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The level of utilizing blended learning in teaching science from the point of view of science teachers in private schools of Ajman Educational Zone

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Abstract

This study aims to define the level of utilizing blended learning in teaching science from the point of view of science teachers (85 male and female teachers) who are working in private schools of Ajman Educational Zone. The study also aims to find if there are significant differences according to gender, years of experience, or the fact that those teachers attended training courses in the field of smart learning. To achieve the goals of this study, an instrument was used to measure the level of utilizing blended learning in teaching science. The study showed the following main results: the level of utilizing blended learning in teaching science was high. There are statistically significant differences in utilizing blended learning according to the years of experience and training courses (in favor of less experienced teachers and teachers who attended training courses in the field of smart learning). The results did not show any statistically significant difference according to the gender. In the light of the study findings and their interpretation, the study highly recommends holding training courses in the field of blended learning and providing the necessary tools to implement it.

Key words: Blended learning, science teachers, science education

1. Introduction and literature review

It is probably obvious that the twenty first century witnessed immense development in the use of the internet, social media websites, email, and other tools that keep users constantly connected with developments in the world (Sprenger, 2010). Since education represents the main pillar of a nation's development, and amid the information revolution created by the internet in the community and its members and institutions, it became imperative for educational institutions to keep their pace with these changes– and even drive them – in order to face issues created by the influx of information and their constant change by utilizing this technology to improve their outputs. Hence, many of these institutions worked on developing their performance by creating and utilizing new educational strategies through which they aim to create a teaching-learning environment where the learner is active and positive (Hasan, 2010).

In the context of the educational institutions' quest to develop their performance, they created a new learning and teaching system called the e-learning system (asynchronous), that is characterized by time and space flexibility, away from the limits of time and space (Mason, 2002). The e-learning system depended on the learners' self-motivation that drives them to search for information and acquire it by themselves. So many educational institutions adopted the idea of e-learning by developing e-learning platforms to provide learning anywhere and at any time, and that was done by developing e-learning content that can be accessed through the internet. In general, e-learning facilitated the learning process because it was in-line with the most important theory of learning: the theory of constructivist learning, which perceives learning as an active process through which the learner constructs meanings that are related to his/ her surrounding world; that is, learning cannot be considered a process of recollecting information that was passively passed to the student from an external source; but an active, rational and self-organized process (Bruner, 1966; Wang, 2008).

Despite the advantage of using modern technology and communication tools in e-learning, and its ability to achieve many of the learning-teaching process objectives, it does involve some downfalls. It lacks face-to-face interaction between the teacher and learner, and it doesn't provide students with the chance to train on having dialogues and discussions (Alvarez,2012). Hence, e-learning cannot solve all problems by itself. Direct learning is the style of teaching used by many teachers. It is the traditional style of learning occurring between the teacher and student in one place, and where the teachers are considered to have the knowledge and information that the student needs to learn. Although direct learning was used in the learning-teaching process for a long time, and

although it contributed to the progress of nations, it suffers many flaws and issues that couldn't be solved. The most important of which is its ignorance of individual differences, and its reliance on indoctrinate as a main method of teaching (Handler, 1993). Due to the importance of preserving the advantages of both direct learning and e-learning, blended learning comes to reconcile those two extremes in order to take the best advantages of both e-learning and direct learning and come up with a recipe that would improve the outputs of the teaching-learning process.

Blended learning is considered a novel concept in the teaching-learning process, for it was only used by few educators before the beginning of the twenty first century (Bliuc, Goodyearb, & Ellisc, 2007). One of the most important reasons for that might be the ambiguity of its concept. The blended learning concept is sometimes used to represent utilizing technology inside the classroom; however, utilizing technology in teaching is inevitable and has been long used since the emergence of the teaching-learning process. The use of chalk, chalkboard, markers, and the interactive board are examples of utilizing technology in teaching. The blended learning concept is also sometimes used to represent distance learning; that is when technology and the internet replace direct contact between the teacher and student by uploading educational content on the internet without any interaction between the student and teacher. Although blended learning is not distance learning, it does have common features with distance learning such as the reliance on the internet in transferring some parts of the content; but it is different from distance learning in terms of the complete separation between students and teachers. Blended learning affirms the necessity of interaction between students and teachers. It is worth mentioning that blended learning came as a natural development of programmed and electronic learning, however, the huge development in technology tools and applications speeded up its spread due to the spread of internet. Several researchers indicate that blended learning is a learning that combines the best of direct classroom learning and learning through the internet by utilizing its applications (Bourne& Seaman, 2005). Al-Khan (2005) also referred to blended learning as a strategy that combines between the forms of direct learning through the internet, and indirect learning.

From the definitions mentioned above, we observe that blended learning does not rely on one method in learning; instead, it combines direct learning methods with e-learning methods to achieve individualized teaching that takes into consideration individual differences among students. According to the European Committee's report (ODL Liaison Committee,2004), despite the simplicity of the idea of blended learning, it requires some organization. Since the practical aspect of blended learning is more complex. That is because it redefines the relationship between teachers and learners to extend communication between them beyond classroom meetings towards learning in any place and at any time outside the classroom boundaries. Hence, we believe that educators need to think thoroughly about defining the frameworks of learning in the classroom and learning through the internet.

One of the advantages of blended learning was summarized by Zaitoon (2005) in his definition of blended learning as a learning strategy in which electronic learning material is transferred through computer multimedia and networks to the learner in a manner that provides the learner with the opportunity to actively interact with the content, teachers and his peers; whether that is synchronously or asynchronously, and at the speed, time and place that suits the learner and his/ her abilities. Although blended learning is directed by the teacher, this doesn't mean that the teacher is an instructor to the students but a facilitator; where students self-learn or learn most of the time in a participatory manner with their colleagues. Hence, blended learning can contribute to the development of students' abilities in the fields of analysis, construction, and correction (Bloom's high thinking levels); which are levels that can't be developed through e-learning. However, Bloom's lower levels of thinking (memorization and comprehension) could be learned by using e-learning (Al-Sharman, 2015).

When reviewing educational literature related to the utilization of blended learning in teaching, we find several English and Arabic studies. Al-Fhaid (2015) conducted a descriptive study which investigated the status of blended learning in teaching science in high schools from the perspective of science teachers and supervisors in Al-Qassim, Suadi Arabia. The sample consisted of 200 teachers and supervisors. The study findings showed that the sample subjects highly agreed to the importance of blended learning in teaching science; and that the sample subjects agreed to a medium extent to the level of utilizing blended learning in teaching science and the level of availability of equipment used in the application of blended learning. The obstacles facing blended learning came at a high level too.

Bani Domi's study (2010) aimed to identify the level of science teachers' appreciation of having educational technological capabilities according to their gender, years of experience, qualifications, and specialty. The study sample consisted of 92 female and male science teachers in public schools of Al-Karak Governorate in Jordan. The study findings indicated that teachers appreciate the importance of having educational technological

capabilities because they contribute to improving their professional performance. The study also indicated that there is a statistically significant difference in the appreciation of having educational technological capabilities according to the gender variable in favor of females, and according to the years of experience variable in favor of those with long years of experience. The study also revealed that there were no statistically significant differences according to the qualification and specialty variables.

A study conducted by Al-Me'waly (2000), which aimed to discover the extent to which Omani high school teachers have technological capabilities and use them, concluded that teachers have (30) capabilities at a high level, (16) at a medium level, and (10) at a low level. The study also indicated that there are statistically significant differences in having and practicing these capabilities, where differences were in favor of females.

Alshannag (2011) investigated the status of using electronic media in teaching science in the UAE from the point of view of female and male teachers. The sample consisted of (154) female and male science teachers in Al-Ain city. The study concluded that teachers use email in teaching to a large extent, and use the data show to a lesser extent.

The study conducted by Al-Mannai (2016) investigated the status of utilizing e-learning and internet services from the point of view of female and male teachers (400 female and male) of core courses in Qatar's independent high schools to define the effect of gender, years of experience, and training courses variables. The study findings indicated statistically significant differences in the utilization of e-learning in favor of male teachers and more experienced teachers. There was no significant difference according to the training courses variable.

Obeidat's study (2013) investigated the challenges of applying blended learning in the high schools of Irbid Governorate from the point of view of teachers in light of gender, experience, qualification, and specialty variables. The sample consisted of 320 male and female teachers. The study findings indicated that there were difficulties in applying blended learning to a high extent in all domains of the study instrument. The findings also indicated that there were no statistically significant differences in any of the study variables (years of experience, gender, qualification and specialty) or any of the study instrument domains.

A study conducted by Athanassios, Panagiotis, Dimitrios and Anastasia (2013) investigated the level of comfort and belief in the efficiency of implementing Web 2 in teaching, and the challenges facing the application of this teaching style. The study tried to answer its questions by implementing a program that aims to prepare teachers and provide them with the necessary skills and knowledge to implement Web 2 in their classes in an active and meaningful manner. Web 2 is a term that combines a series of technologies that are based on utilizing the internet, such as blogs, wiki sites, social media, social networks and other modern forms of communication. The study findings were positive in terms of the perceptions and beliefs of the sample subjects regarding the efficiency of utilizing Web 2. The study also indicated that implementing Web 2 is considered to be supportive of blended learning since it expands the spaces available for student learning whether they are physical or virtual spaces, and transfers those spaces outside the boundaries of the classroom. As a result, this new concept changes the concept of boundaries between home and school, and between formal and informal teaching. Web 2 also provides open channels of communication between classrooms and parents from one side, and the local community from another. In addition, it supports schools on a national and international level, and all of this supports the concept of blended learning.

Erdem (2008) conducted a study that aimed to test the impact of utilizing information technology and communication that is supported by blended learning on the perceptions of preservice teachers on their self-efficiency and on their epistemological beliefs, and that is to validate that teachers have the teaching skills that make them successful teachers. The study sample consisted of 43 female and male from a Turkish university. The study findings showed the ability of blended learning to promote the belief in self-efficiency and epistemological beliefs among males with high and low academic achievement levels, but without achieving the same efficiency among females.

Scott (2013) conducted a longitudinal case study of a female member of the teaching staff in an Australian university in order to identify the method by which the concerned teaching staff member can convert from direct teaching (face to face) to blended learning that is based on using social media. The study focused on the initial beliefs of the staff member and her hesitation to convert to utilizing blended learning tools in her teaching, which could be attributed to factors of age, gender, and level of qualification. The study findings indicated the following main results: although the process of changing beliefs is considered somewhat difficult, it is possible to change practices and beliefs through motivation and cooperative work. Moreover reinforcing the trend towards utilizing blended learning tools requires repetition and experimentation. The factors of age, gender and

experience all affect the capability to change beliefs.

Rowand (2000) conducted a study on a group of teachers in the United States to identify the effect of experience and training courses on the level of utilization of blended learning by those teachers. The study findings showed that less experienced teachers were the ones to use blended learning the most. Teachers who took training courses in the field of technology and the internet were also the ones to use blended learning the most.

It is evident from reviewing previous studies that some were consistent in indicating the importance of utilizing blended learning in teaching (Athanassios et al., 2013; Al-Fhaid, 2015). Erdem (2008) also showed the ability of blended learning to reinforce teachers' belief in their own self-efficiency and their epistemological beliefs. Al-Fhaid study (2015) was also consistent with Obeidat (2013) in showing that there are difficulties/ obstacles facing the utilization of blended learning. Probably what distinguishes this study from other studies - based on reviewing the study literature and in the limits of the researchers' knowledge - is that many studies were conducted in Arab and gulf countries (Saudi Arabia, Jordan, Oman, Qatar), which is why this study came to investigate the level of utilizing blended learning from the point of view of science teachers in private schools of Ajman educational zone.

2. The study problem

Although utilizing e-learning solved many problems and difficulties in conventional teaching, the role of direct teaching in providing opportunities of interaction and live discussion of what the student has learned is still an important factor in reinforcing information and ridding it from any misunderstanding. Since some schools lack the availability of necessary materials and tools, it is possible that this would prevent the creation of a rich teaching-learning environment that allows learners to discover knowledge on their own (Alshannag & Bani Domi, 2010). From that we find that it is possible that teaching science follows the indoctrinate style, which has its negative results on the process of teaching and learning science. In addition to the scarcity of studies that investigated the level of utilizing blended learning in teaching scientific courses, a need has emerged to provide the field with a study that reveals the level of utilization of such method of teaching in teaching science from the point of view of teachers in Ajman educational zone. The study specifically tried to answer the following questions:

1. To what level do science teachers in private schools of Ajman Educational Zone utilize blended learning?
2. Does the level at which science teachers in private schools of Ajman Educational Zone utilize blended learning vary according to gender, years of experience, and training courses in the field of smart learning?

3. The study objectives

1. Identifying the importance of utilizing blended learning in teaching science from the point of view of science teachers in Ajman Educational Zone.
2. Identifying the level of utilizing blended learning in teaching science from the point of view of science teachers in Ajman Educational Zone.
3. Identifying the level of availability of equipment that assists in implementing blended learning in teaching science from the point of view of science teachers in Ajman Educational Zone.
4. Identifying the obstacles facing the utilization of blended learning in teaching science from the point of view of science teachers in Ajman Educational Zone.

4. The importance of the study

The United Arab Emirates is considered one of the first countries to take the initiative of utilizing the enormous technological abilities in the field of teaching and learning, and that was through "Mohammed Bin Rashid Smart Learning Initiative", which aims to create a new educational environment that conforms to the country's vision for the year 2021. The initiative also aims to reinforce the concept of knowledge based economy by merging developed technologies in the educational process; and that is by providing schools with technologies; encouraging creativity, analytical thinking and innovation; and providing specialized training courses to teachers and new scientific curriculums that support the original curriculum (Mohammed Bin Rashid Smart Learning Program, 2012). That is where the importance of this study comes from; that is, it is consistent with the objectives of the Ministry of Education in the UAE to introduce the idea of smart learning so that learning would be suitable for the advances in technology. The importance of the study also comes from the possibility of providing data that represents feedback from those in charge of teaching science in the UAE about the status of using technology in private schools through the implementation of smart learning which was applied on a national level.

5. Method

5.1 Study design

This study utilized the descriptive approach of scientific research. The study comprises three independent variables: gender, years of experience (less than 5 years, 5-less than 10 years, and more than 10 years), and training courses in the field of smart learning. The dependent variable in this study is the level of utilizing blended learning by science teachers.

5.2 Participant

The study sample consisted of a total of (85) female and male teachers in (28) private schools in the Ajman educational Zone in United Arab Emirates in the scholastic year 2015/2016. Participants in this study are the teachers who teach the following subjects to students in all grade levels: general science, physics, chemistry, biology, and geology.

5.3 Instrument

To answer the intended questions, the study depends mainly on the instrument that was developed by Al-Fhaid (2015). This instrument was developed and validated by Al-Fhaid, then administered to (200) educational supervisors and science teachers in Al-Qassim region in Saudi Arabia aiming at investigating the importance of blended learning, the actual use of blended learning by science teachers, and the barriers of utilizing blended learning in classrooms. To ensure the validity of the modified version of the instrument that was used in the current study, it was reviewed by a panel of experts in science education. The reliability of instrument was calculated using Cronbach's alpha equation, with (0.80) coefficient. The final version of the instrument includes (36) items based on Likert's five grading point scale. The items were distributed in four domains; nine items for each domain (see Table 1).

Table 1: The Level of Utilizing Blended Learning in Teaching Science Instrument

Domain	Items
Importance of utilizing blended learning	1,2,3,4,5,6,7,8,9
Level of utilizing blended learning	10,11,12,13,14,15,16,17,18
Level of availability of educational technologies in schools	19,20,21,22,23,24,25,26,27
Obstacles facing the utilization of blended learning in teaching science	28,29,30,31,32,33,34,35,36

Respondents specify their extent of agreement or disagreement on a 5-point Likert scale (strongly agree= 5, agree= 4, uncertain =3, disagree=2, and strongly disagree=1). As the mean scores are ranging from (1) to (5), the following cut points were adopted in evaluating the levels of utilizing the blended learning by science teachers: Very low (1-1.79), low (1.80-2.59), moderate (2.60-3.39), high (3.40-4.19), and very high (4.20-5.00).

6. Study findings and their discussion

6.1 Study findings related to the first question and their discussion

To answer the study's first question, mean scores and standard deviations for the responses of the study subjects were calculated for each of the instrument's items and domains in addition to the entire instrument. Table 2 shows these results.

Table 2. Means and SD of the instruments' four domains

Domain	M	SD	Ut. L*
1. Importance of utilizing blended learning	4.14	0.70	High
2. Level of utilizing blended learning	3.95	0.56	High
3.Level of availability of educational technologies in schools	3.56	0.98	High
4.Obstacles facing the utilization of blended learning in teaching science	3.39	0.79	Moderate
The entire instrument	3.76	0.46	High

*Utilizing Level

It is observed from Table 2 that the level at which teachers utilize blended learning is high, with an average of 3.76. It is also evident from Table 2 that the teachers' responses to the "Importance of utilizing blended learning" domain came in the first place with an average of 4.14 and at a high level of utilization. It is also shown in

Appendix (1) that the highest rating in this domain was for item 9 “Blended learning provides an engaging educational environment”, with an average of 4.27; and the lowest rating was for item 1 “Blended learning saves time and effort” with an average of 4.00.

In addition, it is evident from Table 2 that the teachers’ responses to the domain “Level of utilizing blended learning” came in the second place with an average of 3.95 and at a high utilization level. It is shown in Appendix (1) that the highest rating in this domain was for item 12 “The teacher uses projectors in the educational process” with an average of 4.27, while the lowest rating was for item 18 “The teacher requests delivering homework by email” with an average of 3.39. The “Level of availability of educational technologies in schools” domain came in the third place with an average of 3.56 and at a high level of utilization. With reference to Appendix (1), it is observed that the highest rating in this domain was for item 20 “The school provides ready-made educational software for science curriculum” with an average of 3.75, while the lowest rating was for item 21 “The school provides a smart board in each classroom” with an average of 3.35. The fourth domain of the instrument “Obstacles facing the utilization of blended learning in teaching science” got the lowest average (3.39) at a moderate utilization level. With reference to Appendix (1), it is evident that the highest rating in this domain was for item 29 “Shortage in equipment and technologies” with an average of 3.71, while the lowest rating was for item 33 “Difficulty of switching from conventional learning methods to blended learning” with an average of 2.99.

The findings of this study are consistent with that of Al-Fhaid (2015), which mentioned that all subjects of the study highly agreed to the importance of blended learning, and they highly agreed that there are obstacles facing its utilization. The results of the current study also agree with Scott’s study (Scott, 2013), which mentioned that there is difficulty in switching from conventional to blended learning. They were inconsistent with the findings of Alshannag’s study (2011) regarding the use of email in submitting homework, for the findings of Alshannag’s study showed that science teachers use emails to a high extent in submitting homework.

It is observed from the above results that teachers realize to a large extent the importance of utilizing blended learning in teaching science, which is explained in teachers’ perception that this style of teaching could achieve better student academic results due to its distinction from other teaching styles. Perhaps the consideration of individual differences is one of the most important advantages of blended learning since it enables students of various academic levels and abilities to learn without the pressures of space and time. It is possible that what Bruner (1966) and Wang (2008) meant is in line with the idea behind the importance of utilizing blended learning in education and that is achieving constructive education for students, for they mentioned that learning is an active, rational, and self-organized process and is not limited to memorizing information and retrieving it.

Although teachers realize the great importance of utilizing blended learning in teaching science, the obstacles facing its utilization still exist to some extent. These obstacles might be explained through the responses of the study subjects in the fourth domain of the instrument (Obstacles facing the utilization of blended learning in teaching science) which got a medium rating; that is, teachers feel that these technologies are still below the adequate level.

6.2 Findings related to the second question of the study and their discussion

Mean scores and standard deviations were calculated to answer the study’s second question. Analysis of variance test was conducted to find out the significance of differences between averages. Scheffe’s test for post hoc comparisons was conducted to find the significance of differences between means. The responses of the study subjects are detailed below according to the study variables.

Table 3 shows the resulting averages and standard deviations of the entire instrument and its domains in terms of gender.

Table 3. Means and SD of the study subjects' responses according to gender

Domain	Gender	N	M	SD
First	Male	42	4.06	0.82
	Female	43	4.22	0.56
	Total	85	4.14	0.70
Second	Male	42	3.90	0.60
	Female	43	3.99	0.52
	Total	85	3.95	0.56
Third	Male	42	3.64	0.94
	Female	43	3.48	1.04
	Total	85	3.56	0.99
Fourth	Male	42	3.51	0.85
	Female	43	3.26	0.71
	Total	85	3.39	0.79
Entire domains	Male	42	3.77	0.42
	Female	43	3.74	0.45
	Total	85	3.76	0.46

It is observed from Table 3 that there are apparent differences between means according to gender in terms of the extent of utilizing blended learning, where the average for males was 3.77 and for females 3.74. In order to decide the significance of these differences, variance analysis test was conducted, the results of which are shown in Table 4.

Table 4. Analysis of variance according to gender

Domain	Source	Sum of Squares	df	M	F	Sig.
First	Between Groups	0.55	1	0.55	1.11	0.29
	Within Groups	41.13	83	0.49		
	Total	41.67	84			
Second	Between Groups	0.19	1	0.19	0.60	0.44
	Within Groups	26.20	83	0.32		
	Total	26.39	84			
Third	Between Groups	0.51	1	0.51	0.52	0.48
	Within Groups	81.60	83	0.98		
	Total	82.10	84			
Fourth	Between Groups	1.31	1	1.31	2.11	0.15
	Within Groups	51.36	83	0.62		
	Total	52.66	84			
Entire domains	Between Groups	0.03	1	0.03	0.13	0.72
	Within Groups	18.09	83	0.22		
	Total	18.12	84			

It is observed from Table 4 that the differences between means of teachers' responses about the utilization of blended learning are not statistically significant ($\alpha = 0.05$), where the significance level of the entire instrument was (0.72). In addition, the results in Table 4 did not show that the teacher's gender is statistically significant in any of the four domains, where the level of significance for the four domains was (0.29, 0.44, 0.48, 0.15) respectively. These results are consistent with the results of Athanassios et. al, (2013), Obeidat (2013), and Scott (2013), and are inconsistent with the results of Erdem (2008), Bani Domi (2010) and Al-Me'waly (2000), which all indicated significant differences in favor of females; however, Al-Mannai (2016) demonstrated significant differences in favor of males.

The results of this study could be attributed to both genders' realization of the importance of blended learning, since in their opinion it increases their competency by overcoming the time and space issues which limit learning. Blended learning also opens opportunities for self-learning, and it increases the chances of social interaction between teachers and students from one side and among students from another.

Relating to experience, Table 5 shows the mean scores and standard deviations of teacher responses to the entire instrument and its four domains according to the years of experience.

Table 5. Means and SD of the study subjects' responses according to years of experience

Domain	Years of Experience	N	M	SD
First	Less than 5	25	4.21	0.75
	5-less than 10	24	3.93	0.80
	More than 10	36	4.24	0.59
	Total	85	4.14	0.70
Second	Less than 5	25	4.09	0.52
	5-less than 10	24	3.73	0.50
	More than 10	36	4.01	0.59
	Total	85	3.95	0.56
Third	Less than 5	25	3.93	0.99
	5-less than 10	24	3.18	0.97
	More than 10	36	3.56	0.92
	Total	85	3.56	0.99
Fourth	Less than 5	25	3.58	0.66
	5-less than 10	24	3.20	0.82
	More than 10	36	3.39	0.85
	Total	85	3.39	0.79
Entire domains	Less than 5	25	3.95	0.41
	5-less than 10	24	3.51	0.50
	More than 10	36	3.80	0.42
	Total	85	3.76	0.47

It is observed from Table 5 that there are apparent differences between means of subject responses to the entire study instrument in terms of experience. Analysis of variance was conducted to find the significance of these differences; the results of which are shown in Table 6.

Table 6. Analysis of variance according to experience

Domain	Source	Sum of Squares	df	M	F	Sig.
First	Between Groups	1.59	2	0.80	1.63	0.20
	Within Groups	40.09	82	0.49		
	Total	41.67	84			
Second	Between Groups	1.79	2	0.90	2.99	0.06
	Within Groups	24.60	82	0.30		
	Total	26.39	84			
Third	Between Groups	6.94	2	3.47	3.78	0.03*
	Within Groups	75.17	82	0.92		
	Total	82.11	84			
Fourth	Between Groups	1.72	2	0.86	1.38	0.26
	Within Groups	50.94	82	0.62		
	Total	52.66	84			
Entire domains	Between Groups	2.48	2	1.24	6.51	0.00*
	Within Groups	15.64	82	0.19		
	Total	18.12	84			

*Differences are significant ($\alpha \leq 0.05$)

When examining the values of (f) shown in Table 6, it becomes evident that the experience variable is statistically significant in terms of the entire study instrument, where the significance value was (0.00). It is also observed from Table 6 that the differences are statistically significant in the third domain "Level of availability of educational technologies in schools", where the significance level reached (0.03). Scheffe's test for post hoc comparisons was conducted to define the source of these differences; the results of which are shown in Table (7).

Table 7. Post- hoc comparisons between means in terms of the experience

Domain	Experience (Year)		Sig.
First	Less than 5	5- less than 10	0.36
		More than 10	0.99
	5- less than 10	More than 10	0.24
Second	Less than 5	5- less than 10	0.08
		More than 10	0.88
	5- less than 10	More than 10	0.15
Third	Less than 5	5- less than 10	0.03*
		More than 10	0.35
	5- less than 10	More than 10	0.31
Fourth	Less than 5	5- less than 10	0.26
		More than 10	0.65
	5- less than 10	More than 10	0.68
Entire domains	Less than 5	5- less than 10	0.00*
		More than 10	0.43
	5- less than 10	More than 10	0.04*

*Differences are significant ($\alpha \leq 0.05$)

The results of Scheffe's test show that the differences in averages of subject responses according to the experience variable are statistically significant in the third domain "Degree of educational technologies availability the school", where differences were in favor of teachers with less than five years of experience compared to their counterparts who had more than 10 years of experience, and also in favor of the entire instrument, where differences were in favor of teachers who had less than five years of experience compared to teachers who had (5-10) years of experience. They were also in favor of teachers who had (5-10) years of experience compared to teachers who had more than (10) years of experience.

In general, this finding is consistent with the findings of Erdem (2008) and Scott (2013) which indicated the difficulty of switching to blended learning due to factors of age, beliefs, and level of education. However, it was inconsistent with the results Al-Fhaid study (2015), which indicated that there are no significant differences attributed to the years of experience. It was also inconsistent with the findings of Al-Mannai (2016) and Bani Domi (2010) studies, which showed statistically significant differences in favor of more experience teachers. It is also inconsistent with the findings of Obeidat study (2013), which showed the lack of statistically significant differences according to the years of teaching experience.

The findings of this study could be attributed to the difficulty of changing the beliefs of more experienced teachers who have more than 10 years of experience towards making a change and using modern methods in teaching, since their skills in using modern technologies might be modest. Teachers with less years of experience could be younger than those who are more experienced, hence younger teachers might have the ability to use the technologies of blended learning more than others since they witnessed the development of these technologies.

In terms of the "Training courses in the field of smart learning" variable, mean scores and standard deviations of the entire instrument and its domains were calculated to find out the status of this variable and its effect on blended learning. Table 8 shows these results.

Table (8): Analysis of variance according to "Training courses in the field of smart learning" variable

Domain	Training courses in the field of smart learning	N	M	SD
First	Yes	62	4.19	0.61
	No	23	3.99	0.912
	Total	85	4.14	0.70
Second	Yes	62	4.05	0.53
	No	23	3.68	0.57
	Total	85	3.95	0.56
Third	Yes	62	3.52	1.01
	No	23	3.65	0.95
	Total	85	3.56	0.99
Fourth	Yes	62	3.30	0.81
	No	23	3.62	0.70
	Total	85	3.39	0.79
Entire domains	Yes	62	3.75	0.49
	No	23	3.73	0.41
	Total	85	3.76	0.46

It is evident from Table 8 that there are apparent differences between means of the entire instrument and its domains according to the "Training courses in the field of smart learning" variable, where the mean of the entire instrument was (3.76) while the means of the four domains were (4.14, 3.95, 3.56, 3.39) respectively. In order to decide the significance of these differences, analysis of variance test was conducted; the results of which are shown in Table 9.

Table 9. Analysis of variance according to "Training courses in the field of smart learning" variable

Domain	Source	Sum of Squares	df	M	F	Sig.
First	Between Groups	0.65	1	0.65	1.31	0.26
	Within Groups	41.03	83	0.49		
	Total	41.67	84			
Second	Between Groups	2.33	1	2.33	8.03	0.01*
	Within Groups	24.07	83	0.29		
	Total	26.39	84			
Third	Between Groups	0.28	1	0.28	0.28	0.60
	Within Groups	81.83	83	0.99		
	Total	82.11	84			
Fourth	Between Groups	1.69	1	1.69	2.76	0.10
	Within Groups	50.97	83	0.61		
	Total	52.66	84			
Entire domains	Between Groups	0.02	1	0.02	0.07	0.79
	Within Groups	18.11	83	0.22		
	Total	18.12	84			

*Differences are significant ($\alpha \leq 0.05$)

Tables 9 show that there is no statistically significant difference in the entire instrument, since the level of significance of the entire instrument was (0.79). However, results showed that there are statistically significant differences in the second domain "Level of utilizing blended learning in teaching science", where the level of significance reached (0.01). With reference to Table 8, we find that the average for this domain was in favor of those who were trained (4.05) compared to teachers who weren't trained (3.68). These results come in accordance with the results of Al-Fhaid (2015), Athanassios et. al, (2013), Scott (2013), and Rowand (2000); and is inconsistent with Al- Mannai (2016. The findings of this study can be explained by the importance of training on smart teaching methods through the introduction to all that is new in technological tools that can be utilized in blended learning; where training helps the teacher in the teaching process and makes it an enjoyable experience for both students and teachers.

7. Study recommendations

- Develop teacher training programs at education faculties and develop vocational diploma in teaching programs so that they keep up with new technologies which help teachers in their profession.
- Develop science curriculum so that they are suitable to blended learning.
- Provide smart learning instruments such as devices and software in private schools in general.
- Hold training courses and workshops for teachers to introduce them to the applications of smart learning.

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Appendix (1) Means and standard deviations of study participants' responses to the study instrument items

Domain	Item No.	Item	M	SD
First	1	Blended learning opens for students self-learning opportunities	4.04	0.87
	2	Blended learning provides students with various learning resources	4.20	0.83
	3	Blended learning increases students' motivation towards learning	4.20	0.90
	4	Blended learning contributes to providing group learning opportunities	4.04	0.87
	5	Blended learning saves time and effort	4.00	1.04
	6	Blended learning increases the student's self-confidence	4.09	0.86
	7	Blended learning makes students active learners	4.24	0.81
	8	Blended learning develops research and reasoning skills	4.20	0.86
	9	Blended learning provides an engaging educational environment	4.27	0.82
Second	10	The teachers uses a smart board when presenting lessons	4.06	0.85
	11	The teacher uses educational videos	4.26	0.73
	12	The teacher uses projectors in the educational process	4.27	0.66
	13	The teacher uses scientific learning websites	4.11	0.85
	14	The teacher uses text and voice chats	3.88	0.93
	15	The teacher uses virtual labs	3.96	0.94
	16	The teacher uses social media	3.80	0.92
	17	The teacher uses educational forums alongside curriculums	3.85	0.82
	18	The teacher requests delivering homework by email	3.39	1.04
Third	19	The school provides internet	3.73	1.23
	20	The school provides ready-made educational software for science curriculum	3.75	1.15
	21	The school provides a smart board in each classroom	3.35	1.38
	22	The school provides an electronic support team through specialists and technicians	3.61	1.23
	23	The school provides enough computers for students	3.52	1.30
	24	There are digital curriculums for scientific material	3.64	1.15
	25	The school provides training programs for students about using modern technology	3.47	1.10
	26	Availability of educational forums that are concerned with blended learning	3.51	1.04
	27	The school has an educational portal	3.48	1.18
Fourth	28	Teachers lack sufficient skills in using technologies	3.49	1.13
	29	Shortage in equipment and technologies	3.71	1.15
	30	Technical malfunctions in technical devices	3.66	1.06
	31	Lack of e-courses	3.36	1.16
	32	Parents' beliefs about using technology	3.12	1.03
	33	Difficulty of switching from conventional learning methods to blended learning	2.99	1.20
	34	Lack of internet in students' homes	3.13	1.17
	35	Lack of sufficient time for discussions and conversations through the internet	3.40	1.16
	36	Low level of awareness of blended learning among the community	3.66	1.02