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Using the interactive whiteboard for teaching from the viewpoint of physics teachers in the Sultanate of Oman

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Abstract:

Interactive whiteboards are provided in most schools in Oman, including those in the Al-Batinah North Governorate of the Sultanate, but many are not activated. Some teachers abandon them despite their presence and prefer to use the traditional blackboard or whiteboard for teaching. This study reveals the views of physics teachers in the Al Batinah North Governorate about the use of the interactive whiteboard for teaching physics. This study adopts a descriptive approach to collecting data from 377 male and female physics teachers, undertaken in the second semester of the 2017-2018 academic year. Statistical analysis shows that the teachers' responses to the tool were positive and profound, and there were no significant differences in their views about the effectiveness of using interactive whiteboards for teaching due to the variables of gender, educational qualification, or years of experience. This result is satisfactory because of the similarity of the job environment for all members of the sample, which leads to the absence of a difference in the viewpoints of male and female teachers. In light of the results, the study recommends holding workshops and training courses for teachers to develop their skills in using the interactive whiteboard in teaching and conducting similar studies in other provinces with larger samples to generalize the results.

Keywords: interactive whiteboard; teaching; physics teachers; Oman

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1: Introduction

In light of the ongoing scientific and technological developments in this era and the tangible progress in the technical tools used in the classroom, the interactive whiteboard (IWB) has become one of the most important educational methods created. This interactive white screen is a revolution in communications technology and digital display tools, with significant benefits in the field of classroom teaching (Betcher and Lee, 2009). On a global level, interactive whiteboard technology emerges as one of the most relevant educational media technologies, and its entry into schools brought many direct benefits to the classroom, solving many problems. The use of the traditional board has declined in favour of expanding the use of the IWB (, Al-ga2013; Kennewell, 2006).

The IWB has many essential features for teaching, such as the ability to control writing in terms of font size, colour, thickness and type. The teacher can clear it quickly and easily using the electronic eraser, or keep what is written on it for later use. The teacher can save time and effort that would have been spent writing text or drawing an illustration by retrieving a document or a ready-made example from the IWB memory or directly from the internet, which is usually connected (Kennewell, 2006). With the touch of a finger, the teacher can view or process a large amount of information and use it to solve many of the problems they face (Betcher and Lee, 2009).

The IWB connects to a printer that can print everything displayed on the screen for distribution to students. The IWB also includes many of the educational tools that students need such as rulers, calipers, protractors, triangle angles, maps, figures, and various measuring tools, saving the teacher the time and effort of preparing these tools and transferring them to the classroom (Smith, Hardman & Higgins, 2006). The IWB can send anything displayed on it via e-mail. It is equipped with an audio and camera system that enables it to play a new interactive role, displaying computer applications, animations and videos, and performing many modelling and simulation experiments (Schuck & Kearney, 2007).

The IWB is a convenient way for students with special needs, learning difficulties, autism, Down syndrome, etc. to learn, because of its ability to provide audio and visual effects that attract the attention of the disabled, increase their concentration and focus information in their minds (Mechling, Gast and Krupa, 2007). The IWB helps teach science, according to the STS, which works to strengthen the link between science, technology, and society, which is an important education goal, and a primary requirement of the Next Generation Science Standards (NGSS) (NRC, 2015). The connection between technology with the educational process has become very important. After students complete their education, they must be prepared to face the professional world, which requires the skills to use technology in an optimal way (Al-Zboon and Hamdi, 2014; Rodney, 2002). The frequent use of an IWB, which is similar in appearance to a traditional whiteboard, in the classroom reduces students' awe and fear of technology, which is known as "technology phobia." It improves communication with modern technological media, increases the opportunity to employ technology in working life, and improves students' attitudes towards it (Winzenried, Dalgarno & Tinkler, 2010; Al-Zboon and Hamdi, 2014; Al-Gharib, 2013).

Many local and global studies have been conducted on the use of the interactive whiteboard, in many environments across the world, which indicates the significance of the topic and its importance to many researchers. Some of these studies explore the impact of the IWB using a semi-experimental approach, all of which reveal its positive effect on achievement in science. These studies include Al-Yateem, Alsalhi and Habboush (2015), Al-Zboon and Hamdi (2014), Bseisu (2013), Al-Hazmi (2013), Al-Gharib (2013), Winzenried, Dalgarno & Tinkler (2010) and Marzano and Haystead (2010).

The study conducted by Al-Juwair (2009) examines the effect of the IWB on cognitive and metacognitive thinking skills among students. The study of Morgan (2008), undertaken for her PhD at Liberty University, reveals a positive effect of using an IWB to improve the participation of high school students. The study

conducted by Al-Ssahaffi (2013) reveals a whiteboard's impact on the motivation to learn. The study conducted by Hendawi and Nosair (2020) determines the effectiveness of using an interactive smartboard in teaching a unit of a social studies curriculum in Qatar using an experimental method. The results indicate an increase in student achievement and a positive attitudes toward using the smartboard for learning.

As with other developed countries, the countries in the Arab world introduced interactive whiteboards into their schools as an alternative to traditional blackboards, which necessitated everyone working in the education sector, headed by teachers, being aware of their importance and convinced of the role they could play in the educational process. It has been observed that the IWBs are not activated in many schools, including schools in the Al-Batinah North Governorate of the Sultanate of Oman, most of which were provided with them. Some teachers abandon them despite their presence and prefer to use the traditional blackboard for teaching. They appear comfortable with using the blackboard, due to their habit and long experience of dealing with it, especially the class of teachers with long teaching experience. On the other hand, it is observed that another group of teachers, especially young teachers, tend to use the IWB, and show a willingness and enthusiasm to keep pace with scientific and technological development in the educational process.

None of the previous studies related to the subject matter of the study deal with the views of physics teachers towards the use of the interactive whiteboard. This is despite the results of studies revealing physics to be one of the most important research topics for educational systems across the world (NRC, 2015), physics being considered one of the most abstract, complicated and challenging subjects, and an unwillingness to study physics on the part of students (Ismail, 2010; Ghanem, 2010).

Modern technology can improve the process of learning science if it is activated and used efficiently. It can be employed in teaching physics, reducing the difficulties facing students and teachers, improving their attitudes, and reducing their aversion and reluctance to study the subject. This study is conducted in order to reveal the views of physics teachers in the Al Batinah North Governorate, Sultanate of Oman, towards the use of the IWB in teaching physics.

This study aims to answer the following questions:

1: What are the views of physics teachers in Al Batinah North Governorate on the use of the interactive whiteboard in teaching?

2: Do the views of physics teachers in the Al-Batinah North Governorate differ on the use of the interactive whiteboard in teaching according to the variables of gender, educational qualification, and the number of years teaching experience?

3: Do the views of physics teachers in the Al-Batinah North Governorate differ on the use of the traditional whiteboard and the interactive whiteboard?

2: Methods

2.1 Design and development of research data

In this study, the descriptive survey approach is used to describe the views of physics teachers on the effectiveness of using the interactive whiteboard in teaching physics in the Sultanate of Oman. The study tool consists, in its final form, of 46 items. Responses are measured on a five-point Likert scale: Strongly agree (5), OK (4), neutral (3), I do not agree (2), I strongly disagree (1). A classification is adopted, consisting of three levels, based on the arithmetic mean, in which the effectiveness of using a whiteboard in teaching is described as: weak if the mean of teacher assessments is 1-2.33; moderate if it is 2.34-3.66; and high if it is 3.67-5.

2.2 Reliability and validity

To verify the validity of the study tool, it was presented in its original form to a group of specialists arbitrators with expertise. Their suggestions and comments on its performance were taken on board to develop the tool in its final form. The internal consistency of the study tool is calculated using Cronbach's alpha equation and applying the tool to a sample survey of ten physics teachers in the North of Al Batinah Governorate, outside the study sample. The Cronbach's alpha coefficient for interactive whiteboard paragraphs was 0.91. This value is an indication of the stability of the study tool and the quality of its construction (Odeh, 2014).

2.3 Study sample

The study population consisted of 377 male, and female teachers enrolled in the physics unit database in Al Batinah North Governorate in the Sultanate of Oman. The questionnaire was implemented in the second semester of the 2017-2018 academic year. The sample of the study consisted of 124 male and female teachers, of whom 62 were chosen in a random and stratified way. The sample included about 30% of the study population. The sample selection took into account several personal and functional variables related to the teachers, specifically the sex of the teacher, the number of years of teaching experience, and the educational qualification held. Table 1 shows the distribution of individuals in the sample according to these variables.

Table 1: Distribution of the sample by personal and professional variables

variable	Level	Number	Percentage
Gender	Male	62	50%
	Female	62	50%
	Total	124	100%
Qualification	Bachelor	117	94.4%
	Postgraduate	7	5.6%
	Total	124	100%
Teaching experience	Less than 5 years	9	7.3%
	6-10 years	39	31.5%
	11-15 years	53	42.7%
	More than 15 years	23	18.5%
	Total	124	100.0%

2.4 Study limitations

The study sample is restricted to teachers who taught physics in schools affiliated to the Directorate of Education in Al Batinah North Governorate, Sultanate of Oman, in the second semester of the 2015-2016 school year.

3: Results

To answer the first question of the study: "What is the view of physics teachers about the effectiveness of using the interactive whiteboard in teaching in the North Al Batinah Governorate?" the means and standard deviations of the responses are calculated. Statistical analysis shows that the calculated mean of teachers' responses to the tool as a whole is 4.07, which is statistically high. At the same time, their estimates of the effectiveness of the whiteboard in teaching were positive and profound. The mean of their responses to the instrument's paragraphs was between 2.18 and 4.56. Teachers' reactions to the tool's sub-paragraphs ranged from medium to high. The arithmetical mean of their estimates was an average of only 8 items, compared to 38 items.

To answer the second question: "Do the views of physics teachers in the Al Batinah North Governorate differ on the use of the interactive whiteboard in teaching according to the variables of gender, educational qualification and the number of years of teaching experience?" the means and standard deviations are calculated according to the study variables and the triple contrast analysis test is applied. Table(2) shows the results.

Table 2: Means and standard deviations of gender, educational qualification and number of years of teaching experience

Variable	Level	Mean	Standard deviation
Gender	Male	4.03	0.50
	Females	4.10	0.32
Educational qualification	Bachelor	4.08	0.42
	Postgraduate	3.86	0.38
Experience years	Less than 5 years	4.13	0.19
	6-10 years	4.13	0.48
	11-15 years	4.03	0.36
	16 years or more	4.02	0.49

Table 2 shows that there are differences between the means for the responses of the study sample according to the study variables. To reveal the statistical significance of these differences, triple variance analysis is applied, as shown in Table 3.

Table 3: ANOVA analysis of the means of responses according to gender, educational qualification, and years of experience.

Variable	Sum of squares	DF	Sum of squares	F	Statistical significance
Gender	0.07	1	0.07	0.37	0.54
Educational qualification	0.27	1	0.27	1.54	0.22
Experience years	0.14	3	0.05	0.27	0.85

Error	20.76	118	0.18	
Total		124		

Table 3 shows no significant differences in the views of physics teachers about the effectiveness of using the IWB in teaching due to gender, educational qualification or years of experience.

To answer the third question: "Do the views of physics teachers in Al Batinah North Governorate differ on the use of the traditional whiteboard and the interactive whiteboard in teaching?", an independent samples T-test is applied. Table 4 shows the results.

Table 4: T-test on means and standard deviations of the study sample responses to the traditional whiteboard and interactive whiteboard

	standard deviation	mean	T	Statistical significance
Traditional board	0.52	2.79	21.27	0.00
Interactive whiteboard	0.42	4.07		

Table 4 shows statistically significant differences at the $\alpha = 0.05$ level in the physics teachers' estimates of the effectiveness of the use of interactive and traditional whiteboards. The differences are in favour of the IWB, with a mean of 4.07 and a standard deviation 0.42. The mean of their estimates relating to the use of the traditional whiteboard is 2.79, and the standard deviation is 0.42.

4: Discussion

The statistical analyzes of the first question related to what is the view of physics teachers about the effectiveness of using the interactive whiteboard in teaching shows that the high calculated value of most of the instrument's paragraphs (38 out of 46 items) indicates that the views of the physics teachers of the effectiveness of using the interactive whiteboard for teaching physics were positive and high, due to their conviction of its importance in teaching and their awareness of its many advantages in the educational process such as the ease of writing clearly and neatly, and controlling the size, colour and thickness of the font so that all students can see and read it. The IWB contributes to solving the problem of poor calligraphy and lack of clarity on a traditional board. One of the characteristics of the interactive whiteboard that teachers agreed upon is that it encourages students to engage in meaningful dialogue and discussion and helps develop self-learning skills, love of cognitive inquiry and mental skills, and stimulates students to think and solve problems.

Statistical analysis shows that the paragraphs with medium mean value are related to obstacles and challenges to using the IWB, such as the use of the whiteboard requires additions to the infrastructure of the classroom, electrical connections, the internet and the installation of curtains, among other things; and this is what the study of Al-Hazmi (2013) found.

Also, the teachers warned of the malfunctions that may occur, such as a shutdown that causes the whiteboard to stop working, or the loss of internet connection, which removes many of the IWB's advantages and disrupts its interactive functions. In addition, technical skills are required for its operation, which constitutes a considerable burden for teachers, especially teachers who are not proficient in dealing

with technology and hence avoid engaging with it. The opinions of the sample in the intermediate response study indicate that the use of the IWB is costly and requires constant maintenance. Its faults cannot simply be repaired as it requires an expert to fix it. Their responses also included an indication of a type of anxiety on the part of some teachers that their use may reduce teachers' role in the educational process, which reduces their prestige and the time standing in front of their students. They also pointed out some of the caveats that teachers fear that their use reduces students' manual skills, such as the skill of writing with readable handwriting, that grow using the traditional blackboard.

The above results show that the physics teachers' views were positive, and the effectiveness of using the IWB was high. This is in agreement with the results of previous studies, whether Arab or foreign, all of which indicate the importance of using the IWB in teaching, and its positive impact on learning science topics and achieving educational outcomes for all ages without exception (Marzano & Haystead, 2010; Kennewell, 2006; Levy, 2002). Some studies show a positive effect on many of the study variables, such as feeling enjoyment and excitement while presenting scientific content, improving students' motivation to learn (Torff and Tirotta, 2010), and improving their behaviour, interaction, class participation and involvement in the lesson (Morgan, 2008).

Using an interactive whiteboard increases students' ability to think, develops cognitive and metacognitive thinking skills (Al-Juwair, 2009), and improves students' attitudes toward science (Al-yateem, Alsalhi, and Habboush, 2015). These attributes of the IWB, and technology in general, are shown by all studies conducted into these effects, such as Al-Zboon and Hamdi (2014), Bseisu (2013), AL-Gharib (2013), Al-Ssahaffi (2013) and Winzenried, Dalgarno & Tinkler (2010).

The result regarding the second question, do the views of physics teachers differ on the use of the interactive whiteboard in teaching according to the variables of gender, educational qualification and the number of years of teaching experience? This result is satisfactory because of the similarity in the job environment for all members of the sample, which leads to the absence of difference in the viewpoints of male and female teachers towards using the IWB.

The current study agrees in its outcomes with Abdel-Moneim (2015) study, which reveals no significant differences in the reality of using the IWB in Gaza Governorate in Palestine due to number of years of teaching experience. It also agrees with Al-Zboon and Hamdi (2014) study, which reveals no differences in the attitudes of primary stage teachers to the use of the IWB due to experience or scientific qualification. The study also agrees with Bseiso (2013) study in which teachers with bachelors' or masters' degrees responded to the trend towards the use of IWBs in the educational process, but does not agree with the results of that study related to the effect of the variable of experience, which show differences in the trend in favour of teachers experienced for 1-5 years.

The statical analysis regarding the third question, do the views of physics differ on the use of the traditional whiteboard and the interactive whiteboard in teaching indicates the superiority of the interactive whiteboard over the conventional whiteboard in terms of its effectiveness in teaching physics from the viewpoints of the teachers of this subject.

This result may be attributed to the advantages that this interactive whiteboard enjoys and the important roles it can play in the educational process. The traditional blackboard is unable to do it such as: the ability to use it in conducting electronic simulation experiments, employing illustrative animations, and viewing audio clips or videos, And the various educational games, which lead to investing all the senses of the learner and employing them during the learning process, and this makes using them creates an atmosphere of fun and excitement, and leads to the learner feeling comfortable and enjoying learning. It increases students' motivation towards learning, stimulates them to participate in class, attracts their attention, and increases their focus on educational material. This may make their use increase students'

appreciation of science and scientists, and develop positive attitudes and tendencies towards technology and its uses in practical life.

While the book is the only source of information, the interactive whiteboard is characterized by its ability to enrich the learning environment with various learning materials and sources, and makes it easier for the teacher to link the practical theoretical aspects of the scientific subject,it helps to diversify in teaching strategies and learning activities, and has to employ active learning strategies, diversification by methods of evaluation and feedback, which may help students to learn better, and helps them to understand the scientific content, and increase their academic achievement.

The results of this study agree with several studies that reveal the effectiveness of the IWB in student achievement. The results of these studies show a positive impact on performance. They include Al-Hassan and Al-Badawi (2016), Al-Rashid (2014), Al-Zoubi and Abbas (2013), Al-Juwair (2009), Dhindsa and Emran (2006), Marzano and Haystead (2010) and Al-yateem, Alsalhi and Habboush (2015).

5: Conclusions

This study reveals that teachers prefer to use the IWB for several reasons. It has multiple advantages and plays an essential role in the educational process that the traditional whiteboard cannot, such as conducting electronic simulation experiments, animated illustrations, audio, and video clips and educational games, which all engage the learner's senses in the learning process. Using an IWB creates an atmosphere of pleasure and excitement and leads to the learner feeling comfortable and enjoying learning.

The reasons teachers are encouraged to use the IWB are that it increases the students' motivation for learning, motivates them to participate in the classroom, attracts their attention, and increases their focus on the educational subject. This means their use increases students' appreciation of science and scientists and helps them develop positive attitudes towards technology and its use in practice. Among the benefits of the IWB that the participants strongly agreed upon is that it reduces the burden on the teacher, relieving the fatigue and stress that teachers can feel when repeating the same information for multiple people studying. They see it as a convenient way for students with special needs to learn, confirming the results of many other studies.

On the ground, we find that some teachers do not use the interactive whiteboard in class despite its presence, and the traditional whiteboard is used instead. The reasons for this may require further study to provide an accurate, adequate, and sufficient explanation. However, initially, the study results attribute this adherence to the traditional whiteboard to habit, familiarity, and the human desire, in general, to adhere to old systems one understands. Conceivably, the reason for not using the IWB effectively, despite strong attitudes towards it, is the difficulties and obstacles that stand in the way of using it, and the many components that make it complicated to install and use. This can be a challenge for teachers and requires a high level of technological skill to get the full benefit of its advantages. All this requires training, especially for teachers who do not have technical skills.

6: Recommendations

In light of the results, this study recommends providing appropriate technological capabilities in schools; employing modern technical media, such as the IWB, in the teaching process; urging physics teachers to use the interactive whiteboard in teaching; holding workshops and training courses to develop skills in using the IWB in teaching; generalising the experience of the IWB to all schools in the Al-Batinah Governorate; using the interactive whiteboard for all study subjects; conducting further studies to determine the rate of use of the IWB compared to the traditional white or blackboard; and, finally,

conducting similar studies in other provinces with larger samples of teachers to generalise the results of this study.

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