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Multimedia Interactive Whiteboard (MIW) System in Technical Drawing in Nigeria: A Perception

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Abstract: The study adopted a descriptive survey design to ascertain the technical student's perception of Multimedia Interactive Whiteboard (MIW) in teaching technical drawing and related courses. Three research questions and one hypothesis tested at 0.05 level of significance guided the study. The population of the study comprises 75 students. A 5-point scaled 24 item questionnaires titled "MIW perception questionnaire" was validated by five experts from the Department of Industrial Technical Education. The value of the content validity index was determined as one and the internal consistency (Cronbach's alpha) was 0.86. The test-retest reliability was conducted within the interval of 2 weeks and the reliability coefficient of 0.89 was obtained. The scores of the MIW perception questionnaire were described in terms of item mean and standard deviation. ANOVA was carried out to compare item means of MIW perception between the three groups of students while pair sample t-test was performed to compare item means of second and third year, second and final year as well as third and final year, respectively. The result shows that technical education students perceived MIW to enhance their engagement, motivation and interest in technical drawing. In addition, there was no significant difference in their perception of MIW use in teaching technical drawing. By implication, technological tools such as MIW can assist technical drawing lecturers to raise the level of their student's engagement, motivation and interest.

Key words: Technical education, technical drawing, multimedia interactive whiteboard, engagement, motivation, interest

INTRODUCTION

In a society where knowledge is constantly changing due to ages of globalization, the importance of ICT use cannot be overstated. To foster continued and extensive access to Information and Communications Technologies (ICT) in schools and to reap the benefits of ICT in teaching and learning, many countries have adopted the use of innovative ICT tools. Subsequently, to meet the educational prospects offered by the new digital classrooms, the integration of ICT has been considered from a new interactive teaching and learning horizon as a means to an end (Sarsa and Soler, 2011). Presently, one of the innovative ICT tool employed for interactive teaching and learning is Multimedia Interactive Whiteboard (MIW). Multimedia interactive whiteboard according to (British Educational Communications and Technology Agency (Anonymous, 2006) is a relatively simple new type of technology that teachers can use in the classroom as instructional aids which improve the learning environment by engaging students in the instruction. In the opinion of Lin (2012), MIW is a board on which users can interact with multimedia content. As some researchers have noticed, most MIW use the same principle, they "comprise a computer linked to a projector and a large touch-sensitive electronic board displaying the projected image" (Lin, 2012). There are different versions of MIW that are utilized in teaching and learning environments, most of which are small apparatuses mounted to a traditional whiteboard with the connection of a computer and a projector. MIW with the support of the MIW Software enables following features: highlighting, screen-shade, spotlight, annotation, Capturing, Record, handwriting recognition (OCR), zooming, screen sharing over a network and so on (Turel and Demirli, 2010). Furthermore, MIW is regarded as having the potential to facilitate instruction owing to numerous advantages including easy-to-use, interactivity, adaptability to various environments and usability with most of instructional methods and techniques successfully (Cuthell, 2003). By virtue of all those benefits of MIW, it enhances various crucial indicators including

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learner's interaction, achievement, active participation, attention, engagement, motivation and interest in a positive manner (Anonymous, 2006). Be that as it may, these benefits have not been established in relation to teaching technical drawing courses among technical education students in Nigeria.

Didactics of such courses as technical drawing, engineering design, electrical drawing or architectural drawing are a group of professional subjects offered at the second, third and final year of technical and engineering programmes at universities in Nigeria. This course deal with graphical representations of ideas used by engineers, technologist, draftsmen, technicians, architects, etc., to convey instructions in the workshop making use of technical standards that define practical symbols, perspectives, units of measurement, notation systems, visual styles or layout conventions (Faah, 2001). Technological advancements are altering the ways and methods of teaching technical drawing courses. Until recently, these courses had only been taught with traditional methods using paper, pencil, compasses and a ruler. These instruments were used both at lectures and in classes and the technical constructions were recorded in the form of drawings. Teaching aids for this type of tutorials comprised of textbooks and other academic manuals. Currently, MIW is more and more frequently used in the teaching of technical drawing course, along with relevant software. It will have a very important contribution to knowledge and literature if the student's perception of MIW with respect to its ability to raise the level of engagement, motivation improvement and interest elation in technical drawing courses.

A factor in the learning environment is the value attached to the learning which may affect motivation. Consideration of such affective aspects is important in creating an effective technical drawing learning environment (Hunkins and Ornstein, 1993). Believe that student's affective needs outweigh their cognitive needs. Therefore, in the educational setting, for learning to take place, effective needs must be addressed. Motivation is one such need that educators must be attentive to in order to promote learning. Student engagement is also an essential component of the learning process. Al-Saleem (2012) stated that "both the quality and quantity of engaged time is considered to be important in improving student learning". Therefore, without the involvement, attention, motivation and interest of the student in technical drawing courses, learning cannot occur.

Nowadays, the use of technology to assist technical education teaching and learning is increasing. This is demonstrated by the growing number of investigations around the world. One of particular interest is about the use of MIW and its contribution to technical drawing teaching and learning. As some researchers have concluded, MIW contributes to motivate learners, engage them increase their interest and enhance interaction among them (Al-Saleem, 2012; Javidi *et al*., 2014). In addition, studies conducted in this field were mostly interested in the advantages and disadvantages of using MIW in an educational context (Schmid, 2008), an effect study on attitudes of both teachers and students towards the use of this advanced technology in classroom (Tataroolu and Erduran, 2010), pedagogical uses of MIW in the fields of Mathematics, Physics and other sciences (Jang and Tsai, 2012), difficulties teachers face in using multimedia interactive whiteboard in their classes (Alfaki and Khamis, 2018). However, empirical based research that investigated the technical education students perception of MIW in teaching technical drawing to students is meagre, hence, theses research to close this gap in the literature. Therefore, the general purpose of the study is to determine the technical student's perception of Multimedia Interactive Whiteboard (MIW) in teaching technical drawing. Specifically, the study will determine:

- Technical students perception of MIW in enhancing their level of engagement in technical drawing and related courses
- Technical students perception of MIW in enhancing their motivation in technical drawing and related courses
- Technical students perception of MIW in promoting their interest in technical drawing and related courses

Research questions: The following research questions were formulated to guide the study:

- What is the technical student's perception of MIW in enhancing their level of engagement in teaching technical drawing?
- What is the technical student's perception of MIW in enhancing their motivation in teaching technical drawing?
- What is the technical student's perception of MIW use in promoting their interest in teaching technical drawing?

Hypothesis: There is no significant difference between the second, third and final year technical students perception of MIW in enhancing their level of engagement, motivation and interest in technical drawing.

MATERIALS AND METHODS

Ethical approval was obtained from the Department of Industrial Technical Education Research Committee of the University of Nigeria, Nsukka. Participation was entirely voluntary and students had an opportunity to determine their willingness to participate in the study. A signed, informed consent was obtained from each student before data collection. Students were free to refuse to participate or withdraw from the study at any time. The obtained data from the participants was used only for the study. Students were told that all findings would be reported as group results and would be submitted for publication.

A descriptive survey research design was adopted in this study because it is a design in which data are collected from a relatively large number of people or items. The population for this study consisted of all the second, Third and final year technical education students that are offering technical drawing, drawing and design, electrical drawing and building/architectural drawing in the Department of Industrial Technical Education University of Nigeria, Nsukka. Available record from the academic records in the institutions showed that there are a total number of 75 students with a breakdown as follows second year 24, third year 29 and final year 22. No. sampling was carried out since the number is manageable. A structured questionnaire titled "MIW Perception Questionnaire" with 24 items measuring the student's perception with respect to their engagement, motivation and interest were developed and utilized in the study. The questionnaire was content validated by five experts from the Department of Industrial Technical Education. The value of the content validity index was determined as one and the internal consistency (Cronbach's alpha) was 0.86. The test-retest reliability was conducted within the interval of 2 weeks and the reliability coefficient of 0.89 was obtained. A 5-point Likert scale response choice with a (1 = strongly disagree and 5 = strongly agree) was used for answering the research questions. The questionnaires were administered with the help of two research assistants and all the questionnaires were retrieved and analysed. The scores of the MIW perception questionnaire were described in terms of item mean and standard deviation using the Statistical Package for Social Science SPSS 22.0 (Software package, Chicago, Illinois, USA). ANOVA and pair sample t-test was performed to compare item means of MIW perception between the 2nd year, 3rd year and final year students, respectively.

RESULTS AND DISCUSSION

All participants completed all items of the questionnaire for a 100% response rate. As shown in Table 1-3, all the technical education students perceived

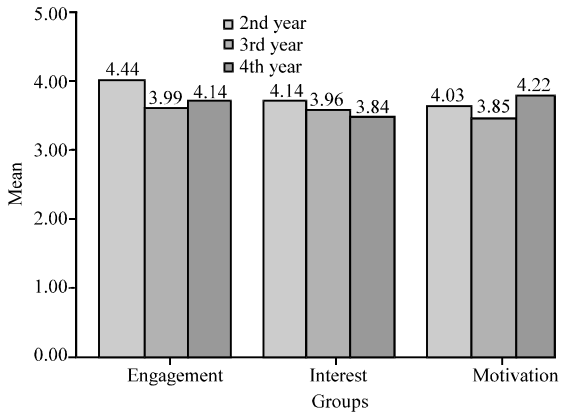

Fig. 1: A bar chat representation of technical student's perception of MIW

MIW to enhance their engagement (item cluster mean 4.06±0.93) with 95% CI ranging from (3.5-4.57), highly effective in motivating technical education students in technical drawing (item cluster mean 4.06±1.04); 95% CI ranging from (3.32-4.61) and promoting their interest in technical drawing (item cluster mean (3.94±0.94) with 95% CI ranging from (3.53-4.49). Thus, all the technical education students indicated that MIW was instrumental in promoting students engagement, motivation and interest in technical drawing, drawing and design, electrical drawing and architectural drawing.

Table 4 shows the study outcomes for the participant's comparison of MIW perception by years of study. A one-way ANOVA showed that no group differences were observed among technical students regarding their perception of MIW in technical drawing, engagement $F = 0.70$, $p = 0.499$; motivation $F = 0.392$, $p = 0.677$ while interest $F = 3.95$, $p = 0.096$. Additionally, regarding engagement, 3rd year students had a lower item mean score (4.03±0.91) than 2nd year students (4.44±0.98) and final year students (4.17±0.89). Also, 3rd year students had a lower item mean score (3.85±1.03) than 2nd year students (3.99±1.01) and final year students (4.22±1.06) while final year students had a lower item mean score (3.84±0.96) than 3rd year students (3.88±0.89) and 2nd year students (4.14±0.93) (Fig. 1). Furthermore, paired samples t-test showed that the differences with regards to perception of MIW in technical drawing were not statistically significant, $t(74) = 3.00$, $p = 0.095$ (2nd and 3rd year); $t(74) = 0.837$, $p = 0.491$ (2nd-4th year) and $t(74) = 0.941$, $p = 0.446$ (3rd year and final year). The results provide support for the hypothesized perception of MIW on their engagement, motivation and interest in technical drawing (Table 4 and 5).

Table 1: Students perception of MIW in enhancing their level of engagement in technical drawing and related courses

MIW items		CI(95%)	Item means	SD	Decision
Students perception of MIW in enhancing their level of engagement in technical drawing and related courses					
1	I enjoy learning technical drawing with MIW	3.56-3.96	3.76	0.88	Agree
2	I like receiving instruction through a whiteboard	4.26-4.57	4.41	0.68	Agree
3	I concentrate better in class when MIW is used to deliver instruction	3.75-4.25	4.00	1.08	Agree
4	I work harder when MIW is used in teaching technical drawing	3.51-4.01	3.76	1.10	Agree
5	I am always excited about coming to technical drawing class taught with MIW	4.14-4.53	4.33	0.84	Agree
6	I exert my full efforts towards technical drawing class with MIW	3.86-4.30	4.08	0.94	Agree
7	My mind is always focused on MIW class drawing discussions and activities	3.81-4.27	4.04	0.99	Agree
8	I pay a lot of attention to MIW enabled discussion and activities	3.65-4.11	3.88	1.01	Agree
9	I feel positive about the drawing task I completed in the MIW during the class	4.08-4.50	4.29	0.91	Agree
10	I am enthusiastic about technical drawing when MIW is used	3.85-4.26	4.05	0.88	Agree

Table 2: Students perception of MIW in enhancing their motivation in technical drawing and related courses

MIW items		CI(95%)	Item mean	SD	Decision
Students perception of MIW in enhancing their motivation in technical drawing courses					
11	The MIW encouraged me to take an active rolein my drawings	3.32-3.78	3.55	1.01	Agree
12	The MIW motivates me to draw more effectively	3.58-4.07	3.83	1.07	Agree
13	The use of MIW encouraged my participation through the discussion of drawing difficulties	3.96-4.39	4.17	0.92	Agree
14	I fill delighted when MIW is used in teaching technical drawing	3.57-4.09	3.83	1.13	Agree
15	MIW made me retain what I learnt	3.66-4.24	3.95	1.26	Agree
16	Because of MIW, I attend technical drawing lectures on time	3.65-4.17	3.91	1.13	Agree
17	MIW motivates me to accomplish difficult technical drawing exercises	3.40-3.94	3.67	1.18	Agree
18	MIW helps to improve my attention and behaviour in the class	4.32-4.61	4.47	0.64	Agree

CI = Confidence Interval; SD = Standard Deviation

Table 3: Students perception of MIW in promoting their interest in technical drawing and related courses

MIW items		CI(95%)	Item mean	SD	Decision
Students perception of MIW in promoting their interest in technical drawing and related courses					
19	The MIW stimulated my interest	3.53-3.99	3.76	1.01	Agree
20	The MIW kindles my attentiveness	3.69-4.16	3.92	1.02	Agree
21	The MIW prompt a sense of curiosity	3.70-4.14	3.95	0.96	Agree
22	The MIW was novel and created enthusiasm for learning technical drawing	4.18-4.49	4.33	0.68	Agree
23	Lessons with MIW are more enjoyable	3.60-4.05	3.83	0.99	Agree
24	Lessons with MIW improves student's attention span	3.63-4.10	3.87	1.03	Agree

CI = Confidence Interval; SD

Table 4: Comparison of MIW perception by years of study

	2nd year (n= 24)		3rd year (n = 29)		Final year (n = 22)		ANOVA		
MIW outcomes	Mean	SD	Mean	SD	Mean	SD	df	F-values	Sig.
Engagement	4.44	0.98	4.03	0.91	4.17	0.89	72	0.701	0.499
Motivation	3.99	1.01	3.85	1.03	4.22	1.06	72	0.392	0.677
Interest	4.14	0.93	3.96	0.88	3.84	0.92	72	3.950	0.096

SD = Standard deviation, DF = degree of freedom, Sig. = Significance

Table 5: Paired samples t-test of students perception by years of study

Paired samples	Mean	SD	SE mean	t-values	df	Sig.
Pair 1 (year)						
2nd	4.2033	0.21221	0.12252	3.000	52	0.095
3rd	3.9333	0.07371	0.04256			
Pair 2 (year)						
2nd	4.2033	0.21221	0.12252	0.837	45	0.491
4th	4.0667	0.20033	0.11566			
Pair 3 (year)						
3rd	3.9333	0.07371	0.04256	-0.941	50	0.446
4th	4.0667	0.20033	0.11566			

Discussion of findings: The main objective of this study was to investigate the technical student's perception of MIW use in teaching technical drawing. Our findings revealed that technical education students perceived MIW use to improve their engagement in technical drawing. The present findings support and extend previous research regarding MIW and students engagement (Souhila and Khadidja, 2013; Javidi *et al*.,

2014). The findings further support (Bacon, 2011) who proposed that MIW affects learning in several ways including raising the level of student engagement in a classroom, motivating students and promoting enthusiasm for learning.

The results also showed that technical students perceived MIW use in improving them to learn technical drawing. These findings in are agreement with previous studies on MIW and student's motivation such as (Higgins *et al*., 2005) which indicated that MIW has the potential to improve student's motivation to learn and increase lesson's pace. The findings also supported the outcomes of (Al-Saleem, 2012) which ascertained that MIW is a contributing factor to motivating learners. The results also showed that technical students perceived MIW use in promoting their interest to learn technical drawing. These findings are in agreement with previous studies on MIW and students interest improvement (Marzano and Haystead, 2009) which stated that the most widely claimed advantage of MIW is that they motivate pupils because lessons are more enjoyable and interesting, resulting in improved attention and behaviour. Pupils report that their lessons are faster paced, more funny and exciting. The findings also supported the outcomes by Schmid (2008) which shows that the use of MIW technology-based classroom improving attention and participation, enhanced motivation and facilitation of students learning. Also, according to Sarsa and Soler (2011), it raises their level of interest and motivation, maintains their attention for a longer period of time and improves energy levels and encourages active participation (Ardichvili, 2008). The implication of this study is that technology can assist technical drawing teachers to increase student's engagement and motivation. Thus, the use of technology does not demerit other actions that teachers usually carry out to engage, motivate and elevate the interest of their students in the classroom but can potentially contribute to the teaching-learning process. In addition, since, this study has further "strenghtned" the evidence that technical drawing engagement, motivation and interest may be positively affected by the use of the MIW, technical drawing teachers need to be supported in their professional development in adapting their pedagogy in lesson preparation.

CONCLUSION

This study investigated the 2nd-4th year technical education student's perception of the use of MIW in teaching technical drawing and related courses. According to the results of this investigation, the perception of students toward the uses of MIW revealed a very favourable description in all the items tested. Therefore, the shift from traditional whiteboard towards using MIW globally as well as in Nigerian schools settings to teach technical drawing is necessary and requires immediate attention. It is noteworthy to say that the general perspectives of technical students regarding the use of the MIW in teaching technical drawing were strongly positive. Consequently, students have expressed their views that the MIW technology used in technical drawing classrooms affect their academic learning process such as efficient learning, more effective and permanent learning increasing engagement's increasing motivation and increasing the interest of students (Patel, 2013).

LIMITATIONS

This is a local descriptive study with a small sample size from 3 years of study in Nigeria. The result reflects how the perception of MIW has been interpreted locally and it is difficult to see how the findings can be generalized.

RECOMMENDATIONS

Further, study is required to confirm the technical education student's perception of MIW with a mixed research design. While this study presented the student's perception about of MIW, the facilitator's experiences and their necessities and worries were not explored. As facilitator's are critical in endorsing the deliberate process of engaging, motivating the students in co-constructing knowledge for practice, exploring their viewpoint would add deepness to the discussion.

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