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Original Research Article

Investigating the effect of smart schools on students' learning and teaching

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ABSTRACT: The aim of this study is to examine the effect of smart schools on the development and speed of the teaching-learning process. The study has been conducted through descriptive/survey method, and data collection tools and methods include library resources, articles, and valid scientific websites. For data collection, two researcher-made questionnaires have been used for teachers and students. Five questions with 40 sub-questions for teachers and five questions with 38 sub-questions for students have been designed on a 5-point Likert scale. The sample includes 170 students and 45 teachers of smart high schools in four districts of Karaj. The results suggest that a wider range of students' senses become deeper in the teaching-learning process. In other words, in addition to increasing the efficiency of class and using various software tools due to the use of audio-visual senses, this system allows students to take steps beyond the curriculum and puts greater emphasis on the skills of thinking and students' deep learning. Furthermore, the smartization of schools increases the interactions between students and teachers in smart schools.

KEYWORDS: smartization; schools; teaching-learning; students

1. Introduction

The advent of the information age and the development of network- and computer-based technologies have caused new forms of formal and informal learning to emerge. In this regard, one of the systems that support formal education in the education system of the country is the emergence of smart schools, which have provided new learning opportunities for students. These types of schools have been created to compensate for some backwardness, such as inefficient methods of traditional teacher-centered teaching, a lack of up-to-date and valuable textbooks, and the poor computer knowledge of teachers and students, and also to compensate for these shortcomings and help the formation, development, and enhancement of creative and educated forces. These schools are one of the key necessities in knowledge-based societies and adopt approaches to developing knowledge-based and entrepreneurial skills of students. In these schools, learning-teaching processes are improved, and an integrated environment for the development of key skills of students is created. Students' interest in working with computers has accelerated their learning. This interest has also increased teachers' motivations to integrate technology with the teaching-learning process. Students spend more time doing their homework and research projects on computers, and they are even busy working with computers in their free time. In these schools, learning is based on individual speed, collaboration, autonomy, and integration between subjects, and the content of the lesson is not limited to books but rather includes ebooks, multimedia software,

courseware, and databases. Some programs have been designed for the individual differences of students and their different learning styles at the same time. Since teacher-centeredness and traditional teaching are currently the basis of the education system in the country, updating schools, using modern technologies, benefiting from new creativity in education, and giving importance to students' capabilities require a fundamental transformation in the form and method of education. The use of new information technologies has created new potential in technology-based education, which is very effective in the learning-teaching process. These technologies have also led to comprehensive and deep permanent learning. The facts indicate that the use of new technologies in the 21st century will have a profound impact on human social life. Undeniably, education is no exception to these changes. Studies on education show that information technology has been used to a great extent in the systematic education system. Therefore, it can be said that information technology is considered the most important and fundamental principle of transformation and development in today's world. The use of communication, Internet networks, and virtual and electronic teaching are some of the achievements of information technology. Since education is a key and stable pillar in any society, new teaching technologies are needed. In this regard, e-learning is the most effective and modern method for the development of individual and group education. Therefore, one of the most essential skills is to find how we can develop learning in an organization. On the other hand, the most important concern of the education system in the country is the intellectual development of students, leading them to excellence and the production of knowledge in this field. Therefore, the educational system of the country needs some schools that can transform the education process by using information and communication technology. For this purpose, the smartization of schools, the use of communication technology in the teaching-learning system, creating an efficient curriculum for students, and effective teaching seem to be necessary. Moreover, a smart school is a school where the administrative processes of the entire process, including management, supervision, control, teaching-learning, educational resources and teaching aids, evaluation, documentation, office affairs, communications, and the foundations of their development, have been designed based on ICT (Information Technology and Communication) and to improve the education and research systems. Accordingly, it seems that the traditional method of the education system in learning and teaching leads to the loss of resources, and for greater efficiency and the use of valuable educational resources, smart schools make the impacts of teaching and learning take effect effectively, which can be evident in the behavior of students and teachers. Therefore, in this study, we aim to find out whether smart schools really make a difference, whether these types of smart schools that exist in our country make fundamental changes in the teaching-learning process, or whether we need to make fundamental changes in the use of these types of hardware and software. This study is applied research in terms of purpose, descriptive-survey research in terms of data collection method, and correlational research in terms of the relationships between variables. The area of study of this research is related to the discussions of the Ministry of Education on smart schools and high schools in the city of Karaj in Alborz Province, and the survey has been conducted through the distribution of the questionnaire.

2. Statement of the problem

Information technology has been proposed as one of the most important and fundamental principles of change and development in today's world. The use of communication networks, the Internet, and virtual and electronic training are the achievements of information technology. Given that education is one of the main and stable pillars of any society, there is a need for new technologies to provide education. In this regard, electronic education is one of the most effective and newest methods for the development of individual and group education. Therefore, one of the most important essential skills is how to develop

Yagiri in the organization. Changing behavior is considered the most basic element of learning. Learning is a process in which people's behaviors and mental models change. Learning is a relatively permanent change in behavior, or potential behavior, that is the result of direct or indirect experience. Of course, learning is important at different individual, group, and organizational levels. That is, in learning, people learn to take advantage of each other, learn new things, and try to complement each other. The new electronic educational system brings unique benefits and advantages for individuals, organizations, and educational centers. The trend of the current century is such that traditional education cannot meet the current needs of students, so a new type of education should be introduced in this field. For some time, some countries in the world have started to establish electronic schools or smart schools. In smart schools, computers affect the way of teaching and evaluation, while the social performance of schools remains strong. A smart school is a school in which the implementation process of all processes, including management, supervision, control, teaching and learning, educational resources and educational assistance, evaluation, documents and office affairs, communication, and the foundations of their development, are based on FAVA (information and communication technology). And it is designed to improve the research-oriented educational system. (Ministry of Education, Transformational Strategy). This kind of educational system, by overcoming the one-centered nature of education that is usually provided by the teacher to the student, and the students are also obliged to maintain the same concepts by using the diversity of educational resources and content, has a significant effect on the ability of learners. Therefore, in this research, considering the schools of Karaj (areas 1 and 2) as a statistical population, we intend to reach the conclusion that the strategic plan of smartening schools, which is one of the basic strategies of the fundamental transformation of education, has an effect on the learning and teaching of students. Considering that we know that the teacher plays a key role in this program, the book has its own place, and goal-setting for students, teachers, and parents (family) has been emphasized.

3. Significance of the study

In today's challenging world, in order to compete on the global stage, to meet the needs and expectations of customers, and to adapt to the changing nature of work, organizations are trying to hire employees who go beyond the duties and roles of their jobs. It is believed that these behaviors beyond the role are reflected in the performance evaluation, affect the participation of employees in the programs, and can be said to be an effective factor in job engagement, organizational commitment, and self-esteem. Today, in the modern literature of management, behaviors beyond the role of employees, who are self-motivated and aware, are referred to as organizational citizenship behavior. By creating motivation, self-discovery, and self-confidence, transformational leadership causes people to do more work than expected. In other words, transformational leadership provides the most effective organization by creating cultural contexts. The necessity of studying transformational leadership with employee citizenship behavior is that these structures are mentioned in the literature and background related to organizational behavior as key structures in organizational behavior. Therefore, organizational citizenship behavior as a voluntary behavior and beyond the role in today's organizations is very necessary because organizations in today's complex and highly variable environment cannot properly describe the needs and requirements of the required job. As a government institution, the municipality provides many public services to the citizens, including the construction of streets, public places, and passages; garbage disposal; taking care of citizens' health affairs; civil works; beautifying the city; and other urban services. Since the performance of such organizations is largely influenced by their leadership and citizenship behavior, the investigation and analysis of municipal employees' behaviors can provide the basis for strengthening employee motivation issues and subsequently increasing their effectiveness

and efficiency. Also, the municipality, as a public institution, allocates a lot of budget to carry out its related affairs; therefore, the use of organizational citizenship behavior and the help of employees will lead to better performance and efficiency for the organization. Also, by being aware of the state of organizational citizenship behavior of employees, municipal managers will strengthen this behavior and achieve higher performance.

4. The importance of the research

Attaran believes that the need to keep pace with technological developments and human sciences is an urgent need for education today, and currently, studies show that the use of computers can help students' self-understanding and socialization. For this purpose, smart schools and the use of information and communication technology in the learning-teaching system, and consequently, the formulation of an efficient curriculum for students in such schools, increase their motivation to learn. The entrance to the field of information and the promotion of global network-based and computer-based technology have led to the creation of new learning environments. According to the document of fundamental transformation of education based on Horizon 1404, chapter 6, paragraph 7 (a clever utilization of modern technologies in the official public education system in the Islamic Republic), promotion of the quality of education process based on the clever use of new technologies (1, 2, 3, 7) and on the other hand, according to the strategic plan of comprehensive IT system of the country, that emphasizes upon the facilitation of formal education based on information technology in schools with the development of Internet networks, smart schools and enhancement of technology-based education system of big and small high schools and colleges, according to the 20-year perspective to achieve first place in economic, scientific and technological fields, according to software movement and the fifth development plan in paragraph 19, the government must include information and communication technology in all process by the end of the plan to achieve educational equity electronically. On the other hand, in the ICT document of the Ministry of Education and the comprehensive scientific plan of the country, an emphasis has been put on the development of e-learning systems and IT infrastructure in the field of higher education. According to what was previously mentioned, this study aims to examine whether smart schools will improve the learning-teaching process or whether they will contribute to educating the elite through an accurate and scientific approach.

5. Research background

Taghipour et al.[1] studied "Risk analysis in the management of urban construction projects from the perspective of the employer and the contractor."

Mahboobi et al.[2] discussed "Assessing ergonomic risk factors using combined data envelopment analysis and conventional methods for an auto parts manufacturer", occupational injuries are currently a major contributor to job loss around the world.

Taghipour et al.[3] studied "The impact of ICT on knowledge sharing obstacles in knowledge management process (including case-study)."

Khalilpour et al.[4] studied "The impact of accountant's ethical approaches on the disclosure quality of corporate social responsibility information an Islamic perspective in Iran."

Mirzaie et al.[5] studied "The relationship between social bearing capacities with conflict as a result, in the perception of the visiting historical sites."

Alamdar khoolaki et al.[6] studied "Effect of integrated marketing communication on brand value with the role of agency's reputation (including case study)."

Taghipour[7] studied "A survey of BPL technology and feasibility of its application in Iran (Gilan Province)."

Mohammad et al.[8] studied "Assessing the effect of the FRP system on compressive and shear bending strength of concrete elements."

Jalili[9] studied "Comparative study of Khaje Rashid al-Din views on Rab-e Rashidi Islamic utopia and Kevin Lynch ideas."

Taghipour et al.[10] studied "Insurance performance evaluation using BSC-AHP combined technique."

Rezvani et al.[11] discussed "The design of high-rise building with ecological approach in Iran (Alborz Province)."

Taghipour et al.[12] studied "The identification and prioritization of effective indices on optimal implementation of customer relationship management using TOPSIS, AHP methods—Case study: Pasargad bank."

Taghipour[13] studied "Seismic analysis (non-linear static analysis (pushover) and nonlinear dynamic) on cable-stayed bridge."

Taghipour et al.[14] studied "Investigating the relationship between competitive strategies and corporates performance (case study: Parsian Banks of Tehran)."

Taghipour and Moosavi[15] studied "A look at gas turbine vibration condition monitoring in region 3 of gas transmission operation."

Rahmani et al.[16] studied "Providing health, safety and environmental management (HSE) program in metal mining industry (including case study)."

Taghipour and Vaezi[17] studied "Safe power outlet."

Tarverdizadehet et al.[18] studied "Predicting students' academic achievement based on emotional intelligence, personality and demographic characteristics, attitudes toward education and career prospects through the mediation of academic resilience."

Azarian and Taghipour[19] studied "The impact of implementing inclusive quality management on organizational trust (case study: Education)."

Ghadamzan Jalali et al.[20] studied "Explain the relationship between intellectual capital, organizational learning and employee performance of Parsian Bank Branches in Gilan province."

Mohammadi et al.[21] studied "Investigating the role and impact of using ICT tools on evaluating the performance of service organizations."

Abdi Hevelayi et al.[22] studied "Predicting entrepreneurial marketing through strategic planning (including case study)."

Arsalani et al.[23] studied "Investigating the effect of social media marketing activities on brand awareness."

Khorasani and Taghipour[24] studied "The location of industrial complex using combined model of fuzzy multiple criteria decision making (including case study)."

Taghipour et al.[25] studied "Risk assessment and analysis of the state DAM construction projects using FMEA technique."

Hoseinpour et al.[26] studied "The problem solving of bi-objective hybrid production with the possibility of production outsourcing through Imperialist Algorithm, NSGA-II, GAPSO Hybid Algorithms."

Taghipour and Sarchoghaei[27] studied "Evaluation of tourist attractions in Bourujerd county with emphasis on development of new markets by using topsis model."

Hashemi et al.[28] studied "The effect of personal factors on increasing the productivity of low-level employees in the General Welfare Department of Tehran Municipality."

Safdarpour et al.[29] studied "The effect of government support on innovation ability (including a case study)."

Ganjali et al.[30] studied "Strategic analysis of household hazardous waste reduction."

Taghipour et al.[31] studied "The impact of managerial factors on increasing the productivity of low-level employees (including case study)."

Ganjali et al.[32] studied "Investigating the relationship between environmental awareness and the level of education and occupation of people."

Baghipour Saramiet et al.[33] studied "Modeling of nurses' shift work schedules according to ergonomics: A case study in Imam Sajjad (As) Hospital of Ramsar."

Moradi Lalekaei et al.[34] studied "Measurement of the country of origin of the brand of branding and brand loyalty."

Taghipour et al.[35] studied "Investigating the effect of intelligent ordnance on the level of learning/teaching (including case study)."

Taghipour et al.[36] studied "The study of the effect of smart schools on the level of learning-teaching in high school."

Taghipour et al.[37] studied "The impact of motives from obtaining ISO 9001 certification on organization performance (including case study)."

Yaghoubi et al.[38] studied "Students learn and learn using the effects of smart schools."

Taghipour et al.[39] studied "The impact of working capital management on the performance of firms listed in Tehran Stock Exchange (TSE)."

Habibi et al.[40] studied "Designing a smart model for managing Iranian chain stores based on business intelligence (case study of proma chain store)."

Akbarnezhadbaei et al.[41] studied "Modeling the application of knowledge management system in order to improve the technology governance in the automotive industry of Iran using the data mining environment."

Akbarnezhadbaei et al.[42] studied "Determining a model for evaluating the knowledge management system in order to improve industries with the focus on educational technology and applying data mining concepts."

6. Research objectives

1) Examining the weaknesses and strengths of smart schools in terms of software and hardware.
2) Further expansion of such schools in the direction of science production.
3) Increasing the participation of school-related elements (parents, teachers, and students) and providing the possibility of their interaction.
4) Improving effectiveness and increasing efficiency in the formal education system with the development of information and communication technology.
5) Increasing the effectiveness of the family in the teaching-learning process.
6) Creating a dynamic and attractive environment for the full flowering of talent and individual creativity.
7) Providing a teaching-learning environment and its continuity inside and outside the school.
8) Continuous development of the scientific and professional abilities of educators using new educational trends.
9) Doing research activities as a team.
10) Changing the basis of education to learning based on research (Ministry of Education, transformational strategy).

7. Hypothesis

1) There is a significant relationship between the intelligentization of schools and the learning of secondary school students.
2) There is a significant relationship between the intelligentization of schools and the performance of high school students.
3) There is a significant relationship between the education of schools and the cultural exchange of high school students.
4) There is a significant relationship between the intelligence of schools and the research skills of high school students.
5) There is a significant relationship between the intelligentization of schools and the attitude towards the intelligentization of high school students.
6) There is a significant relationship between the intelligentization of schools and the technological orientation of students.

8. Research methodology, statistical society, sampling method and data analysis methods and tools

The current research is descriptive in terms of its purpose and in terms of the method of collecting descriptive information, and the scope of this research is the discussions related to smart schools that have been conducted at Alborz Education Organization and in several smart schools.

The statistical population of the research is the high school students of Karaj City, and the sampling was done randomly.

The inferential statistics method was used to analyze the obtained data, and the statistical methods used were correlation coefficients and SPSS software.

9. Data collection

The data collection tool is a questionnaire that has been designed based on a Likert five-point scale and is distributed among students and teachers. In this study, to analyze the data obtained from samples, inferential and descriptive statistics have been used. In statistics, correlation coefficient and Friedman variance analysis have been used, and SPSS software has been used for data analysis. Data analysis is performed using both descriptive and inferential statistics.

Descriptive statistics (students):

The data collected from the students' questionnaire is presented in **Table 1**:

Table 1. Frequency Distribution of student community features.

Total number	**frequency**		
170 people	7/64	Male	Sex
	3/35	Female	
	8/48	Mathematics	Field of study
	4/49	Science	
	8/1	Humanities	
	7/34	District 1	Educational district
	5/46	District 2	
	8/18	District 3	
	9/92	PC	The status of having PC
	1/7	Lack of PC	
	5/3	Dial up	Internet connection
	6/70	ADSL	
	6/17	Other internet connections	
	2/8	No internet connection	

According to the research findings, the sample includes 64.7 percent of male students and 35.3 percent of female students. As it is shown, 48.8 percent of students under study were studying mathematics, 49.4 percent were studying science, and 1.8 percent were technical and vocational students. Also, 34.7 percent of students were studying in District 1, 46.5 percent were in District 2, and 18.8 percent of them were in District 3 of Karaj. 93 percent of students stated that they had a personal computer at home, and only 7 percent did not have a personal computer at home. About 70 percent of students had access to ADSL Internet at home. In the meantime, 17 percent had other forms of Internet connection, and only 3.5% of students used dial-up Internet. It was also found that 8 percent of students did not have access to the internet at home.

The level of computer use at home.

Table 2 indicates the status of the level of computer use at home. As you can see, 8 percent of students stated that they do not use computers at home. 42 percent use computers for less than 1 h per day, 30 percent use it for 1 to 3 h, and 17 percent use it 3 to 5 h a day. It was also found that 1.3 percent of students use computers more than five hours a day.

Table 2. Frequency distribution of the status of access to Internet.

Students				**Field of study**
Cumulative percentage	**Valid percentage**	**Percentage**	**Frequency**	
8.8	8.8	7.7	14	Not using
50.6	41.9	36.8	67	Less than 1 h
81.3	30.6	26.9	49	1 to 3 h (s)
98.8	17.5	15.4	28	3 to 5 h
100.0	1.3	1.1	2	More than 5 h
-	100.0	12.1	22	No response
-	-	100	170	Total

Descriptive statistics (teachers):

The data collected from students' questionnaire is presented given in **Table 3**:

Table 3. Frequency distribution of features of teachers' community.

Total number	**Frequency** %		
45 people	8/57	Male	Sex
	2/42	Female	
	7/6	Principal	Position
	2/2	Instructor	
	4/84	Teacher	
	7/6	Student	
	8/57	District 1	Educational district of teachers
	9/28	District 2	
	1/11	District 3	
	2/2	District 4	
	2/2	Associate	Teachers' degree of education
	60	B.A.	
	8/37	M.A.	
	3/93	High school	Teaching level
	7/6	Vocational school	
	1/11	Less than 10 years	Educational experience
	8/57	10 to 20 years	
	1/31	More than 20 years	
	9/8	Less than 35 years	Age
	1/71	35 to 45 years	
	20	More than 45 years	
	100	PC	Having PC
	0	No PC	
	4/84	ADSL	Internet connection
	7/6	Dial up	
	9/8	No accesses	

Table 3. (*Continued*).

Total number	Frequency %		
	4/84	Internet	Participate in educational courses
	80	Excel	
	4/84	Windows	
	9/88	Word	
	4/84	PowerPoint	

According to the research findings, the sample of teachers includes 57.8 percent of male teachers and 42.2 percent of female teachers. Also, it includes 6.7 percent of principals, 2.2 percent of teachers, 84.4 percent of instructors, and 6.7 percent of students. 57.8 percent of teachers were teaching in the first district of the education system, 28.9 percent were teaching in the second district, and 11.1 percent were teaching in the third district of the education system in Karaj. Moreover, 1 person, equal to 2.2% of the sample, was teaching in District 4 of the Karaj education system. Most of the teachers, or 60 percent of teachers, had a bachelor's degree. 37.8 percent of teachers had master's degrees, and finally, only 2.2 percent of them had associate degrees. In addition, 93.3 percent of teachers under study were teaching in high school, and only 6.7 percent were teaching in technical and vocational schools. As it is obvious, 11 percent of the sample under study had less than 10 years of teaching experience; 57.8 percent of teachers were teaching for 10–20 years; and 31.1 percent were working for more than 20 years. The average teaching experience of teachers was also 19 years. Mean: 19, SD: 5.74, Min: 5, Max: 29.

On the other hand, 8.9 percent of the sample were less than 35 years old, 71.1 percent were 35 to 45 years old, and 20 percent were more than 45 years old. The average age of the students was 41.67. Mean: 41.67, SD: 4.61, Min: 29, Max: 50.

All teachers had personal computers at home, and about 84.4 percent of teachers had access to the ADSL Internet at home. Only 6.7 percent of students use dial-up Internet. It was also found that 8.9 percent of teachers do not have access to the internet at home. Besides, as it is clear, a maximum of them, 88.9 percent, participate in Word courses, and a minimum of 80 percent of them participate in Excel courses.

10. Analytical statistics

Examining research hypotheses:

The first hypothesis of the research.

H1: There is a significant relationship between the smartness of schools and the learning of secondary school students.

H0: There is no significant relationship between the smartness of schools and the learning of secondary school students.

In this part of the research, in order to investigate the effect of smartening schools on students' learning, one-sample *t*-test was used. According to the results of the table and the level of significance, it was found that the smartening of schools had a positive effect on students' learning (**Table 4**).

Table 4. One-sample *t*-test results of the first research hypothesis.

Test value = 2.5					
Confidence level 95%		**The mean of differences**	**Significance level**	**Degree of freedom**	**value *t***
High	**Low**				
0/561	0/356	0/459	0/000	168	8/84

The second research hypothesis:

H1: There is a significant relationship between the smartness of schools and the performance of high school students.

H0: There is no significant relationship between the intelligentization of schools and the performance of high school students.

The results of the second hypothesis test are shown in the table below (**Table 5**). According to the results of the table and the level of significance, it was found that the smartening of schools had a positive effect on the performance of students.

Table 5. One-sample *t*-test results of the first research hypothesis.

Test value = 2.5					
Confidence level 95%		**The mean of differences**	**Significance level**	**Degree of freedom**	**value *t***
High	**Low**				
0/532	0/276	0/4040	0/000	168	6/23

The third research hypothesis:

H1: There is a significant relationship between the smartness of schools and the cultural exchange of high school students.

H0: There is no significant relationship between the intelligentization of schools and the cultural exchange of high school students.

According to the results of the table and the level of significance, it was found that the intelligentization of schools does not have a statistical effect on the cultural exchange of students (**Table 6**).

Table 6. One-sample *t*-test results of the first research hypothesis.

Test value = 2.5					
Confidence level 95%		**The mean of differences**	**Significance level**	**Degree of freedom**	**value *t***
High	**Low**				
0/3323	0/0441	0/188	0/051	169	2/07

The fourth research hypothesis:

H1: There is a significant relationship between the intelligentization of schools and the research skills of high school students.

H0: There is no significant relationship between schools' intelligentization and secondary school students' research skills.

The results of the fourth hypothesis test are shown in **Table 7**. According to the results of the table and the level of significance, it was found that the smartening of schools has a positive effect on the research skills of students.

Table 7. One-sample *t*-test results of the first research hypothesis.

Test value = 2.5					
Confidence level 95%		**The mean of differences**	**Significance level**	**Degree of freedom**	**value *t***
High	**Low**				
0/8323	0/5441	0/688	0/000	169	9/428

The fifth research hypothesis:

H1: There is a significant relationship between the intelligentization of schools and the attitude towards the intelligentization of high school students.

H0: There is no significant relationship between the intelligentization of schools and the attitude towards the intelligentization of high school students.

The results of the fifth research hypothesis test are shown in **Table 8**. According to the results of the table and the level of significance, it was found that the intelligentization of schools has a positive effect on the attitude towards the intelligentization of students.

Table 8. One-sample *t*-test results of the first research hypothesis.

Test value = 2.5					
Confidence level 95%		**The mean of differences**	**Significance level**	**Degree of freedom**	**value *t***
High	**Low**				
0/0627	0/3196	0/1911	0/004	169	2/93

The sixth research hypothesis:

H1: There is a significant relationship between the smartness of schools and students' technological orientation.

H0: There is no significant relationship between the intelligentization of schools and students' technological orientation.

The results of the test of the sixth research hypothesis are shown in **Table 9**. According to the results of the table and the level of significance, it was found that the intelligentization of schools has no effect on the technological orientation of teachers.

Table 9. One-sample *t*-test results of the first research hypothesis.

Test value = 2.5					
Confidence level 95%		**The mean of differences**	**Significance level**	**Degree of freedom**	**value *t***
High	**Low**				
0/221	0/237	0/0079	0/802	44	0/252

Factor analysis of the barriers to the development of smart schools from the teachers' point of view.

In order to identify the factors influencing the development of smart schools from the perspective of teachers, the selected variables are included in the factor analysis, and based on the collected data, the

KMO value is equal to 0.683 and Bartlett's test value is equal to 624.78, which is significant at the 0.01 level and shows that the data is suitable for factor analysis. There are 6 variables extracted from 21 variables (**Table 10**).

Table 10. Extracted factors with special values, percentage of variance and the percentage of their cumulative variance.

The cumulative frequency of variance percentage	Variance percentage of special value	Special value	Factors	Row
87/19	87/19	17/4	First factor	1
04/38	17/18	81/3	Second factor	2
79/53	74/15	30/3	Third factor	3
06/62	27/8	73/1	Fourth factor	4
68/69	62/7	60/1	Fifth factor	5
83/75	14/6	29/1	Sixth factor	6

According to the results (see **Table 11**), the educational structure of the country is the most significant obstacle to the development of smart schools from the teachers' perspective. The variables included in the analysis were rotated through the Varimax method, and the factors related to each one of them were identified. However, it should be noted that after the rotation, some variables were excluded from the analysis due to low factor loading (less than 0.5) and the insignificance of their correlation with other variables. The reason why these variables were excluded from the analysis is that the interface between these variables was already covered by more important variables. Thus, the above-mentioned variables can be summarized as other variables.

Table 11. Variables related to each factor and the level of coefficients obtained from rotated matrix.

Factor loading	Components	
0.887	Teaching method in Iranian educational system is an obstacle to learning through multimedia	Educational structure of Iran
0.821	Not considering enough time for teachers and students to study is an obstacle to learning through multimedia.	
0.716	Strict bureaucratic regulation in the education system is an obstacle to learning through multimedia	
0.681	The method of evaluation of teachers in Iranian educational system is an obstacle to learning through multimedia.	
0.633	Futility of multimedia in annual evaluation of teachers who used them compared with those who did not	
0.572	Iranian education system's too much support for traditional methods is an obstacle to development of learning through multimedia	
0.804	Lack of facilities and necessary technical infrastructure (high-speed Internal, internal network, etc.	Technical Infrastructure
0.779	Insufficient number of computer and other required accessories in school	
0.772	Financial inability of schools in the preparation, protection and maintenance of hardware and software equipment	
0.754	lack of CD and appropriate and specialized and educational software available to teachers at school	
0.730	Lack of good space equipped with computers, projectors and other necessary equipment (computer workshops or special classes)	

Table 11. (*Continued*).

Factor loading	Components	
0.825	Commitment of teachers to use traditional methods in education	Motivational
0.754	Teachers' resistance to use new multimedia	
0.725	Lack of enough motivation among teachers	
0.713	The lack of proper criteria for students' assessment due to using multimedia	
0.840	Low salaries and benefits decided for teachers is an obstacle to learning through multimedia	Economic problems
0.616	Insufficient time for using multimedia in the classroom by teachers	
0.847	Lack of enough knowledge and skill in teachers	Information knowledge
0.609	The impossibility of using electronic devices and tools in accordance with the school requirements due to teachers' lack of knowledge	
0.913	The content of textbooks in Iran does not allow education using multimedia	Course content
0.726	The method of assessment of students in Iranian educational system is an obstacle to learning through multimedia.	

11. Conclusion

The purpose of this research was to investigate the effect of school smartening on the depth and speed of teaching and learning for students. The results of the research showed that a wider range of students' senses deepen in the teaching-learning process.

In other words, in addition to increasing the efficiency of the class and the use of various software, it helps students learn due to the use of auditory and visual senses. This system allows students to go beyond their curriculum and puts more emphasis on thinking and learning skills. Students have deep. Also, with the smartening of schools, interactions between students and teachers in smart schools will increase.

And also:

In examining the results for the first hypothesis of the research, entitled There is a significant relationship between the intelligence and learning of secondary school students, it was found that the intelligence of schools had a positive effect on students' learning.

In the examination of the results for the second hypothesis of the research, entitled There is a significant relationship between the intelligentization of schools and the performance of high school students, it was found that the intelligentization of schools had a positive effect on the performance of students.

In examining the results for the third hypothesis of the research titled There is a significant relationship between the smartening of schools and the cultural exchange of high school students, it was found that the smartening of schools does not have a statistical effect on the cultural exchange of students.

In examining the result for the fourth hypothesis of the research, entitled There is a significant relationship between the smartening of schools and the research skills of secondary school students, it was found that the smartening of schools has a positive effect on the research skills of students.

In the examination of the result for the fifth hypothesis of the research entitled: There is a significant relationship between the intelligentization of schools and the attitude towards the intelligentization of

high school students, it was found that the intelligentization of schools has a positive effect on the attitude towards the intelligentization of students.

In examining the result for the sixth hypothesis of the research entitled There is a significant relationship between the smartness of schools and the technological orientation of students, it was found that the smartness of schools does not affect the technological orientation of teachers.

In examining the result for the seventh hypothesis of the research entitled There is a significant relationship between the smartness of schools and the amount of educational technology used by teachers," It was found that the smartness of schools has a positive effect on the amount of use of educational technology by teachers.

In the examination of the result for the eighth hypothesis of the research titled There is a significant relationship between the intelligentization of schools and the computer literacy of teachers, it was found that the intelligentization of schools does not affect the computer literacy of teachers.

Author contributions

Conceptualization, EAK and MT; methodology, EAK and MT; software, MT and EAK; validation, EAK and MT; formal analysis, EAK and MT; investigation, MT and EAK; resources, EAK and MT; data curation, EAK and MT; writing—original draft preparation, EAK and MT; writing—review and editing, MT and EAK; visualization, MT and EAK; supervision, EAK and PP; project administration, EAK and MT. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

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