Interdiscip J Virtual Learn Med Sci. 2018 September; 9(3):e68777. doi: 10.5812/ijvlms.68777.

Published online 2018 October 6. **Research Article**

Identification and Prioritization of Factors Affecting the Improvement of Teaching-Learning at Smart Schools

Aliakbar Dolati [1, *], Seyed Ali Siadat [1] and Hadi Dehgani [2]

[1] Faculty of Educational Sciences and Psychology, Isfahan University, Isfahan, Iran
[2] Department of Educational Sciences, Faculty of Educational Sciences, Marvdasht Azad University, Shiraz, Iran

[*] *Corresponding author*: PhD Student of Higher Education, Faculty of Educational Sciences and Psychology, Isfahan University, Isfahan, Iran. Email: dolatiali662@gmail.com

Received 2018 March 18; **Revised** 2018 September 28; **Accepted** 2018 September 30.

Abstract

Background: Information and communication technology (ICT) is the empowerment key to the development of communities, especially in the education system. A smart school refers to educational units, who are flexible for students regarding capabilities and features and prepare learners for the future.
Objectives: This study aimed at identifying and prioritizing ways to improve teaching-learning process in the second semester of year 2017 - 2018 at smart schools of Semnan province.
Methods: This qualitative study included six experts in information and communication technology in smart schools, and in-depth interviews were carried out with 24 teachers, who were selected by purposive and snowball sampling. The analysis of the content of the interviews and theoretical basis was set in the form of questionnaire in two sections of ideal situation and the status quo. According to experts, content validity and reliability by Cronbach's alpha had a good condition at 0.88 and 0.96. In the quantitative section, a questionnaire was completed by 310 teachers and administrators, who were selected using stratified sampling.
Results: Result of freedman test for determining the significance of ranking methods of improving teaching- learning showed that it was valid at $P < 0.05$. The findings showed that teachers (with average of 6) were in the first place followed by interaction (4.48), students (4.41), content (3.11), teaching method (1.58), and evaluation with average of 1.42 stands was in the sixth place amongst factors effecting the teaching-learning process of smart schools.
Conclusions: Development of education systems refers to creating fundamental changes in the process of teaching and learning. To enhance these changes, ICT is an empowering key factor. Teaching/learning process includes the teacher, student, and teaching methods. Among these, the teacher has a vital role because they provide information for thinking and reasoning.

Keywords: ICT, Smart Schools, Teaching-Learning

1. Background

Information and communication technology (ICT) is an empowerment key to the development of communities, especially in the education system. Smart schools initiative is a step forward in the information age by combining technology and curriculum, and creates fundamental changes in the processes of teaching-learning (1). A smart school refers to educational units, who are flexible for students about capabilities and features and prepares learners for the future (2). Smart schools is more interesting, more exciting, and more meaningful for students. As well as the mind, spirit and body learners affects the learning process (3).

The introduction of smart schools changes traditional policies, practices, content, curriculum, literacy concepts, the role of teacher and student evaluation methods, and techniques (4). What is important in this research is to identify and prioritize methods to improve the teaching-learning process in smart schools.

To improve the effectiveness of teaching-learning process in smart schools, a model should be provided that could determine the components of this type of school as a reference for developing smart schools. According to studies on global models as well as comments received during interviews with experts, this study attempted to make a comprehensive framework for the definition of smart schools, according to background information on this research.

This conceptual model has tried to pay attention to all aspects of the development of smart uniforms, in the areas of interaction, content, teaching methods and evaluation, the role of teacher and student, and definition. Then, each of the elements were listed and separately

defined. Six main elements for a comprehensive review of teaching-learning process in any system of e-learning should be studied, including: teacher, student, content, teaching methods, evaluation and interaction. The first part of teaching-learning process is teachers. Since professional manpower or e-teacher is the most important component at smart schools, special attention should be paid to their role and tasks. Teachers must be trained to assume their new roles and competencies necessary to work in this field. Lubis et al. (1) argued that the role of teachers in smart schools is a necessity. Also, they believed that teachers need to change their old views in the learning process, as the traditional concept of the classroom, where the teacher's role in the transmission of information or knowledge should become a facilitator of knowledge, in other words, the teacher's role should be changed from 'scholars in the field "to" aid in the margins (5, 6).

The changing role of the teacher to provide information for thinking and reasoning through discussions in small student groups enables understanding the meaning of content through individual and independent study using new technologies, which is necessity the for radical change in education (7).

The second part of teaching-learning process is students. The use of information technology in the learning process as a foundation must change the structure of learning and this can only be achieved by changing the role of students and teachers, which is directly related to structural developments in educational content (8).

Ghonoodi and Salimi, in a study entitled "Study of the curriculum in smart schools" concluded that ICT-based curriculum, provides background for students to activate their individual capabilities and to gain their independence, rather than just a collection of information that is dictated (9).

Rezaei Rad noted that more than 85% of respondents reported that the involvement of students is very important. Cidral et al. believed this measure is an important factor in the success of e-learning programs (10).

The third part of teaching-learning is teaching methods. In education and training, effective training is conducive to sustainable learning. For this purpose, using technology to support teaching and learning activities, according to the existing shortcomings, could be effective. In order to create active learning, appropriate pedagogy and instructional design coordinator with the methods of learning in smart schools should be provided. Nowadays, ICT has the ability to facilitate the teaching and learning process (11). Also, arrival of personal computers and widespread access to the internet, has created an environment in which education systems worldwide are required to cease major changes in the structure of education (12).

However, rapid growth and technological advances not only change lifestyle and establish effective ways to connect with each other, yet are also effective in teaching and learning methods. The fourth part of this process is assessment. Assessment is a vital element in the teaching-learning process (1). Assessment is at the heart of all policies and strategies for improving quality of education in today's world (13). Assessment can affect teaching and learning (14).

Assessment is done to measure the educational process and to provide access to the course objectives; it should instead focus on failure and failure to engage and motivate students to be mobile. Assessment should not be considered as an indicator of school success, yet as a tool to promote the student's success, and assess the strengths, weaknesses, opportunities, and threats in order to improve teaching methods (15).

Arguably, creating an efficient assessment system can be more efficient and transparent system of smart schools contributes to its activities. On the other hand, assessment could be achieved using information about the extent necessary to ensure the realization of the mission and educational goals to be achieved.

Part five of the teaching-learning process is materials and educational content. Cai argued that old ways and tools can no longer meet the needs of teaching-learning process and the result of this is alternative technologies and new educational content rather than traditional methods and content (16).

The use of e-learning content at schools, has led to interest and motivates students to learn and become involved in learning faster and better (17). Research results by Sani Idrahim et al. showed that 96% of respondents reported the importance of e-learning in educational program's success. In general, the use of ICT is a key element of education reform and school change (15). Therefore, the use of multimedia content and electronic teaching-learning process, is the linchpin of smart schools. Using multimedia content attracts a wider range of students in the teaching-learning process.

Part six of teaching-learning process is interaction between individuals. Most researchers and educational specialists have emphasized on value action or interaction (18, 19). Interaction of learners, tutors with learners and learners with the content is the most important indicator of quality of schools. Various research findings suggest that this interaction is fundamental to learning (20). Research also shows that communication and interaction between elements of training is encryption of successful teaching-learning and effective IT-based training and communication (21).

The findings of numerous studies suggest that engage-

ment increased learning at schools (22). Therefore, the interaction and the formation of a variety of interactive teaching-learning process, especially at schools, is vital and undeniable, and attention and correct and consistent use is needed to increase quality ine-learning programs.

Despite the positive impact of each identified way to improve the teaching-learning at smart schools, the project has faced obstacles and problems. Research shows major obstacles in Malaysia by teachers, including not having enough time for integration in projects related to information technology and communications (1).

Results of another research has shown that there is a big gap between the action of teachers and educational framework (5). The studied program used teacher-centered methods and training, as well as teachers of the smart board as a demonstration tool for teaching English classes as well. Teachers adhered to conventional methods (teacher-centered method). They lacked knowledge about hardware troubleshooting training, and more than 42% of the teachers complained about their busy schedule, more than 35% of teachers in English classes did not use web-based educational resources, and more than 15% of teachers were unqualified regarding computer use (15, 23, 24).

This research showed that the majority of teachers were at the medium level of English competence and they used electronic resources in teaching and learning skills and did not have any computer knowledge.

A further study showed that teachers emphasized that student motivation is low. This factor influenced learning English (5). Teachers also emphasized that more than 30% of students did not use interactive whiteboard learning, and most students did not have access to educational websites. Some other studies noted difficulty in adapting the new role of education, low motivation for providing education to students, unfamiliarity with English language, and lack of credible scientific pattern for the development of smart schools as obstacles and challenges. Research results have also shown computer literacy training as one of the most important obstacles and challenges of e-learning (25).

Research results have indicated lack of knowledge, skill and efficiency in producing educational content based on the educational needs of students, lack of coherent planning for continuity of teaching-learning of students outside of school hours and poor English language skills of students to use global content as the main challenges for correct formation (26).

Research results have reported on barriers to application of IT in the teaching process, including lack of equipment, hardware and software, lack of time in school programs for ICT-based projects, lack of knowledge regarding the integration of ICT with curriculum, and lack of adequate resources at home for students, who want to achieve their educational materials (27).

Tezer and Ertarkan (28) conducted a study entitled "Use smart techniques and Semantic Web technologies in e-learning environments" in the national telecommunications network of scientific and educational institutions of Ukraine. The results showed that the learning system requires hardware and software for the development of new and more complex systems, and therefore student feedback is always delayed and time-consuming. Other studies suggest that the inadequacy of the computers, lack of skills and knowledge of teachers, problems with education and technology integration process, difficulty in adapting to the new role of training, lack of preparation and lack of scientific students are obstacles and challenges in the development of smart schools (28).

Research results also showed that the integration of ICT in teaching and learning is low (29). However, ICT had positive results, although time constraints prevented its use. Results also suggest that the low level of integration of ICT requires innovative designs that are introduced by the Ministry of Education.

Thus, in the field of electronic education, it is more important is to identify ways to improve each of the sectors identified in teaching-learning process in smart schools. This study also showed that each of these methods should be prioritized to promote effectiveness and efficiency of teaching-learning . Using these methods, it is expected that teaching-learning process increases and improves the quality of e-learning.

Thus, development of ICT in education with the aim to transform the educational system is the foundation of an efficient educational system. Semnan province during the past five years has taken valuable steps in the development of e-learning, and according to the latest figures, 192 students from schools in Semnan province were smart. Nowadays, there is a strong feeling about smart schools in order to direct students towards deep learning of content. This points to the importance of designing a comprehensive framework for smart schools more than ever, because it can improve the quality of electronic learning. In this respect, identifying and prioritizing ways to improve the teaching-learning process in schools, can promote the efficiency and effectiveness of using ICT in teaching-learning and stops waste in investing huge budgets in this area, therefore, this study sought to answer two main research question is:

1. Which factors influence the improvement of teaching-learning process in smart schools?

2. How should the factors be prioritized to improve teaching-learning ?

2. Methods

The research method was mixed and exploratory and the study was executed in academic year of 2017 - 2018 in Semnan province. In the qualitative part, interview and content analysis were used. In the quantitative part, a survey method was employed. In this research, quantitative data were collected first, and based on them, quantitative data were collected in order to generalize the findings. The present study, in terms of purpose of the research, was applied and the criteria to collect data was cross-sectional and descriptive. Also the research methodology is exploration. Combined researches are studies done with the combination of qualitative and quantitative research methods (30). In mixed exploratory research projects, researchers sought to survey an uncertain situation. For this purpose, qualitative data are initially collected. This leads to description of countless aspects of phenomena and finally the researcher based on findings from qualitative data, attempts to collect quantitative data to enable generalization of the findings.

2.1. Data Collection Tools

In this qualitative study, using semi-directed interview, the general aim was to identify ways of improving the teaching-learning through ICT experts, teachers and administrators at smart school. The main objective of the semi-directed interviews was to identify effective methods to improve the teaching-learning at smart schools.

In the quantitative part, benchmarking and review of the results from successful experiences in the field of intelligent schools, in-depth study history and literature, six content analysis of interviews with experts and ICT professionals and 24 guided interviews with teachers was done.

In the qualitative part, two sampling methods were employed: (1) Purpose-based sampling. In this method and after consulting with department of research at office of education, experts of information and communication technology, teachers, and administrators were selected and interviewed. (2) Snowball sampling. In this method, experts and interviewed people were asked by the researcher to identify and introduce other experts to be interviewed. After interview with experts, a questionnaire was designed and administered. The populations of the study was all teachers and administrators of smart schools at Semnan province, totaling 1640, among whom 310 were selected randomly based on the Morgan table as the sample. In order to select teachers and managers for implementation of the questionnaire, share of each city in the province was firstly determined and then the sample size for each city was selected for implementation of the questionnaire. In the qualitative part of content analysis technique and in the quantitative part, exploratory factor analysis and Friedman test were used. The descriptive statistics of the research based on gender and educational level are presented in Table 1.

Table 1. Descriptive Statistics Based on Gender and Educational Level

Variables	Value[a]
Sex	
Male	187 (60.3)
Female	123 (39.7)
Sum	310 (100)
Education	
Diploma	12 (3.9)
Bachelor	184 (59.4)
MA	114 (36.8)
Sum	310 (100)

[a] Values are expressed as No. (%).

The above table shows that 60.3% response rate to the research questionnaire, the highest number of sample individuals, were males, and females also completed 39.7% of the research questionnaire. Also, 59.4% of the respondents to the research questionnaire were graduate students. After that, 36.8% of them had higher education and 3.9% belonged had a postgraduate degree.

2.2. Tool Reliability Study

In order to determine the reliability of the questionnaire at the beginning of the pilot phase, 95 questionnaires were distributed among the population and collected, and after data analysis of the questionnaires, the reliability (Cronbach's alpha) of the questionnaire, to check the current status of the various factors in improving methods of evaluation, and the status of the questionnaire, to assess the importance of each of these proposed methods to improve the teaching-learning, were assessed (Table 2).

3. Results

Theoretical researches as well as content analysis, interviews, six of the most important components that improve teaching and learning at schools involved were identified and were studied from the perspective of teachers, principals, deputies, experts, and ICT professionals. Content validity was determined based on ICT experts' views. In order to examine the data analysis, the Chi-square test (for the viewpoints of the respondents for each individual item) and Friedman test (to prioritize each one of the items in the optimal situation and the status quo) were used. Collected data were analyzed through the Chi-square test, and

Table 2. Questionnaire Reliability Coefficient of the Various Sectors

Questionnaire Section	Number of Item	Reliability Coefficient	
		Favorable Situation	Available Situation
Teachers	17	0.84	0.94
Students	13	0.82	0.80
Content	12	0.85	0.85
Teaching method	7	0.77	0.92
Evaluation	7	0.85	0.88
Interaction	13	0.85	0.89
Reliability	69	0.88	0.96

freedman test at $\alpha < 0.05$ using the SPSS software version 22. Respondents' views on the individual components and Chi-square test results to items in terms of the importance of items on the improvement of teaching-learning process (favorable position) and also in terms of attention to the items on the improvement of teaching-learning process (status quo) were studied.

In order to check the status of these methods relative to each other and in terms of priority importance and attention to this approach in improving the teaching-learning process at schools and the ranking of the methods, the Friedman test was used, Tables 3 and 4.

Based on the results presented in Table 3, the result of Friedman test (to check meaningful ranking in this test, Chi-square statistic is used) (Pearson χ^2 = 1461.917) was statistically significant at the level of 0.05. Based on the results, the "teacher" is of utmost importance and was ranked first, "interaction" second, "students" third, "content" fourth, "teaching method " fifth and "evaluation" sixth in the improvement of teaching-learning process at smart schools.

Based on the results presented in Table 4, the result of Friedman test (to check meaningful ranking in this test, Chi-square statistic is used.) Pearson χ^2 = 1133.695 is statistically significant

At the level of 0.05. Based on the results, " teaching method ", with the lowest rank, and then to the "evaluation", " interaction ", "content", "students" and "teachers" are located of less attention to improving the teaching-learning process smart schools.

4. Discussion

Component with the highest security at smart schools improved teaching and learning process from the perspective of respondents and were detected and ranked first among these methods and assigned to the "teacher". This component was discussed previously (5, 7) as a key component.

Teachers are the main brokers that interact with information and communication technology in the educational system. Teachers in today's classes must be prepared to provide technology-based learning opportunities for their students. In fact, the main person in helping learners to access technology capabilities is the classroom teacher, who prepares for technology and knowledge of how technology supports student's learning.

From the perspective of the respondents, "interaction" was the second most important factor in teaching and learning process to improve smart schools. This was considered very important by previous studies (18-20, 22, 25, 31). Therefore, the interaction and the formation of a variety of interactive teaching-learning process, especially at schools is vital and irrefutable and attention and correct and consistent use of quality in e-learning programs will be increased.

"The students' were considered the third most important factor for improving the teaching-learning process. This method was developed by researchers such as Mitrofan and Cioricaru (8), Ghonoodi and Salimi (9), Cidral et al. (10) and Hamzah et al. (32). Students are the most important and effective part of the society. The education system should be smart so their skills in the form of an integrated system with an emphasis on ICT development to improve student learning and social skills.

Thus, paying attention to the role of students in the teaching-learning as well as development and strengthening of the skills of students by schools will improve the teaching-learning process.

The fourth most important factor was improving the teaching-learning process from the perspective of respondents was "educational content". Previous studies have also touched on this factor (10, 16, 17, 33). The use of multimedia content and electronic teaching-learning process is the main pillars of smart schools. Using multimedia con-

Table 3. Friedman Test Results to Rank the Importance of Improving Methods of Teaching-Learning Schools (Favorable Position)

Row	Affecting Factor on Learning-Teaching	Average	Chi-Square	df
1	Teachers	6.00	1461.61[a]	5
2	Interaction	4.48		
3	Students	4.41		
4	Contents	3.11		
5	Teaching method	1.58		
6	Evaluation	1.42		

[a] Sig = 0.000, P < 0.05.

Table 4. Friedman Test for Ranking According to the Ways of Improving the Teaching-Learning Schools (The Status Quo)

Row	Affecting Factor on Learning-Teaching	Average	Chi-Square	df
1	Teacher	5.77	1133.695[a]	5
2	Students	4.30		
3	Content	4.29		
4	Interaction	2.82		
5	Evaluation	2.53		
6	Teaching method	1.30		

[a] Sig = 0.000, P < 0.05.

tent involves a wider range of students in the teaching-learning process and the process is deepening. Hence, use of multimedia content in the teaching-learning can be useful. The fifth most important way to improve teaching-learning was "teaching methods" (11). In general, it can be concluded that new technologies and media used for teaching in schools can transform the learning environments and attract students to their learning process, motivating and reinforcing stimuli injected in the process of teaching and learning to improve educational quality while boring traditional learning spaces become rich and full-on and full of joy of learning.

The "evaluation" process was also ranked sixth in the method by Lubis et al. (1), UNESCO (13), Sani Idrahim et al. (15) and Alt (14). Assessment is a vital element in the teaching-learning process. It should instead focus on failure to engage and motivate students to be mobile. With regards to application in teaching-learning at smart schools, it is expected that classes be interactive and cooperative and use multi-media to improve the teaching-learning process.

References

1. Lubis MA, Yunus MM, Embi MA. ICT and systematic steps in teaching and learning language in the classroom. *Procd Soc Behv Sci*. 2010;**9**:1055–61. doi: 10.1016/j.sbspro.2010.12.285.
2. Markoe Hayes S, Chapple S, Ramirez C. Strong, smart and bold strategies for improving attendance and retention in an after-school intervention. *J Adolesc Health*. 2014;**54**(3 Suppl):S64–9. doi: 10.1016/j.jadohealth.2013.12.030. [PubMed: 24560079].
3. Taleb Z, Hassanzadeh F. Toward smart school: A comparison between smart school and traditional school for mathematics learning. *Procd Soc Behv Sci*. 2015;**171**:90–5. doi: 10.1016/j.sbspro.2015.01.093.
4. Büyükbaykal CI. Communication technologies and education in the information age. *Procd Soc Behv Sci*. 2015;**174**:636–40. doi: 10.1016/j.sbspro.2015.01.594.
5. Slay H, Siebörger I, Hodgkinson-Williams C. Interactive whiteboards: Real beauty or just "lipstick"? *Comput Educat*. 2008;**51**(3):1321–41. doi: 10.1016/j.compedu.2007.12.006.
6. Bagheri K. Intelligent school under the magnifying of interactive teaching. *School tomorrow*. 2013;**10**(1):8–9.
7. Hu BY, Fan X, Yang Y, Neitzel J. Chinese preschool teachers' knowledge and practice of teacher-child interactions: The mediating role of teachers' beliefs about children. *Teach Teach Educ*. 2017;**63**:137–47. doi: 10.1016/j.tate.2016.12.014.
8. Mitrofan N, Cioricaru MF. Emotional intelligence and school performance-correlational study. *Procd Soc Behv Sci*. 2014;**127**:769–75. doi: 10.1016/j.sbspro.2014.03.352.
9. Ghonoodi A, Salimi L. The study of elements of curriculum in smart schools. *Procd Soc Behv Sci*. 2011;**28**:68–71. doi: 10.1016/j.sbspro.2011.11.014.
10. Cidral WA, Oliveira T, Felice MD, Aparicio M. E-learning success determinants: Brazilian empirical study. *Comput Educat*. 2017. doi: 10.1016/j.compedu.2017.12.001.
11. Ferdousi B, Bari J. Infusing mobile technology into undergraduate courses for effective learning. *Procd Soc Behv Sci*. 2015;**176**:307–11. doi: 10.1016/j.sbspro.2015.01.476.
12. Breen R, Lindsay R, Jenkins A, Smith P. The role of information and communication technologies in a university learning environment. *Stud High Educ*. 2010;**26**(1):95–114. doi: 10.1080/03075070123233.
13. UNESCO. *School evaluation for quality improvement, An ANTRIEP report,*

meeting of the Asian Network of Training and Research Institutions in Educational Planning (ANTRIEP), Kuala Lumpur, Malaysia. 2004.
14. Alt D. Science teachers' conceptions of teaching and learning, ICT efficacy, ICT professional development and ICT practices enacted in their classrooms. *Teach Teach Educ*. 2018;**73**:141–50. doi: 10.1016/j.tate.2018.03.020.
15. Sani Idrahim M, Razak AZ, Kenayathulla HB. Smart principals and smart schools. *Procd Soc Behv Sci*. 2013;**103**:826–36. doi: 10.1016/j.
16. Cai H. E-learning and english teaching. *IERI Procedia*. 2012;**2**:841–6. doi: 10.1016/j.ieri.2012.06.180.
17. Altun T, Bektas E. Views of regional boarding school teachers about the use of ICT in education. *Procd Soc Behv Sci*. 2010;**9**:462–7. doi: 10.1016/j.
18. Chickering AW, Gamson ZF. Seven principles for good practice in undergraduate education. *Biochem Educat*. 1989;**17**(3):140–1. doi: 10.1016/0307-4412(89)90094-0.
19. Yuksel I. Instructor competencies for online courses. *Procd Soc Behv Sci*. 2009;**1**(1):1726–9. doi: 10.1016/j.sbspro.2009.01.305.
20. Luo N, Zhang M, Qi D. Effects of different interactions on students' sense of community in e-learning environment. *Comput Educat*. 2017;**115**:153–60. doi: 10.1016/j.compedu.2017.08.006.
21. Arvola M. Grading in interaction design education using design practitioners' conceptions of process quality. *Interact Comput*. 2012;**24**(6):472–81. doi: 10.1016/j.intcom.2012.09.002.
22. Aziz Z, Anowar MH. A comparison of cooperative learning and conventional teaching on students' achievement in secondary mathematics. *Procd Soc Behv Sci*. 2010;**9**:53–62. doi: 10.1016/j.sbspro.2010.12.115.
23. Amiri R, Sharifi M. The influence of using interactive whiteboard on writings of EFL students regarding adverbs. *Procd Soc Behv Sci*. 2014;**98**:242–50. doi: 10.1016/j.sbspro.2014.03.413.
24. Jesson R, McNaughton S, Rosedale N, Zhu T, Cockle V. A mixed-methods study to identify effective practices in the teaching of writing in a digital learning environment in low income schools. *Comput Educat*. 2018;**119**:14–30. doi: 10.1016/j.compedu.2017.12.005.
25. Assareh A, Hosseini Bidokht M. Barriers to e-teaching and e-learning. *Procd Comput Sci*. 2011;**3**:791–5. doi: 10.1016/j.
26. Attaran M, Alias N, Siraj S. Learning culture in a smart school: A case study. *Procd Soc Behv Sci*. 2012;**64**:417–23. doi: 10.1016/j.
27. Makki TW, O'Neal LTJ, Cotten RS, Rikard RV. When first-order barriers are high: A comparison of second- and third-order barriers to classroom computing integration. *Comput Educat*. 2018;**120**:90–7. doi: 10.1016/j.
28. Tezer M, Ertarkan Z. Teachers' proficiency and infrastructural problems of using technology during the process of technology integration in pre-school education institutions of north Cyprus. *Procd Soc Behv Sci*. 2010;**9**:1960–8. doi: 10.1016/j.sbspro.2010.12.430.
29. Umar IN, Hassan ASA. Malaysian teachers' levels of ICT integration and its perceived impact on teaching and learning. *Procd Soc Behv Sci*. 2015;**197**:2015–21. doi: 10.1016/j.
30. Creswell JW. *Research design: Qualitative, quantitative, and mixed methods approaches*. Illustrated, annotated ed. London: SAGE Publications; 2003.
31. Gokkurt B, Dundar S, Soylu Y, Akgun L. The effects of learning together technique which is based on cooperative learning on student's achievement in mathematics class. *Procd Soc Behv Sci*. 2012;**46**:3431–4. doi: 10.1016/j.
32. Hamzah MI, Ismail A, Embi MA. The Impact of technology change in Malaysian smart schools on Islamic education teachers and students. *Int J Human Social Sci*. 2010;**4**(11):824–36.
33. Asli A, Berrado A, Sendide K, Darhmaoui H. Effect of the use of information and communication technologies (ICT) resources on the scholastic performance of middle school students in biology and geology courses. *Procd Soc Behv Sci*. 2012;**5**(5):1113–7. doi: 10.1016/j.