

Examining the Impact of Interactive Smart Board Use on Technical Students' Learning Outcomes in Nigerian Higher Educational Institutions

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Abstract

The study was carried out to determine the impact of Interactive Smart Board (ISB) usage on technical students' learning outcomes (achievement and motivation). The study adopted a quasi-experimental design and was carried out at First Technical University, Ibadan. The study's population consisted of 276 students enrolled in GST 004, with a sample size of 90. GST 004 was taught using ISB, and a pre-test and post-test were performed. The mean, standard deviation, t-test, and p-value were used to record and interpret the results. A questionnaire was also distributed to assess pupils' motivation. The results showed improved achievement scores and increased levels of motivation by the students who were taught using ISB, compared with those students who use the traditional method only. Results obtained from a pre-test/post-test revealed that students in the experimental group (taught using ISB) had a higher mean achievement score (23.06) and a higher mean gain score (15.27) than the control group (taught using the traditional method; mean achievement score 9.92, mean gain score 7.34). Further results from a motivation questionnaire showed that the experimental group had significantly higher scores than the control group on all three subscales of the questionnaire (Procedural Skills Rating, Interest/Enjoyment, and Perceived Choice), with the highest difference being for the Procedural Skills Rating subscale. The overall motivation score for the experimental group was also much higher than that of the control group. These findings suggest that ISB technologies have the potential to transform educational practices in Nigeria as the country strives to provide students with a quality education that meets the best global standards while also recasting itself as an innovative, efficient, and adaptable economy capable of competing in our modern world.

Keywords: Interactive smart boards, students' achievements, students' motivation, conventional teaching method.

1. Introduction

Currently, ways of accessing information have changed and varied in line with technological advancement. This rapid change has not only influenced all areas of life but has also affected and transmuted the educational sector. Generally, new technologies were conceived and designed regularly in the late 1990s. Any new technology breakthrough introduced into society was a main focus for educational researchers to determine whether it might help improve/transform the educational sector. Traditional chalk and board environments are being substituted gradually by new learning environments. In other words, instead of the chalk and blackboard used previously, today whiteboards and ISB are being used (Elmas et al., 2012; Hussein et al., 2022). Today's pupils must be taught 21st-century skills to prosper in the future. Digital literacy, imaginative thinking, good communication, teamwork,

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and the capacity to develop high-quality projects are some of these talents. To attain this ambitious aim, educators must focus technology on the critical foundation components of student achievement and motivation. Assessment, alignment, accountability, access, and analysis are some of these fundamental components.

There are various drawbacks to the traditional or talk-and-chalk form of instructional delivery that make it less effective for educating pupils. Firstly, according to Twahirwa, et al. (2021) and Etefe et al. (2021), it lacks engagement and participation, which can lead to student boredom and indifference. Secondly, Twahirwa, et al. (2021) also indicate the technique makes use of restricted resources like textbooks, blackboards, and chalk, limiting the use of multimedia tools that can make learning more dynamic and engaging for students. Thirdly, according to Twumasi, et al. (2022), the talk-and-chalk technique may not accommodate varied learning styles, which may impede learning for some pupils. Finally, Smith, et al. (2022) also mentioned the technique may not give enough opportunities for group work and cooperation, which are critical for building teamwork, communication, and problem-solving abilities. These constraints necessitate the adoption of Interactive Smart Boards (ISBs), which provide students with a more engaging, dynamic, and collaborative learning experience.

The ISB is gradually replacing the overhead projector in many lecture halls and classrooms today across the world. Smart Board technology in the classroom may enhance the curriculum by making a routine lesson more engaging and interactive. Furthermore, if utilized successfully, ISB may assist in improving the quality of instructional delivery and boost the intelligibility of a lesson. In a study from Pakistan, it was concluded that the utilization of ISB was perceived as more helpful to deliver content more efficiently, increasing students' level of motivation, reducing the workload, making use of time more efficiently, and making the classroom more planned and organized (Ahmad, Muhammad, & Bakhsh, 2021). According to Saltan and Arslan's (2009) research findings, the ISB has apparent promise for successful teaching and learning, and the touch-sensitive feature of ISBs promotes more professional and efficient delivery of multimedia materials. Similarly, Tsayang et al., (2020) indicate that ISB has the potential to transform educational practices in Botswana as it strives to provide its children with a quality education that meets the best global standards while also recasting itself as an innovative, efficient, and adaptive economy capable of competing in the global world of the twenty-first century. Blanton and Helms-Breazeale (2000) in their study indicated that if students are allowed to view someone they like or respect; demonstrate behavior they have acquired, then they stand a better chance of acquiring that behavior. The ISB allows the students to watch peer leaders prompt and perform the appropriate behavior which made the ownership of that behavior much more enticing. This is because Students with short attention spans can attend to any situation as long as it is on the television screen. Relatedly, Mun et al. (2019) findings indicate that active learning utilizing ISB has characteristics that can effectively improve the learning outcomes of primary school pupils.

Interactive Smart Boards (ISBs) offer several capabilities that can help to overcome the limitations of the talk-and-chalk method of instructional delivery. Firstly, according to Fawaz, et al. (2022), ISBs enable interactive and multimedia-based learning, which can serve to engage students and make the learning process more exciting and participatory. Teachers may use an ISB to add films, animations, and simulations into their courses, making learning more dynamic and interesting for pupils. Secondly, ISBs are designed to accommodate various learning styles, making them a perfect tool for addressing individual variances in students' learning preferences (Wang, 2022). Visual learners, for example, can benefit from the usage of images and diagrams on the ISB, while auditory learners can gain from audio and video materials. Thirdly, according to Zain, et al. (2022), ISBs encourage cooperation and group work, which can help students build teamwork, communication, and problem-solving skills. Teachers, for example, can utilize the ISB to support group exercises, brainstorming sessions, and collaborative discussions, which encourage

students to collaborate and share their ideas. Finally, ISBs make instruction more efficient and effective by providing tools for quick feedback and assessment. According to Wang and Yu (2022), teachers may use an ISB to evaluate students' progress in real-time, offering rapid feedback and changing their teaching techniques as needed. This can help to enhance students' learning outcomes and ensure that they understand the subjects being taught. ISBs' features make them a great tool for improving the teaching and learning experience and overcoming the constraints of the traditional talk-and-chalk instructional delivery approach.

General Studies courses are important components of the curriculum in tertiary institutions, aimed at providing students with a broad range of knowledge and skills. GST 004, titled "Nigeria People and Culture," is a course offered at the First Technical University, Ibadan, which introduces students to the history and culture of Nigeria. It was observed that technical students who took the course in the 2018-2019 academic session, before the university acquired Interactive Smart Boards (ISBs), scored lower compared to subsequent sets who had access to the ISBs. This indicates the need to explore the impact of ISBs on technical students' learning outcomes in GST 004.

Research has shown that ISBs facilitate interactive and multimedia-based learning, which can make the learning process more engaging and participatory (Fawaz et al., 2022). Unlike traditional teaching methods, ISBs allow teachers to incorporate films, animations, and simulations into their courses, which can make learning more dynamic and interesting for students. ISBs also promote cooperation and group work, which can help students build teamwork, communication, and problem-solving skills (Zain et al., 2022). Teachers can utilize ISBs to facilitate group exercises, brainstorming sessions, and collaborative discussions, which encourage students to share their ideas and work together. Additionally, ISBs can accommodate various learning styles, making them an effective tool for addressing individual variances in students' learning preferences (Wang, 2022). For example, visual learners can benefit from the usage of images and diagrams on the ISB, while auditory learners can gain from audio and video materials. Lastly, ISBs make instruction more efficient and effective by providing tools for quick feedback and assessment (Wang & Yu, 2022). Teachers can use ISBs to evaluate students' progress in real-time, offer rapid feedback, and adjust their teaching techniques as needed. While previous research has shown the usefulness of ISB on students' learning outcomes at various levels of education, this study intends to determine the impact of ISB on technical university students' learning outcomes who spend less time on theory and more time on practically focused training. The specific research questions that guide this study are:

1. How does ISB enhance GST 004 students' achievement scores as compared to traditional methods of instruction?
2. How much effect does IBS have on students' motivation to learn GST 004 as compared to traditional methods?

The following null hypotheses were set for the study:

H₀₁: There is no significant difference in the mean achievement scores of students taught GST 004 using the ISB and those taught using the traditional method.

H₀₂: There is no significant difference in the mean motivation scores of students taught GST 004 using the ISB and those taught using the traditional method.

In the following section, the literature on Interactive Smart Board (ISB) and their effect on technical university students' learning outcomes – achievement and motivation will be reviewed.

2. Literature review

Interactive Smart Boards (ISB) have gained popularity in classrooms due to their ability to create an engaging and collaborative learning environment. The purpose of this literature review is to offer an overview of the research on ISB, examining their merits and downsides, as well as prospective uses in the classroom. ISB (interactive whiteboards) are interactive digital whiteboards that allow students to access material, run programs, and collaborate on projects. ISB provides multiple benefits for both students and teachers, according to the research, including increasing student engagement, motivation, and accomplishment, making learning more interactive and visual, and enhancing teaching quality. Nevertheless, there are certain disadvantages, such as the expense of procurement and upkeep, potential disturbance to pupils' attention, and the requirement for teachers to become acquainted with the technology. Despite these downsides, the benefits of ISB outweigh the negatives, making them an indispensable tool for both educators and students. Several studies have found that employing ISB in the classroom can boost student accomplishment, engagement, involvement, teamwork, communication, and motivation. Overall, this evaluation of the research shows that ISBs can have a favorable influence on student learning outcomes, making them useful tools in modern classrooms.

2.1 Interactive Smart Board (ISB)

Interactive Smart Boards are becoming increasingly popular in classrooms due to the many advantages they provide. The smart board is a form of interactive touch-sensitive screen that may be used to collaborate and communicate with students in the classroom or with colleagues over the internet wherever there is power, a computer socket, and a projector. This literature review seeks to provide an overview of the research on Interactive Smart Boards, exploring their benefits and drawbacks, as well as their potential applications in the classroom. According to research, ISB gives several benefits to both students and teachers. For example, Ahmad, Muhammad, and Bakhsh, (2021) discovered in their study that ISB can aid to boost student engagement, motivation, and achievement by offering a more engaging and enjoyable learning environment. In addition to making learning more enjoyable and interesting for students, the use of ISB helps teachers develop many creative ways to capture students' attention and imagination (Abdallah, 2021). Bush et al. (2004) found that ISB made teaching more visual and learning more interactive which in turn, encourages greater participation of the students, thus improving their motivation and concentration. Furthermore, Tsayang et al. (2020) and Aldalalah (2021) stated that the usage of ISB can assist to improve teaching quality by allowing teachers to employ images and multimedia to convey complicated topics entertainingly. Furthermore, ISB can assist to make classes more accessible to students with special needs by allowing them to personalize the session to their unique requirements.

However, there are several disadvantages to using ISB. According to Preston (2008) and Tara (2013), one of the biggest drawbacks is the cost of acquiring and maintaining the boards. Furthermore, Elliston (2020) claims that using ISB might be disruptive for pupils since they are more focused on the board than on the lecture. Furthermore, some teachers may be unfamiliar with the technology and find it difficult to utilize it properly.

Despite these disadvantages, ISBs are becoming more popular in schools owing to their numerous benefits. ISB might be utilized in the future to encourage collaborative learning, provide tailored training, and enhance teaching by displaying multimedia information. They might also be used to measure students' knowledge of subjects and offer pupils rapid feedback on their work. Overall, this literature review has provided an overview of the research on ISB, exploring their benefits and drawbacks, as well as their potential applications in the classroom. While there are certain disadvantages to using ISB, the benefits they give exceed these disadvantages, making them a vital tool for both instructors and students. Based on these research findings, it is clear that

ISB help improves students' learning outcomes; nevertheless, how effective is ISB in comparison to traditional teaching methods is what this study seeks to discover.

2.2. Interactive smart board (ISB) Effect on Students' Achievement and Motivation

Technology has become a vital element of the classroom experience in recent years. The ISB is one of the most popular classroom devices today. ISBs are interactive digital whiteboards that allow students to access information, use programs, and collaborate on projects. This technology has been shown to promote student engagement, student accomplishment, and student motivation. The goal of this research review is to assess how ISB affects student success and motivation.

Much research work has been conducted to investigate the influence of ISB on student success and motivation. Akar (2020) discovered that using ISB in the classroom resulted in greater academic accomplishment for pupils. Furthermore, the study discovered that students who utilized the ISB reported better levels of motivation and engagement. Davidovitch et al. (2017) and Kühl et al. (2022) investigated the impact of ISB on student motivation and engagement. The study found that using ISB in the classroom boosted student engagement and motivation. In addition, the study discovered that using interactive smart boards in the classroom increased the quality of student learning. Aktas et al. (2016) and Özerbaş (2013) investigated the effects of ISB on student motivation and achievement. The results of the study showed that the use of ISB in the classroom improved student motivation, engagement, and achievement. Additionally, the study found that the use of ISB in the classroom improved student collaboration and communication.

The results of the research analyzed in this study imply that using ISB in the classroom can improve student success and motivation. According to the studies, using ISB in the classroom increased student involvement and motivation while also improving the quality of student learning. Furthermore, using ISB in the classroom increased student participation and communication. Finally, using ISB in the classroom may be a useful tool for enhancing student achievement and motivation.

3. Methodology

The study adopted the quasi-experimental design and was carried out at First Technical University. The population was 276, and the sample for the study was 90 available purposively selected students. The study had treatment and control groups. Two instructional approaches were employed for this study. The first approach was the use of ISB while the second approach was the use of a conventional chalkboard. The two approaches were identical in terms of content exposure, time, and mode of assessment among others. ISB was used for the treatment group while the conventional approach was used for the control group. Pretest was administered in all the groups before the treatment. This pre-test was used to measure the students' initial group equivalence and for providing initial data at the end of the treatment session, the post-test was administered to the students for the study. Data collected from the two groups were recorded and used for analysis based on the research questions and hypothesis. The mean, standard deviation, t-test, and p-value were used to record and interpret the results. A questionnaire was also distributed to assess pupils' motivation.

3.1. Treatment group: teaching with an interactive smart board (ISB)

The students received their instruction (GST004) through the use of ISB. The presentation made on ISB had text, graphics, pictures, videos, and simulations embedded in it. The class was interactive as the presentation developed students' critical thinking, ideas, and problem-solving solutions. Pre-test and post-test were administered to this group of students for providing both initial data of entry behavior and changes after treatment.

3.2. Control group: Conventional chalkboard

The teaching of the same content was done using the conventional chalkboard method of teaching. The instruction was assisted by other teaching aids; textbooks, pictures, and diagrams. Pre-test and post-test were also administered to this group of students for providing both initial data of entry behavior and changes after treatment.

3.3. Results and analysis

Table 1. Pre-test and post-test mean achievement and standard deviation scores of students taught GST 004 due to the teaching method

Teaching Method	Number of Students	Type of Tests				Achievement Test
		Pre-test		Post-test		
		X	SD	X	SD	
ISB	90	6.77	5.04	23.06	5.66	15.27
Traditional Method	90	3.93	1.76	9.92	7.01	7.34

Table 1. shows the mean and standard deviation scores of the students taught using ISB and those taught using the traditional method, in pre-test and post-test. Those taught with ISB belong to the experimental group while those taught with the traditional method belong to the control groups. From the table, it can be seen that the students taught using the ISB had a mean score of 6.77 and a standard deviation of 5.04 in the pre-test while in the post-test the students scored a mean achievement of 23.06 and a standard deviation of 5.66. For the students taught using the traditional method, it was observed that they had a mean score of 3.93 and a standard deviation of 1.76 in the pre-test while in the post-test, the students scored a mean score of 9.92 and a standard deviation of 7.01. Comparing the pre-test and post-test gain of the two groups, it can be seen that the students taught with ISB had gained a mean achievement score of 15.27 while those taught with the traditional method obtained a gain mean score of 7.34. Thus, though both the experimental and control groups obtained pre-test and post-test gain scores, that of the

experimental group was higher than that of the control group. The standard deviation of those taught using ISB in the post-test is very close compared with those taught using the traditional method.

Table 2. Effect of using ISB for teaching GST 004 on students' motivation over the use of the traditional method

MOTIVATION SUB-SCALES	GROUP	N	X	S.D
Procedural Skills Rating (PSR)	ISB	90	13.29	2.22
	CONTROL	90	8.06	3.81
Interest/Enjoyment (IE)	ISB	90	9.10	2.59
	CONTROL	90	10.16	2.05
Perceived Choice (PC)	ISB	90	12.85	3.09
	CONTROL	90	11.18	2.97
OVERALL MOTIVATION	ISB	90	86.30	5.67
	CONTROL	90	52.02	6.90

Table 2 results show the differences in motivation between the two groups, the ISB group, and the Control group. The ISB group scored significantly higher than the Control group for each of the three motivation subscales (Procedural Skills Rating, Interest/Enjoyment, and Perceived Choice), with the highest difference being for the Procedural Skills Rating subscale. The students were rated on a scale of 5. In addition, the overall motivation score for the ISB group was much higher than that of the Control group, with an average of 86.30 compared to 52.02.

3.4. Discussion

The purpose of this study was to assess the impact of ISB usage on technical university students' learning outcomes. This research contributes to the literature on the usage of ISB to improve university student learning outcomes at First Technical University Ibadan.

As undergraduate students at the university, it is expected that the use of ISB to teach the student will significantly improve their achievement scores and also motivate the students to learn. From the above table 1, it can be seen that the students taught using ISB had a higher mean score and a higher pre-test and post-test gain score compared to those taught using the traditional method. This indicates that the use of ISB is more effective in teaching students compared to the traditional method. The close standard deviation of the post-test score of the two groups further indicates that the use of ISB is more effective in teaching students and that the achievement scores of those taught using ISB are more consistent than those taught using the traditional method. The results of this study suggest that the use of ISB is effective highly for teaching students in classrooms. The finding of this study aligns with Demiralay and Karadeniz (2010) who concluded in their research that there is a positive effect of smart boards, computer use, frequency of use, and access (both computers and Internet) on student performance. Similarly, Recuero (2020) claims that collaborative tools, notably interactive smartboards, significantly improve student performance. Furthermore, Abdullah's (2020) research found that using a smart board improves students' higher-order thinking skills (HOTS).

The findings of this study from the above table 2 show a significant difference in motivation between the ISB and Control groups. All three motivation subscales, including Procedural Skills Rating, Interest/Enjoyment, and Perceived Choice, were considerably greater in the ISB group. The Procedural Skills Rating subscale showed the greatest difference between the two groups, showing that the ISB group had a substantially greater degree of proficiency and grasp of the content than the Control group. Furthermore, the ISB group's total motivation score was much greater than the Control group, with an average of 86.30 versus 52.02. These findings indicate that the use of ISB helped increase students' motivation to study and engage with the subject.

The findings of this study suggest that the use of Interactive Smart Boards (ISBs) in teaching has a positive impact on students' achievement scores and motivation levels. Several justifications can explain this outcome. Firstly, the use of ISBs provides a more interactive and multimedia-based learning experience, which can increase students' interest and enjoyment in the subject matter, leading to higher motivation levels. Secondly, ISBs can accommodate different learning styles, making it possible to address individual variances in students' learning preferences, leading to a greater level of understanding and proficiency in the subject matter, resulting in higher achievement scores. Thirdly, ISBs encourage cooperation and group work, which can help students build teamwork, communication, and problem-solving skills, resulting in a greater sense of competence and procedural skill rating, leading to higher motivation levels to engage with the subject matter. Lastly, ISBs make instruction more efficient and effective by providing tools for quick feedback and assessment, leading to a greater sense of progress and achievement, resulting in higher motivation levels to continue learning and improve further. In conclusion, the use of ISBs in teaching can lead to improved learning outcomes and motivation among students, and this study provides evidence to support this claim.

This result supports Davidovitch and Yavich's (2017) research findings on the contribution of technology to teaching, through a case study of smartboards to be a significant criterion of good teaching and increase motivation. This finding also seemed to agree with Granito and Chernobilsky (2012) that learners retain knowledge no matter which approaches to learning they use (traditional or technological). This is also at variance with Cheang (2009), that the learner-centered approach is effective in the promotion of the efficacy of several domains of motivation such as critical thinking, meta-cognitive self-evaluation, and problem-solving. Technology is therefore, in this respect, a very critical catalyst of motivation. When technology was first introduced into learning, one of its promises was the potential to actively engage students by enabling an array of learning activities that could help students comprehend the content better, facilitate learning, and enhance learning for a better understanding through enabling an array of learning activities that could help students comprehend the content better. Several studies have tested this claim and investigated the impact of ISB usage on students (Ang & Wang, 2006; Fovet, 2009; Sankey, Birch & Gardiner, 2010). These studies have been conducted at all levels of education, from primary through the tertiary level, and they all concur that technologies provide the use of tools that capture students' attention and keep them actively engaged in the lessons. The results of this present study are consistent with the rest of the literature on the impact of ISB usage on learning outcomes. These findings have important implications for the design and implementation of educational programs. They suggest that incorporating interactive and engaging activities, such as those found with the use of ISB, can be beneficial in improving student motivation. Furthermore, these results provide evidence of the potential effectiveness of ISB in improving student motivation and engagement with the material. It is therefore important for educators to consider incorporating such activities into their teaching practices.

4. Conclusions and Recommendations

The results of this study indicate that the use of ISB had a positive impact on student achievement and motivation. In comparison to students taught using the traditional method, those taught using ISB obtained higher mean pre-test and post-test scores and greater pre-test and post-test gain scores. Additionally, the ISB group scored significantly higher than the Control group on all three motivation subscales, with the highest difference being for the Procedural Skills Rating subscale.

Based on the findings of this study, it is recommended that ISB be adopted as a teaching method in schools and other educational institutions. ISB can be used to effectively engage students and improve their academic performance and motivation. Additionally, it is recommended that further research be conducted to explore the impact of ISB on other academic outcomes and to compare its effectiveness with other instructional strategies.

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