappropriate teaching methods (TM) and Lack of application of ICTs (**IT**) and respectively.

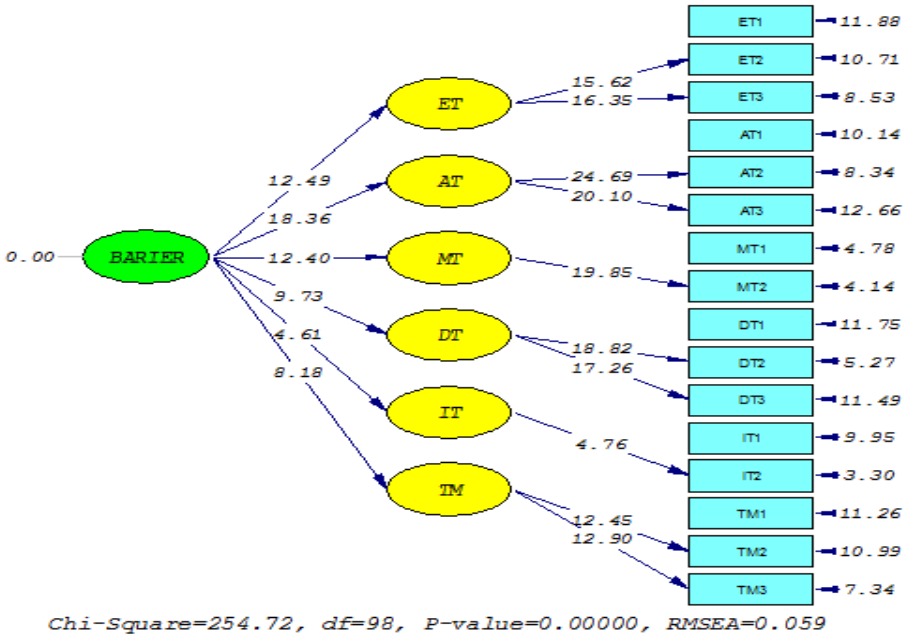


Figure (2) confirmatory model of educational technology obstacles based on significance level

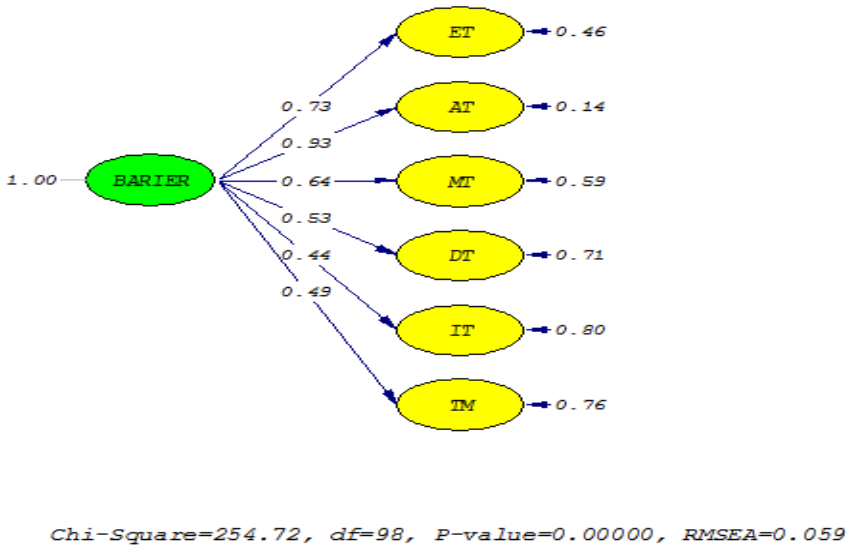


Figure (3) confirmatory model of educational technology obstacles based on standardized structure

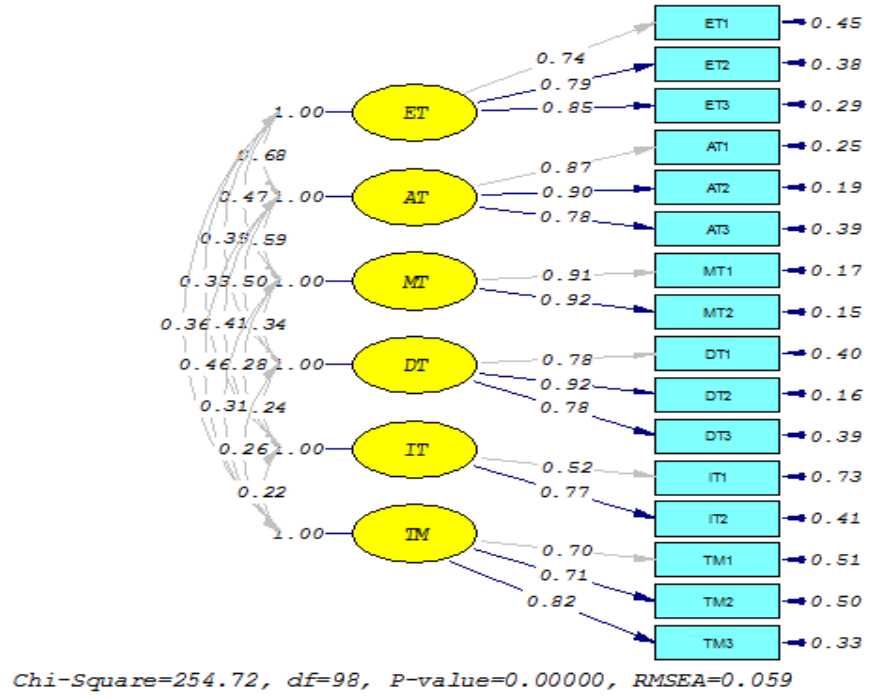


Figure (4) confirmatory model of educational technology obstacles based on Greg Standard

Conclusion:

The aim of this study was to analyze the limitations in application of Educational Technology and Information and Communication Technology in teaching-learning process. As the result showed, the opinion of the sampled teachers (in girl's high schools in four areas of Karaj) toward Information Technology is one dimensional and it is considered just as a tool for them and there is still a traditional attitude toward the teaching-learning process and methodology.

According to the figure (1) the main obstacles of applying educational technology can be categorized into six classes. According their importance they are Inappropriate application of educational technology (**AT),** Lack of knowledge of educational technology(**ET),** Lack of upgrading educational technology (**MT),** Low attention to problem solving and educational designing **(DT),** Inappropriate teaching methods (TM) and Lack of application of ICTs (**IT**) and respectively.

Practical suggestions:

Hence it is recommended that the skills of high school teacher should be improved through appropriate training courses in the areas of ICTs. Modern devices, hardware and software have to be provided for the schools and specific laboratory has to be established and equipped. Teachers need to evolve their teaching methods from conventional to innovative modes.

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