Investigating the Role of Interactive Whiteboard Technology in Learner Engagement and Achievement in the Mathematics Classroom

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Abstract

Recently there have been a growing number of researches on the influence of interactive whiteboard on engagement and achievement, and many of them have yielded positive results. Learner engagement has emerged from the connection between involvement and achievement and now quite many researchers agree on the correlation between learner engagement and learner achievement. This study aims to show whether the implementation of interactive whiteboard in Mathematics classes affect learner engagement and achievement. A questionnaire survey was conducted including 60 Mathematics department students at a private university in Iraq. The results indicated that the employment of interactive whiteboard impressively influences learners' engagement and achievement in Mathematics.

Key words: Achievement, engagement, interactive whiteboard, motivation.

Introduction

Learner engagement and achievement in the learning process have challenged instructors for many years. However, the use of technology in education has affected learner engagement and achievement (Beeland, 2002; Morgan, 2008). Learner engagement has emerged from the connection between involvement and achievement and now quite many researchers agree on the correlation between learner engagement and learner achievement (Klem & Connell, 2004; Marks, 2000). Newman (1992), advocating this notion, argues that "until we learn more about the fundamental problem of how to engage students in schoolwork, there is no reason to expect improvements in achievement" (p.3).

Although interactive whiteboard (IWB) is relatively new, its influence on learner achievement has been highlighted in an emerging body of literature. IWB alone does not lead to enhanced learning (Wood & Ashfield, 2008). From this perspective, according to instructors who use IWB receive proper training, the efficiency of IWB application depends on how the instructor uses it in the classroom (O'Hanlon, 2007).

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Literature Review

The key benefit of IWB is increased student motivation because IWB has the capability to incorporate videos and websites into teaching. IWB has the potential to allow learners to physically interact through manipulation of images and to present to learners materials which they can discuss (BECTA, 2003). The supporting role of IWB in learner engagement and elaborate discussion in the learning setting enhance teaching and learning process.

Learner interest, sustained concentration and effective learning are promoted when IWB is employed in the learning environment because it allows instructors to support their teaching through applying a variety of learning styles. Invigorated concentration and motivation foster understanding of learning materials.

There is evidence (Glover & Miller, 2001) that the potential of IWB illuminates instructors' perspectives to seek for changes in the way they teach. The major change in pedagogy is the implementation of interactivity; however, interactivity occurs in the classroom when instruction moves from teacher-centered to experiential teaching (Cogill, 2003; Robison, 2000). The board with its capacity to coordinate visual, textual and audio materials increase interactivity and engagement in the classroom.

Passive learning is a big challenge in education. Nevertheless; the versatile use of IWB has capability to lower this concern due to its investment in learner engagement and interactivity. When learners are actively involved in the learning process, it is possible that they achieve better. The implementation of IWB in classes can stimulate learners to be a part of the learning process in an interactive way.

The implementation of computer in mathematics teaching influences the development of high level skills, like reasoning, problem solving, creative thinking and developing the skill of observation. The technology in the form of mathematic solution tools (like specific software, calculator, computer algebra systems, spreadsheets, statistics programs, Dynamic Geometry Software and etc.) can contribute to student learning; it enhances discovery of mathematical concepts including geometry; it provides correlation of mental representations dynamically; and it may be also useful for general cognitive skills like planning and control (Pierce et. al, 2004). While transmitting mathematical formulas, correlations and algorithms on the screen facilitates analytical understanding, it makes symbolic and graphical transitions possible (Baki, 2008).

Heddens and Speer (1997) mentioned that the development of technology has also started to change the processes regarding mathematics (including geometry) teaching and education. Mathematics lessons with technological aids must be used to increase students' comprehension and interest. According to Peker (1985), one of the benefits of the technology for math is to give habit of effective thinking by lowering anxiety and hesitation towards mathematics (Alakoç, 2003). The technological tools used including computers, programmable calculators, projectors, smart boards, graphic tablets, internet-based applications and CDs not only create an effective learning setting, but also facilitates the comprehension of mathematics by making it more visual and even tangible. Moreover, in the researches that have been conducted about the use of computers in the mathematics classes,

application of exercise-practice and making students play didactic games are the most outstanding implementations (Alakoç, 2003).

Research Questions

This study has tried to investigate the following questions:

1) Does the use of IWB influence learner engagement?

2) Does the use of IWB positively impact on learner achievement in Mathematics classes?

Research Methodology

Design of the Study

This study investigated the contributions of IWB to learner engagement and achievement. It employed a descriptive research which describes the situation, analyzing the collected data without seeking for cause and effect.

Participants

60 university students, who were Mathematics department students, participated in this study. In their classes IWB is very often implemented in almost all classes. Though gender is not a major concern in this study, the number of boys and girls was equal.

Data Collection

In this research a five-point Likert scale was used, ranging from 'strongly disagree' to 'strongly agree'. The participants were delivered the questionnaires during their own classes by the researcher. The gathered data was entered into SPSS and analyzed, using simple frequency distributions.

Results

Table 1: Attitudes of students towards the use of IWB in the mathematics classroom

Variables	Percentage	Mean	Standard Deviation
1. The use of IWB impacts students'			
Motivation		4.300	.6457
Strongly Disagree (1)	0		
Disagree	0		
Neutral	10		
Agree	50		
Strongly Agree (5)	40		

2. The use of IWB impacts learner engagement		4.417	.5907
Strongly Disagree (1)	0		
Disagree	0		
Neutral	5.0		
Agree	48.3		
Strongly Agree (5)	46.7		
3. The use of IWB elaborates discussion in the learning setting		4.167	.6681
Strongly Disagree (1)	0		
Disagree	0		
Neutral	15.0		
Agree	53.3		
Strongly Agree (5)	31.7		
4. The use of IWB enhances learning process		4.367	.5813
Strongly Disagree (1)	0		
Disagree	0		
Neutral	5.0		
Agree	53.3		
Strongly Agree (5)	41.7		
5. IWB fosters interactivity		4.450	.5652
Strongly Disagree (1)	0		
Disagree	0		
Neutral	3.3		
Agree	48.3		
Strongly Agree (5)	48.3		
6.The use of IWB increases concentration		4.267	.6342
Strongly Disagree (1)	0		
Disagree	0		
Neutral	10.0		

Agree	53.3		
Strongly Agree (5)	36.7		
7. IWB creates a stress-free learning environment		4.300	.6457
Strongly Disagree (1)	0		
Disagree	0		
Neutral	10.0		
Agree	50		
Strongly Agree (5)	40		
8. Practice that IWB allows helps learners with learning		4.317	.5964
Strongly Disagree (1)	0		
Disagree	0		
Neutral	6.7		
Agree	56.0		
Strongly Agree (5)	37.3		
9.Visual learning IWB provides is helpful for learning		4.298	.5867
Strongly Disagree (1)	0		
Disagree	0		
Neutral	6.7		
Agree	55.0		
Strongly Agree (5)	38.3		
10.The use of IWB increases learner achievement		4.342	.6189
Strongly Disagree (1)	0		
Disagree	0		
Neutral	8.3		
Agree	53.3		
Strongly Agree (5)	38.3		

Discussion and Conclusion

Table 1 presents the attitudes of learners towards the use of IWB in the mathematics classroom. The table yields that learners state the potentiality of IWB on engagement and achievement. If all variables in table 1 are examined, it is clearly seen that the role of IWB in the learning process cannot be underestimated. Its role in motivation,

concentration, interactivity, and engagement facilitates learning and brings about achievement. The percentages of positive answers ('agree' and 'strongly agree' – 90-95%) and means (4.167 to 4.450) - are quite high, thereby it can be easily concluded that learners favor the use of IWB in the classes.

IWB has been employed in almost all classes lately; thereby it has drawn attention of researchers. Many studies (Beeland, 2002; Garrett, 2009; Levy, 1997) investigated the role of IWB on learner motivation, engagement and achievement. Many of them have found positive results. Similarly, this study indicated that IWB is a useful tool in Mathematics classes to motivate learners. This motivation, created by the use of IWB, led to engagement and achievement. The interest of the learners stimulates the concentration of learners when IWB is employed in the learning environment. Through IWB, teachers can apply a variety of learning styles that will help learners get involved in effective learning.

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