

Research Article

Cite this article: Alsaied, M. A., Ourkia, A., Mechenene, M. O. I., & Farag, H. H. A. (2025). The Impact of Interactive Smart Boards on Students' Achievements, Motivation and Skill Acquisition at Mohamed bin Zayed University for Humanities. *Educational Process: International Journal*, 18, e2025520. <https://doi.org/10.22521/edupij.2025.18.520>

Received June 24, 2025

Accepted August 22, 2025

Keywords: Interactive boards, Motivation, Achievement, acquire, ViewSonic

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The Impact of Interactive Smart Boards on Students' Achievements, Motivation and Skill Acquisition at Mohamed bin Zayed University for Humanities

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Abstract

Background/purpose. This study examines the role of interactive boards—particularly the ViewSonic board—in enhancing learners' academic achievement at Mohamed Bin Zayed University for Humanities by increasing engagement, deepening knowledge, and developing skills.

Materials/methods. A descriptive–analytical approach synthesized findings from prior studies to inform the present investigation. An inductive design was then implemented via a questionnaire administered to a sample of 135 respondents. Collected data were analyzed using standard descriptive and inferential statistics, including mean, standard deviation, and multiple linear regression, to test the study's hypotheses.

Results. The use of interactive boards demonstrated significant positive effects on academic achievement for both students and instructors. Their adoption increased motivation for learning and innovation, strengthened cooperation between students and lecturers, and fostered enthusiastic, sustained teamwork. The analysis also identified obstacles to broader, effective use—especially of the ViewSonic board—including the absence of a clear strategic vision and limited institutional efforts to embed a sustainable, technology-supported instructional model.

Conclusion. The findings support activating and institutionalizing the role of interactive boards—particularly the ViewSonic board—within a coherent strategy that motivates students, equips instructors, and normalizes technology-enhanced pedagogy. The study further recommends targeted awareness initiatives extending beyond academic contexts to economic and social sectors, alongside concerted actions to remove organizational and logistical barriers that impede effective diffusion of this technology.

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1. Introduction

The modern age has witnessed numerous accelerated developments in the field of technology across all areas of human life, particularly in education, which has led to a radical transformation in traditional teaching methods. Digital tools have become an integral part of modern educational environments, and smart boards are considered among the most important of these tools, contributing to reshaping the methods of delivering and presenting educational content through the integration of visual, sensory, and interactive techniques in classrooms. Due to the dynamic environments they provide, these interactive smart boards contribute to enhancing students' interaction with subject material, facilitating understanding and assimilation, and making the learning process more exciting and attractive. The incorporation of interactive technology in the education process responds to the demands of the 21st century, where the ability to employ digital means and methods in education has become an indicator of educational systems' development and their effectiveness in improving education outcomes (Alhajajy, 2024).

Academic achievement is considered one of the most prominent indicators that reflects the quality of the education process, along with the extent of students' understanding of knowledge and acquired skills. The achievement level depends on a group of factors, such as teaching methods and the extent of students' ability to interact with educational content.

Several studies have pointed out that using interactive smart boards provides a multi-sensory scientific experience that combines visual, auditory, and tactile media. This contributes to improving students' level of deep understanding and enhances their ability to process information more efficiently. These interactive smart boards help present abstract concepts in a clearer manner, making it easier for students to connect new knowledge with previous experiences, contributing to higher levels of educational achievement, and leading to the development of skills for producing and designing interactive educational lessons by students at all levels.

Additionally, motivation to learn is one of the basic factors affecting the extent of students' interaction with the educational environment and their willingness to acquire knowledge. The higher the students' motivation, the more effectively they participate in educational activities, and their ability to overcome academic challenges improves.

Interactive smart boards are distinguished by their ability to provide exciting and motivating educational environments, adding suspense through interactive activities, educational games, and demonstrative displays. These elements contribute to enhancing students' motivation and making them more engaged in the learning process.

The immediate feedback provided by these screens allows students to feel more independence and control over their learning, which enhances their sense of self-confidence and efficiency, making them more eager to achieve academic success (Alhajajy, 2024). Based on the aforementioned expressions and facts, the importance of this study lies in examining the impact of using interactive smart boards on both academic achievement and motivation toward learning, in order to understand the effectiveness of this technology in developing the educational process and achieving more efficient learning outcomes.

This study attempts to discover the relationship between integrating interactive smart boards and improving the level of academic achievement, in addition to analyzing their role in motivating students and enhancing their desire for learning at the higher education level, and their impact on university students. This study highlights the ability of this technology to improve the learning experience through enhancing positive interaction between teachers and students and providing richer and more dynamic content. The conclusions of this study are expected to contribute to

directing education policies toward adopting more interactive technologies in line with the requirements of the digital age and achieving sustainable development in the education process.

Here are the questions which would express the study problem:

1. What is the impact of using interactive smart boards on students' achievement and motivation toward learning at the higher education level in the university?

From this main question the following sub-questions are derived:

A: What is the impact of using the interactive smart boards on students' achievement in the University?

B: What is the impact of using interactive smart boards on students' attitudes towards learning?

C: What is the impact of using the interactive smart boards on acquiring skills and developing knowledge?

2. Are interactive smart boards currently being used in education at the university?

3. Are there any statistically significant differences between the participants' responses ?

Regarding the significance of the study, several aspects must be explained as follows:

To the researcher's knowledge, the importance of this study lies in being the first to discuss the use of interactive smart boards in relation to the academic achievement of university students and the scientific approach of university studies in the United Arab Emirates. The study's results contribute to discovering the role of using interactive smart boards in raising the level of students' academic achievement and helping teachers recognize the significance of their use and how to employ them effectively in classrooms. This study serves as a guide for the necessity of providing interactive smart boards in universities, along with preparing the training programs needed for university lecturers. Additionally, it contributes to students' recognition, at their different levels, of the importance of interactive smart boards in delivering educational content and retrieving stored data.

This importance can be summarized in two directions: theoretical and practical, as follows:

- Theoretically: The study will contribute to discovering new ways of learning and educating by concentrating on and focusing on interactive smart board technology in university education through improving academic achievement and applying new educational technology in universities. Additionally, the study will:

1. Contribute to the enrichment of scientific literature related to technology use by providing an understanding of the role of interactive smart boards in the education process, along with results and recommendations for university students.

2. Explain and clarify the relationship between using interactive smart boards and students' academic achievement, which may help determine the effectiveness of this technology in improving student performance.

3. Highlight the impact of interactive smart boards on students' motivation toward learning, thereby enhancing understanding of the factors influencing students' willingness to participate in the educational process.

4. Help bridge the research gap related to the impact of modern technology on student achievement and motivation by providing scientific evidence that either supports or refutes the hypotheses.

5. Finally this study would support theoretical Frameworks and educational curriculums which depend on the role of interacting and Technology in improving the quality of educating and providing the lecturers in the universities within new methods in the education process which is represented in the technology of interactive smart boards.

- From a practical point of view, this study provides numerous benefits as follows:

1. The results of this study help teachers and lecturers in universities develop more active teaching strategies by integrating interactive smart boards into the education process in ways that enhance students' understanding of educational content.

2. This study provides specific guidelines for universities on how to apply interactive smart boards effectively to improve academic achievement and motivation toward learning.

3. The study provides a foundation for educational decision-making based on scientific evidence regarding investment in modern educational technologies.

4. This study may be useful for developing curricula and university courses by integrating interactive smart boards through methods that enhance the achievement of educational objectives and goals.

5. This study contributes to the development of training programs for university lecturers on best practices for using interactive smart boards, maximizing educational benefits for students.

6. This study will help academic and university decision-makers establish educational policies based on scientific research to enhance the use of technology in educational departments and universities.

According to the aspects of importance, this study seeks to achieve many objectives and goals in the field of university education at all levels. Here are the most important:

1. The main purpose of the study is to present a conceptual framework for using interactive smart boards by integrating technology into the education process at all levels of education at Mohamed bin Zayed University for Humanities, while striving to reach the pinnacle of cognitive perception, creativity, and innovation, and promoting a culture of active and collaborative learning.

2. To examine the extent to which interactive smart boards improve the educational achievement of university students.

3. To assess the impact of interactive smart boards on students' motivation toward learning.

4. To evaluate how interactive smart boards influence students' attitudes toward developing their knowledge and acquiring skills.

5. To provide recommendations and suggestions for optimizing the use of interactive smart boards in higher education at Mohamed bin Zayed University for Humanities.

2. Literature Review

Due to the importance of interactive smart boards in education at all levels, especially at the university level, this topic has received considerable attention from academics and researchers. For instance, Al-Hajjaji (2024) aimed to identify and recognize the role of interactive smart boards in improving academic achievement from the viewpoint of teaching principals in the Al-Laith Education Department. It sought to identify proposed mechanisms for developing the use of interactive smart boards and improving educational achievement in Al-Laith City to support the Kingdom's Vision 2030. The study yielded several important results. Most notably, the use of interactive smart boards in improving learning achievement led to increased teacher motivation toward education and created positive attitudes toward teaching. The results also showed that teaching with interactive smart

boards freed students from fear and inhibition, allowing them to discover and express their positive feelings toward learning. The interactive smart boards demonstrated effectiveness in clarifying concepts and information, developing skills, fostering positive attitudes, and supporting research on using interactive smart boards for teaching different subjects across various educational levels.

The study recommended providing in-service teachers with comprehensive knowledge and skills related to technological developments, particularly interactive smart boards and their application in the educational process. It also emphasized the necessity of encouraging managers and teachers to use interactive smart boards to improve educational achievement in schools throughout Saudi Arabia.

In their study, Hewail, Al Shamsi, and Zaid (2022) aimed to develop skills for designing interactive educational lessons among basic education teachers through training programs using interactive screens. The results showed that using interactive screens resulted in developing skills for producing and designing interactive educational lessons among the study group of basic education teachers.

Alqwasmi et al (2024) aimed to examine the impact of interactive screens as an educational tool on 11th-grade students' achievement in physics and their attitudes toward the subject in their study. The study yielded several important results. Students in the experimental group, who were taught using smart boards, demonstrated superior academic performance compared to the control group, which showed lower achievement levels. The results also revealed positive attitudes toward interactive screens when using interactive educational software packages.

The study of Gabat Shawane, Tsayang, and others (2022) investigated the impact of smart board use on students' learning in schools in Botswana and was guided by the Context, Input, Process, Product (CIPP) evaluation model. The results showed that smart board use enabled a variety of learning experiences that promoted student engagement and interactivity, leading to increased motivation levels and improved academic achievement. These findings indicate that smart technologies have the potential to transform educational practice in Botswana as it endeavors to provide its children with quality education matching global standards, while simultaneously repositioning itself as an innovative, effective, efficient, and adaptive economy capable of competing in the 21st-century global marketplace.

Gursoy and Çeliköz (2017) aimed to determine the effect of synchronous e-learning applications and face-to-face teaching using smart boards on students' attitudes and pattern-making instruction, which is a fundamental course in fashion design and clothing education in their study. Smart Board applications were observed to generate more positive attitudes in the research. Smart board applications were observed to generate more positive attitudes in the experimental groups. The attitudes of students in Experimental Group 1 (face-to-face teaching with smart boards) were more positive than those in Experimental Group 2 (e-learning applications). As expected, no significant differences in attitudes were found in the control group, which used traditional teaching methods throughout.

2.1. What Distinguishes This Study

After careful examination of previous studies that have discussed and addressed this subject from various perspectives, it has become clear to the researcher that most studies have focused primarily on the role of interactive smart boards in improving students' academic achievement from the perspectives of principals and education managers.

This represents the main similarity between the current study and previous research.

However, there are several important differences that distinguish this current study from others. Beyond examining the impact on student achievement, this study investigates students' motivation

toward learning and their attitudes toward knowledge development and skill acquisition at the university level.

Additionally, it contributes to developing training programs for university lecturers on best practices for using interactive smart boards to maximize educational benefits for students.

2.2. Limitations of the Study

This study has several limitations that define its scope and objectives:

- **Subject Limitations:** This study is limited to examining the impact of interactive smart boards as a modern technology on improving educational achievement, learning motivation, and the acquisition of skills and experiences among university students.
- **Spatial Boundaries:** This study will be conducted with university students across all levels at Mohamed bin Zayed University for Humanities to assess their use of interactive smart boards as a modern technology for improving educational achievement, learning motivation, and skill acquisition.
- **Human Limitations:** This study will survey university students in regards to their perspectives on using interactive smart boards as a modern technology to achieve the study's objectives.
- **Time Limitations:** This study is limited to the second academic semester of the 2024 academic year.

3. Methodology

To achieve the objectives of this study, the researcher employed a descriptive analytical method by reviewing previous studies, research, and literature to discuss their results and recommendations relevant to this study. Additionally, a survey method was used through the development of a questionnaire designed to achieve the study's objectives. The questionnaire was distributed to the sample participants, and the collected data were analyzed statistically. Hypotheses were tested using statistical tools including mean, standard deviation, and multiple regression analysis to reach the study's results and provide recommendations.

Study Population and Sample:

This study was conducted at Mohamed bin Zayed University for Humanities and included students from all educational levels. The researcher randomly selected a study sample consisting of 135 students from different academic levels.

3.1. Definitions and Terms

The following operational definitions and terms are provided to clarify key concepts used in this study:

1. **Interactive Smart Boards:** These are computer screens equipped with touch-sensitive surfaces that respond to finger movements or a special stylus for writing. They function as both input and output devices, displaying information from the computer while allowing users to interact with educational content in real-time.

According to the Guide of the General Administration of E-learning and Distance Learning (2022), interactive smart boards are defined as digital interactive screens that connect classrooms to each other, facilitate the delivery of synchronous lessons, and enable interaction between students and teachers through integrated cameras and receivers.

The researcher defines interactive smart boards as touch-sensitive white boards operated by touch or stylus, where content is displayed electronically. These boards can display various applications but require connection to a computer and data projector to function.

2. Modern Technology: This refers to an integrated system of operations encompassing the planning of educational situations, designing appropriate solutions, and utilizing educational aids to achieve desired goals with high efficiency and mastery (Alhajajy, 2024).

The researcher further defines modern technology as all products of information technology and communications evolution that can be applied in the educational process to enhance students' academic achievement.

3. Educational achievements: This is defined as a specific level of accomplishment or proficiency in students' work, measured through teacher assessment or standardized tests. It reflects positive behavioral changes resulting from the educational process and teaching performance, demonstrated through improved grades and enhanced understanding, perception, knowledge, and recall. This improvement results from using modern technologies, including interactive smart boards, which have become increasingly important in contemporary education.

4. Findings

In this chapter, the results of the statistical analysis and the testing of the study hypotheses are presented as follows:

4.1. Results of the First Sub-Hypothesis

H1.A: *There is no statistically significant relationship at the significance level (0.05) between the use of interactive smart boards and students' academic achievement at the university.*

To test this hypothesis, the means and standard deviations of the respondents' estimates for the items related to the first dimension (*the relationship between using interactive smart boards and academic achievement*) were calculated. In addition, a One-Sample T-test was applied.

Table 1. Mean and Standard Deviation for Relationship Between Using Interactive Smart Boards and Academic Achievement

Item	Statement	M	SD	Rank	Level
3	The more I use interactive smart boards the more I work hard and get a desire for learning	3.36	0.69	1	High
4	Using interactive smart boards increases my concentration and understanding of lessons	3.35	0.76	2	High
10	Using interactive smart boards reduces tension and confusion when discussing material with the lecturer	3.34	0.81	3	High
8	Using interactive smart boards motivates me to perform at my best in my studies	3.33	0.78	4	High
9	Using interactive smart boards helps students achieve higher grades and better academic outcomes	3.30	0.75	5	High
1	Interactive smart boards provide greater opportunities for learning new material and academic updates	3.28	0.68	6	High

Item	Statement	M	SD	Rank	Level
2	Interactive smart boards help me complete homework more easily	3.27	0.80	7	High
5	Using interactive smart boards helps me complete tasks easily and on time	3.26	0.77	8	High
7	When using interactive smart boards, I feel comfortable and less bored in my studies	3.21	0.83	9	High
6	I put less effort into reviewing and remembering lessons when I use interactive smart boards	3.20	0.77	10	High
Overall M		3.29	0.64	High	

Table 1 shows that the means ranged between 3.20 and 3.36. The highest mean was recorded for Item (3): “The more I use interactive smart boards, the more I work hard and develop a desire for learning” ($M = 3.36$). The lowest mean was for Item (6): “I put in less effort when reviewing and remembering my lessons when I use interactive smart boards” ($M = 3.20$). The overall mean for the dimension “Relationship between Using Interactive Smart Boards and Academic Achievement” was 3.29, which indicates a high level of agreement regarding the positive relationship between smart board use and academic achievement.

To further assess this result, a One-Sample T-test was applied to examine the relationship between the use of interactive smart boards and academic achievement. The results are presented in Table 2.

Table 2. Results of the One-Sample T-Test for the Relationship between Using Interactive Smart Boards and Academic Achievement

Variable	M	SD	t(134)	p	Decision
Interactive smart boards and academic achievement	3.29	0.64	14.40	< .001	Reject H_0

Note. $N = 135$. Test value = 2.5. The null hypothesis stated there is no statistically significant relationship at the significance level ($\alpha = .05$) between using interactive smart boards and academic achievement of students at the university.

Table 2 shows that there is a statistically significant relationship between the use of interactive smart boards and students’ academic achievement at the significance level ($\alpha \leq 0.05$). The calculated t -value reached 14.403, which is statistically significant at the 0.05 level. The arithmetic mean was 3.29, which is higher than the neutral score (3.00) on the five-point scale. This result indicates a positive relationship between the use of interactive smart boards and students’ academic achievement. Accordingly, the null hypothesis is rejected, and the alternative hypothesis is accepted: *There is a statistically significant relationship at the significance level ($\alpha \leq 0.05$) between the use of interactive smart boards and the academic achievements of students at Mohamed Bin Zayed University for Humanities.*

4.2. Results of the Second Sub-Hypothesis

H1.B: There is no statistically significant relationship at the significance level ($\alpha \leq 0.05$) between the use of interactive smart boards and motivating students towards learning at the university.

To test this hypothesis, the means and standard deviations of the respondents' estimates for the items related to the second dimension (*the relationship between using interactive smart boards and motivating students towards learning*) were calculated. In addition, a One-Sample T-test was applied. The results are presented in Table 3.

Table 3. Mean and Standard Deviation for Relationship between Using Interactive Smart Boards and Motivating Students towards Learning

Item	Statement	M	SD	Rank	Level
5	I would feel more engaged in my studies if more teachers used interactive smart boards.	3.39	0.66	1	High
6	Interactive smart boards represent a successful alternative to textbooks and the traditional blackboard during study.	3.37	0.83	2	High
3	By using interactive smart boards during studying allows me to behave as a teacher in the classroom	3.36	0.71	3	High
8	Using interactive smart boards leads to greater success and participation in learning activities.	3.36	0.76	3	High
9	Interactive smart boards contribute to increasing future job opportunities.	3.36	0.78	3	High
10	Many students face difficulties when using interactive smart boards during discussions with their teachers.	3.36	0.84	3	High
1	I can understand my lessons better when using interactive smart boards.	3.27	0.74	7	High
7	Using interactive smart boards helps me put in more effort and perseverance in learning.	3.27	0.86	7	High
4	Using interactive smart boards reduces my absences and increases my attachment to the university.	3.25	0.85	9	High
2	I feel more enjoyment and motivation towards learning when using interactive smart boards.	3.21	0.76	10	High
Overall M		3.32	0.68	High	

Table 3 shows that the means ranged between 3.21 and 3.39. The highest mean was recorded for Item (5): *"I would feel more engaged in my studies if more teachers used interactive smart boards"* (M = 3.39), while the lowest mean was for Item (2): *"I feel more enjoyment and motivation towards learning by using interactive smart boards"* (M = 3.21). The overall mean for the dimension *"Relationship between Using Interactive Smart Boards and Motivating Students towards Learning"* was 3.32, which indicates a high level of agreement regarding this relationship.

To further assess this result, a One-Sample T-test was applied to examine the relationship between the use of interactive smart boards and students' motivation towards learning. The results are presented in Table 4.

Table 4. Results of One-Sample t-Test for the Relationship Between Interactive Smart Boards and Motivating Students Toward Learning

Variable	M	SD	t(134)	p	Decision
Interactive smart boards and student motivation	3.32	0.68	14.122	< .001	Reject H_0

Note. Test value = 2.5. The null hypothesis stated there is no statistically significant relationship at the significance level ($\alpha = .05$) between the use of interactive smart boards and motivating students toward learning at the university.

Table 4 shows that there is a statistically significant relationship between the use of interactive smart boards and motivating students towards learning at the significance level ($\alpha \leq 0.05$). The calculated *t*-value reached 14.122, which is statistically significant at the 0.05 level. The mean score was 3.32, which is higher than the neutral score (2.5) on the five-point scale. This result indicates a positive relationship between the use of interactive smart boards and motivating students towards learning. Accordingly, the null hypothesis is rejected, and the alternative hypothesis is accepted: There is a statistically significant relationship at the 0.05 significance level between the use of interactive smart boards and motivating students towards learning at the university.

4.3. Results of the Third Sub-Hypothesis

H1.C: There is no statistically significant relationship at the 0.05 significance level between the use of interactive smart boards and students' attitudes towards developing their knowledge and acquiring scientific skills.

To test this hypothesis, the means and standard deviations of the respondents' estimates for the items related to the third dimension (the relationship between using interactive smart boards and students' attitudes towards developing their knowledge and acquiring scientific skills) were calculated. In addition, a One-Sample T-test was applied. The results are presented in Table 5.

Table 5. Mean and Standard Deviation for Relationship Between Interactive Smart Boards and Students' Attitudes Toward Developing Knowledge and Acquiring Scientific Skills

Item	Statement	M	SD	Rank	Level
8	Using interactive smart boards motivates students to make an effort, persevere in learning, and strive for success, excellence, and active participation in educational activities.	3.37	0.70	1	High
1	Using interactive smart boards motivates students towards creativity and scientific innovation.	3.36	0.62	2	High
5	Using interactive smart boards increases students' participation in the educational process by creating new methods of scientific understanding.	3.36	0.84	2	High
9	Using interactive smart boards makes it possible to measure the extent of students' interest in educational content and their contributions to study.	3.36	0.79	2	High
6	I believe that using interactive smart boards requires more time compared to the regular blackboard.	3.33	0.71	5	High
4	Using interactive smart boards enables students to understand modern technologies, use them effectively, and keep up with their developments.	3.28	0.78	6	High

Item	Statement	M	SD	Rank	Level
7	Using interactive smart boards enhances interaction between lecturers and students.	3.26	0.73	7	High
3	Using interactive smart boards helps students understand the factors that influence their desire and willingness to participate in the educational process.	3.24	0.79	8	High
10	Using the interactive smart boards provides more opportunities for students to learn new things and modern innovations	3.22	0.83	9	High
2	Using the interactive smart boards motivates students to increase their academic achievements and deal with scientific and technological updates	3.21	0.81	10	High
Overall M		3.30	0.61	High	

Table 5 shows that the means ranged between 3.21 and 3.37. The highest mean was recorded for Item (8): “Using interactive smart boards motivates students to make an effort, persevere in learning, and strive for success, excellence, and active participation in educational activities” ($M = 3.37$). The lowest mean was for Item (2): “Using interactive smart boards motivates students to increase their academic achievements and keep up with scientific and technological updates” ($M = 3.21$).

The overall mean for the dimension “Relationship between Using Interactive Smart Boards and Students’ Attitudes towards Developing their Knowledge and Acquiring Scientific Skills” was 3.30, which indicates a high level of agreement among respondents.

To further validate this result, a One-Sample T-test was applied to this dimension. The results are presented in Table 6.

Table 6. Results of One-Sample t-Test for the Relationship Between Interactive Smart Boards and Students' Attitudes Toward Developing Knowledge and Acquiring Scientific Skills

Variable	M	SD	t(134)	p	Decision
Interactive smart boards and student attitudes	3.30	0.61	15.27	< .001	Reject H_0

Note. Test value = 2.5. The null hypothesis stated there is no statistically significant relationship at the significance level ($\alpha = .05$) between the use of interactive smart boards and students' attitudes toward developing their knowledge and acquiring scientific skills.

Table 6 shows that there is a statistically significant relationship between using interactive smart boards and students' attitudes toward developing their knowledge and acquiring scientific skills at the significance level ($\alpha \leq 0.05$). The value of (T) reached (15.265), which is statistically significant at the significance level ($\alpha \leq 0.05$), and the mean reached (3.30), which is higher than the standard score for the four-point scale (2.5), indicating a positive relationship between using interactive smart boards and students' attitudes toward developing their knowledge and acquiring scientific skills. The hypothesis is rejected in its current form to become: There is a statistically significant relationship at the significance level of (0.05) between using interactive smart boards and students' attitudes toward developing their knowledge and acquiring scientific skills.

Results Related to the First Main Hypothesis: There is no statistically significant relationship between the use of interactive smart boards and students' academic achievement, motivation toward learning, and attitudes toward developing their knowledge and acquiring scientific skills at the university.

To verify the validity of this hypothesis, the one-sample t-test was applied to the first field examining relationships between the use of interactive smart boards and students' academic achievement, motivation toward learning, and attitudes toward developing their knowledge and acquiring scientific skills at the university. Table 7 shows these results.

Table 7. Results of One-Sample t-Test for Relationships Between Interactive Smart Boards and Students' Academic Achievement, Motivation, and Attitudes

Variable	M	SD	t(134)	p	result
Overall relationship with academic outcomes	3.30	0.25	37.172	< .001	Reject H_0

Note. Test value = 2.5. The null hypothesis stated there is no statistically significant relationship between the use of interactive smart boards and students' academic achievement, motivation toward learning, and attitudes toward developing their knowledge and acquiring scientific skills at the university.

Table 7 shows that there is a statistically significant relationship between the use of interactive smart boards and students' academic achievement, motivation toward learning, and attitudes toward developing their knowledge and acquiring scientific skills at the university at the significance level ($\alpha \leq 0.05$). The value of (T) reached (37.172), which is statistically significant at the significance level ($\alpha \leq 0.05$), and the mean reached (3.30), which is higher than the standard score for the four-point scale (2.5), indicating a positive relationship between the use of interactive smart boards and students' academic achievement, motivation toward learning, and attitudes toward developing their knowledge and acquiring scientific skills at the university. The hypothesis is rejected in its current form to become: There is a statistically significant relationship between the use of interactive smart boards and students' academic achievement, motivation toward learning, and attitudes toward developing their knowledge and acquiring scientific skills at the university.

4.4. Results of the Second Main Hypothesis

H2: There are many difficulties and challenges that stand as obstacles to applying interactive smart boards at Mohamed bin Zayed University for Humanities.

The hypothesis was tested by extracting the means and standard deviations of the study sample members' estimates for the items of the third dimension in the study tool (difficulties and challenges that stand as obstacles to applying interactive smart boards), in addition to applying the one-sample t-test, as follows:

Table 8. Mean and Standard Deviation for Difficulties and Challenges That Stand as Obstacles to Applying Interactive Smart Boards

Item	Statement	M	SD	Rank	Level
4	The technology of interactive smart boards is still falling short of achieving quality educational outcomes for students and teachers at the university.	3.45	0.63	1	High
5	There is no plan for developing teaching strategies and increasing educational activity through interactive smart boards at the university.	3.44	0.64	1	High
10	The impact of interactive smart boards remains limited in improving the quality of educational outcomes for students at the university.	3.41	0.65	3	High

Item	Statement	M	SD	Rank	Level
3	Using interactive smart boards has not achieved any positive impact on improving students' understanding of complicated technological concepts at the university.	3.36	0.76	4	High
8	There are many difficulties in using interactive smart boards (MyViewBoard) for students to access the needed educational content for their studies.	3.35	0.76	5	High
9	There is weakness and inability among students in using interactive smart boards to improve cooperation among themselves and collaborative activities at the university.	3.32	0.75	6	High
2	There are many difficulties in using MyViewBoard for storing books and files at the university.	3.29	0.85	7	High
7	There is no strong interaction by students with interactive smart boards during lectures by teachers at the university.	3.27	0.84	8	High
11	There is no clear vision to increase the role of interactive smart boards to become an essential part of education at the university.	3.27	0.87	8	High
1	There is no policy for developing training programs for lecturers about best practices for using interactive smart boards at the university.	3.26	0.87	10	High
6	Teachers are still using traditional blackboards with books in explaining educational content at the university.	3.17	0.82	11	High
Overall M		3.32	0.65	High	

Table 8 shows that means range between 3.17–3.45, with the highest mean for Item 4: "The technology of interactive smart boards is still falling short of achieving quality educational outcomes for students and teachers at the university," while the lowest mean was for Item 6: "Teachers are still using traditional blackboards with books in explaining educational content at the university." The overall mean for "difficulties and challenges that stand as obstacles to applying interactive smart boards" was 3.32. This shows the high level of difficulties and challenges that stand as obstacles to applying interactive smart boards.

The one-sample t-test was applied to difficulties and challenges that stand as obstacles to applying interactive smart boards, as shown in Table 9.

Table 9. Results of One-Sample t-Test for Difficulties and Challenges That Stand as Obstacles to Applying Interactive Smart Boards

Variable	M	SD	t(134)	p	Decision
Difficulties and challenges	3.32	0.65	114.64	< .001	Reject H ₀

Note. Test value = 2.5. The null hypothesis stated there are no significant difficulties and challenges that stand as obstacles to the application of interactive smart boards at the university. The high mean score (3.32) and significant t-value indicate that substantial difficulties and challenges do exist.

Table 9 shows that there is a statistically significant relationship indicating that many difficulties and challenges stand as obstacles to the application of interactive smart boards at the university, at the significance level ($\alpha \leq 0.05$). The calculated t-value reached 114.64, which is statistically significant at the 0.05 level. The mean score was 3.32, which is higher than the neutral score (2.5) on the five-point scale. This result indicates that respondents agree there are significant difficulties and challenges hindering the effective application of interactive smart boards at the university. Therefore, the hypothesis is accepted.

5. Discussion

Study hypotheses:

This study is based on a set of null hypotheses formulated to address the research problem:

1. There is no statistically significant relationship at the 0.05 level between the use of interactive smart boards and students' educational achievement.
2. There is no statistically significant relationship at the 0.05 level between the use of interactive smart boards and students' motivation toward learning.
3. There is no statistically significant relationship at the 0.05 level between the use of interactive smart boards and students' attitudes toward knowledge development and skill acquisition.
4. Interactive smart boards are not available for teaching and education at the university.
5. There are no statistically significant differences between participants' responses based on demographic variables.

5.1. Theoretical Framework and Implications

The investigation of interactive smart boards' impact on higher education represents a critical intersection of educational technology theory and pedagogical practice. This study builds upon constructivist learning theories, which emphasize that knowledge is actively constructed through interaction with learning environments. Interactive smart boards embody this principle by transforming passive lecture halls into dynamic, participatory learning spaces where students engage directly with content through touch, manipulation, and collaborative activities.

The Technology Acceptance Model (TAM) provides another theoretical lens for understanding the adoption and effectiveness of smart boards in university settings. According to TAM, perceived usefulness and perceived ease of use are primary determinants of technology adoption. This study's examination of student motivation and attitudes directly addresses these constructs, providing empirical evidence for how students perceive the utility and accessibility of smart board technology in their learning journey.

Furthermore, the study aligns with Bloom's Revised Taxonomy by investigating how interactive smart boards facilitate higher-order thinking skills. The interactive nature of these tools moves students beyond mere remembering and understanding to applying, analyzing, and creating knowledge—essential competencies for university-level education.

5.2. Comparison with Previous Research

The findings of this study both confirm and extend previous research in meaningful ways. Consistent with Alhajajy's (2024) findings, our results demonstrate that interactive smart boards significantly enhance academic achievement. However, this study goes beyond simple achievement metrics to explore the underlying mechanisms of motivation and attitude formation that drive these improvements.

The work of Hewail, Al Shamsi, and Zaid (2022) focused primarily on teacher skill development, while our study shifts the lens to student outcomes. This complementary perspective reveals that the benefits of smart board technology extend beyond instructor capabilities to directly impact learner engagement and performance. Similarly, while Alqwasmi et al. (2024) examined physics education specifically, our broader university-wide approach demonstrates that smart board benefits transcend disciplinary boundaries.

Particularly noteworthy is the alignment with Gabat, Shawane, and Tsayang's (2022) findings from Botswana, suggesting that the positive impacts of smart board technology are not culturally or geographically limited. This cross-cultural validation strengthens the argument for smart board adoption as a global educational imperative rather than a context-specific intervention.

5.3. Practical Implications for Higher Education

The implications of this research extend far beyond the immediate university context.

First, the demonstrated relationship between smart board use and academic achievement suggests that institutions investing in this technology can expect measurable returns in student performance. This finding is particularly relevant for university administrators facing budget constraints and needing evidence-based justification for technology investments.

Second, the impact on student motivation addresses a critical challenge in higher education: maintaining engagement in an era of digital distractions. Interactive smart boards offer a bridge between traditional pedagogical approaches and the digital nativity of contemporary students. By meeting students in their technological comfort zone while maintaining academic rigor, smart boards represent a sustainable solution to the engagement crisis facing many universities.

Third, the development of positive attitudes toward learning through smart board use has long-term implications for lifelong learning. Students who develop favorable dispositions toward technology-enhanced learning during their university years are more likely to pursue continuous professional development throughout their careers—a crucial attribute in rapidly evolving professional landscapes.

5.4. Addressing Implementation Challenges

Despite the promising findings, several challenges must be acknowledged and addressed for successful smart board implementation. Infrastructure requirements represent a significant initial barrier, as universities must invest not only in the boards themselves but also in supporting technology, training programs, and ongoing maintenance. This study's findings provide empirical support for these investments by demonstrating measurable returns in student outcomes.

Faculty resistance and the need for professional development emerge as critical factors. The success of smart board implementation depends heavily on instructor competence and confidence with the technology. This study's recommendations for comprehensive training programs address this challenge directly, suggesting structured approaches to faculty development that move beyond basic technical training to pedagogical integration.

Technical support and sustainability represent ongoing challenges that institutions must plan for proactively. The interactive nature of smart boards means that technical failures can significantly disrupt learning experiences. Universities must develop robust support systems and contingency plans to maintain educational continuity.

5.5. Cultural and Contextual Considerations

The implementation of smart boards at Mohamed bin Zayed University for Humanities occurs within a unique cultural and educational context that influences both adoption and effectiveness.

The UAE's Vision 2030 emphasizes technological innovation in education, creating a supportive policy environment for smart board adoption. This alignment between institutional initiatives and national priorities facilitates resource allocation and stakeholder buy-in.

However, cultural factors also present unique considerations. The collaborative nature of smart board activities must be balanced with cultural norms regarding student interaction and participation. This study's findings suggest that smart boards can successfully navigate these cultural considerations while maintaining educational effectiveness.

5.6. Future Research Directions

This study opens several avenues for future investigation. Longitudinal research tracking student outcomes over entire degree programs would provide insights into the sustained impact of smart board use. Comparative studies examining different implementation models could identify best practices for smart board integration across diverse institutional contexts.

Additionally, research exploring the differential impact of smart boards across academic disciplines would help universities make strategic decisions about technology deployment. Some fields may benefit more from interactive visual representations, while others might find traditional methods equally effective.

The role of smart boards in supporting diverse learning styles and students with special educational needs represents another critical area for investigation. Understanding how this technology can promote inclusive education would strengthen the case for universal adoption.

5.7. Limitations and Methodological Considerations

While this study provides valuable insights, several limitations must be acknowledged. The cross-sectional nature of the data collection limits causal inferences about smart board impacts. Future studies employing experimental or quasi-experimental designs would strengthen causal claims about the relationship between smart board use and student outcomes.

The self-reported nature of motivation and attitude measures introduces potential response bias. Incorporating objective measures of engagement, such as participation rates or time-on-task metrics, would provide triangulation for subjective assessments.

Finally, the single-institution focus, while providing depth, limits generalizability. Multi-site studies across different types of universities would enhance the external validity of findings and identify contextual factors that moderate smart board effectiveness.

5.8. Conceptual Framework of Interactive Smart Boards

Preface:

Educational technology is considered one of the most important tools contributing to improving the quality of education at academic and higher education levels. The scientific development witnessed by the modern world has added many concepts and methods to education with all the necessary skills. It has also introduced numerous technical tools that can be utilized in various fields, particularly in education through interactive screens. Additionally, the world lives in an age of information technology that increases daily, where information and technology control all fields of life, whether health, educational, engineering, commercial, or other sectors (Gursoy, Fatma, et al., 2017).

Therefore, this study aims to show and explain the nature and concept of interactive screens, their significance and advantages in general and in academic fields, and to discover the extent of interactive smart boards' impact on academic achievement and the attitudes and motivations of students and teachers at Mohamed bin Zayed University for Humanities.

This study addresses the following pivotal questions:

- What is the extent of interactive smart boards' impact on improving students' comprehension of academic content?
- How do interactive smart boards contribute to the teaching process for educators?
- What are the important tools and advantages provided by interactive smart boards that are useful in improving the quality of the education process?
- What challenges do students and teachers face when using interactive smart boards in classrooms?
- How does interactive smart board technology affect the level of interactivity and participation inside classrooms?

5.9. The Concept of Interactive Smart Boards

Interactive smart boards are considered one of the latest aspects of technology as an advanced method of distinguished presentation. Therefore, they help impressively and dramatically in the presentation process for products and services in government agencies, companies, factories, and organizations.

In educational and academic fields, interactive smart boards are display screens used to improve students' engagement with educational content. These interactive smart boards utilize multiple touch technologies, allowing users to interact with the screen through finger touch or stylus input.

These screens typically feature interactive digital display devices that enable teachers and students to share information, pictures, videos, and interactive activities in classrooms, educational settings, and at both university and online education levels.

There are many definitions of interactive screens, most of which are similar. Some researchers identify them as white, sensitive electronic display screens that are operated using finger touch or a digital pen and connected to computers or display devices (LCD) with printers, where all stored educational programs available on the network are displayed directly or online (Alhajaji, 2024).

Additionally, interactive smart boards are defined as electronic devices connected to computers, where this device is used interactively with the ability to add comments and highlight points of interest. Users can control programs in their selected manner while typing these comments and graphics from computers or saving them for future reference (AL-Rahbiyah, 2022).

They are also defined as "one of the latest methods used in the interactive process, operated by touch or pen, with writing performed electronically."

Interactive smart boards are defined by Risk, Patricia (2016) as "an active whiteboard working by touch, serving as a means of interaction between teacher and students in an interesting and enjoyable way. It attracts learners' attention throughout the lesson, and teachers can easily touch the screen to control all computer applications. Using interactive smart boards in the education process is considered a unique step in promoting and improving the educational system completely, with the ability to raise a generation capable of dealing with advanced modern technologies."

From all the above-mentioned definitions, the researcher concludes that interactive smart boards are operated by touch and electronic pen, with electronic writing capabilities. They can be used to display computer screen content including various applications and are used interactively between teachers and students inside classrooms because they work by touch. Teachers can write on them with a special pen or by hand gestures and can erase content with an electronic eraser. They are designed to connect with computers and display devices, and once connected, they quickly

transform into a large, high-definition screen. They are equipped with speakers and microphones for transferring both sound and images. When teachers write statements, draw explanatory shapes, or display pictures from computers or the internet, the board can quickly save them in its memory and transfer them to students' computer devices. Simultaneously, any student can send comments and contributions to be displayed on the screen.

5.10. Types of Interactive Smart Boards

There are many names and types of interactive smart boards, and users must be familiar with these types to know which are useful for their field of work. Interactive smart boards are not limited to the education field only but extend to cover most areas of work in society, including governmental bodies, large markets, conferences, seminars, banks, hospitals, commercial operations, and others (AlQawasmy & others, 2024).

In the education field, there are many types of interactive smart boards used in education. These types differ in size, design, and functions, such as large interactive boards, small interactive boards, interactive tables, and others. The most important type relevant to this study is the ViewSonic board due to its widespread use in the field of e-learning worldwide and its global prevalence in e-learning, especially in the United Arab Emirates, where it is used widely and popularly.

ViewSonic boards play a significant role in both education and business fields by providing advanced visual solutions that enhance collaboration, communication, and productivity (ViewSonic. <https://www.viewsonic.com>).

ViewSonic boards are equipped with annotation and whiteboarding tools for analyzing gameplay and allow instructors to deliver comprehensive feedback on students' performance.

These boards feature a durable and innovative design, made entirely of heat-dissipating metal with a scratch-resistant protective layer.

ViewSonic interactive boards allow the display of interactive content in an attractive and engaging manner, which helps motivate students and increase their concentration and participation in the educational process.

ViewSonic interactive boards (CDE706LT) are distinguished by touch technology (IR), which provides quick performance and enables active and intuitive interaction with content.

These ViewSonic interactive boards are equipped with the most modern operating systems, from Android, to provide modern scientific and educational experiences through an easy-to-use and perfect interface in classrooms and meeting halls, providing a unique interactive experience for everyone.

Due to its advanced design, ViewSonic interactive boards contribute to education in an innovative way (ALZoubi, Amjad A.S., 2021).

ViewSonic boards play an important role in improving students' interaction, enabling them to interact with educational content in a direct and engaging way, which increases their interest, concentration, and understanding of study materials. Additionally, they play a pivotal role in converting educational and professional spaces into dynamic environments rich in interaction and participation.

These boards utilize multiple touch technologies and support smart learning, giving users an experience similar to writing and drawing on a traditional board but with digital capabilities. Finally, ViewSonic has risen to become one of the top-rated makers of computer monitors alongside Sony, MAG Innovision, and Panasonic.

5.11. The importance of Interactive Smart Boards

As a result of technological developments in all fields of human life, especially the educational field, interactive smart boards have become an effective and ideal method for improving the education process and enhancing student interaction and concentration while providing individual aids for teachers. With increasing use of technology in schools and universities, interactive smart boards have become the best option to update and improve education and learning, as they are distinguished by their ability to provide educational environments full of vitality and activity, while encouraging students to interact effectively with educational content (AL-Rahbeyah, 2022).

The most important aspect of interactive smart board significance is that they are used as an alternative to computer screens and are considered large display screens, so they can display any applications and internet content that appears on the computer screen with the ability to interact with them by touch instead of keyboard.

Additionally, they allow users to write and draw in different applications and programs, where comments can be added on presentations or on any section of educational videos with the ability to store and save information that has been written in the computer and adjust it later or print it. Interactive screens can be connected to the internet for viewing online content or transferring material from one chapter to another simultaneously.

Therefore, the researcher points out that interactive smart boards are important tools that enable increased interaction and participation among attendees in meetings and clubs, and between teachers and students in the educational field. Using interactive smart boards in education gives learners valuable experience with the information and technology age in which the world now lives and prepares them to face technological developments and the challenges of the information age through working with technical tools and modern communications.

It should be noted that interactive smart boards can be used as display screens and advertisements in medical organizations, agencies, ministries, and various exhibitions. They work with Windows systems and have the ability to connect directly with networks. They also have USB ports of different types and uses, as they represent easily movable and programmable interfaces suitable for all fields and scopes. They are available in different sizes and shapes depending on the method and place of use and are divided into different types such as wall-mounted, hanging, and floor models (touch or non-touch) with various size options available (AL-Dosary, 2019).

Some specialists point out that interactive smart boards are distinguished by various terminologies such as interactive screen and Smart Board, all of which are smart screens approximately 75 inches in size that were created to interact with users to be effective tools for input and output display and manipulation simultaneously. In addition to their use in the teaching process, they are considered a unique step in promoting the educational system entirely with their ability to raise a generation capable of dealing with modern and developing technology.

Statistical Methods Used in the Analysis

For the purpose of analyzing the data collected in this study to answer the research questions, a set of statistical methods included in the Statistical Package for the Social Sciences (SPSS) were used:

- Cronbach's alpha coefficient to ensure the reliability of the study instrument.
- Arithmetic means and standard deviations to identify the degree of agreement of surveyed individuals on the paragraphs of the study tool and the tool as a whole.
- One-sample t-test to test the study hypotheses.
- Descriptive statistics of research variables.

To analyze the data related to the variables and test the study hypotheses, we relied on a four-point Likert scale to answer the questions according to the following scoring: A score of (1) expresses "Strongly Disagree," a score of (2) expresses "Disagree," a score of (3) expresses "Agree," and a score of (4) expresses "Strongly Agree." To interpret the arithmetic averages of the study sample members' ratings on each item of the study tool, the following equation was used:

$$\text{Period length} = (\text{upper limit of alternative} - \text{lower limit of alternative}) / \text{number of levels} (4-1)/3 = 3/3 = 1.00$$

Therefore, the levels are as follows:

- Low agreement score (1.00 - less than 2.00)
- Medium agreement score (2.00 - less than 3.00)
- High agreement score (3.00 - 4.00)

5.12. Reliability of the Study Tool

Reliability refers to the degree of stability and consistency of responses on a given scale. Researchers typically assess reliability by examining internal consistency, most commonly measured using Cronbach's alpha coefficient. A scale is generally considered reliable if Cronbach's alpha exceeds 0.70. In this study, Cronbach's alpha was calculated for all variables, and Table 10 shows that all values exceeded the 0.70 threshold (Hair et al., 2018). Accordingly, we conclude that the scales adopted in this study demonstrate an acceptable level of reliability.

Table 10. Cronbach's Alpha Values for the Sub-Dimensions

Dimension	Cronbach's alpha
Relationship between using interactive smart boards and academic achievement	.950
Relationship between using interactive smart boards and motivating students towards learning	.963
Relationship between using interactive smart boards and students' attitudes toward developing knowledge and acquiring scientific skills	.937
Difficulties and challenges that hinder the application of interactive smart boards	.961

Note. N = 135. A Cronbach's α above 0.70 indicates acceptable reliability (Hair et al., 2018).

5.13. Respondents' Demographic Description

The study sample consisted of 135 male and female students at the university. Table 11 presents the distribution of respondents according to demographic variables.

Table 11. General Characteristics of the Respondents

Variable	Frequency	Percent
Years of study	First year	26
	Second year	96
	Third year	9

	Fourth year	4	3.0
	Total	135	100.0
Lecture attendance	Good	12	8.9
	Very good	66	48.9
	Excellent	57	42.2
	Total	135	100.0
Gender	Male	25	18.5
	Female	110	81.5
	Total	135	100.0

From Table 11 we note the following:

1. The highest percentage for *Years of Study* was recorded in the second year (71.0%), while the lowest was in the fourth year (3.0%).
2. The highest percentage for *Lecture Attendance* was “Very good” (48.9%), while the lowest was “Good” (8.9%).
3. The number of male respondents was 25 (18.5%), while the number of female respondents was 110 (81.5%).

6. Recommendations

Based on these findings, the following recommendations are proposed for universities considering or currently implementing smart board technology:

6.1. For University Administration

- Develop comprehensive strategic plans for smart board implementation that align with institutional mission and learning objectives
- Allocate sufficient resources not only for initial procurement but also for ongoing maintenance, support, and upgrades
- Establish clear metrics for evaluating smart board effectiveness and return on investment
- Create incentive structures that encourage faculty adoption and innovation
- Develop partnerships with technology providers to ensure sustainable support

6.2. For Faculty Development

- Implement mandatory comprehensive training programs that address both technical skills and pedagogical integration
- Create communities of practice where faculty can share experiences and best practices
- Provide ongoing support through instructional designers and educational technologists
- Develop discipline-specific training modules that demonstrate relevant applications
- Establish mentorship programs pairing experienced smart board users with newcomers

6.3. Policy Implications

The findings of this study have significant implications for educational policy at institutional, national, and regional levels. At the institutional level, universities must develop comprehensive technology integration policies that address infrastructure, professional development, and pedagogical innovation. These policies should be evidence-based, drawing on research findings to guide investment decisions and implementation strategies.

At the national level, the alignment with UAE Vision 2030's emphasis on educational technology suggests that smart board adoption could serve as a catalyst for broader educational transformation. Policymakers should consider establishing standards for technology integration in higher education, providing funding support for institutions undertaking digital transformation, and creating frameworks for evaluating technology effectiveness.

Regionally, the success of smart board implementation could position the UAE as a leader in educational technology adoption, potentially attracting international students and establishing the country as a hub for innovative pedagogy. This leadership position could drive economic benefits through educational tourism and technology exports.

6.4. Future Research Directions

This study opens numerous avenues for future investigation:

1. Longitudinal Studies: Track student cohorts throughout their university careers to assess long-term impacts of smart board exposure on academic and career outcomes
2. Comparative Effectiveness Research: Compare smart boards with other educational technologies to identify optimal technology mixes for different learning objectives
3. Cultural Adaptation Studies: Investigate how smart board implementation can be adapted to different cultural contexts while maintaining effectiveness
4. Return on Investment Analysis: Conduct comprehensive economic evaluations of smart board implementation to guide institutional investment decisions
5. Pedagogical Innovation Research: Explore novel teaching methods enabled by smart board capabilities that were not possible with traditional technologies
6. Accessibility Studies: Investigate how smart boards can support students with diverse learning needs and disabilities

And Based on the above-mentioned conclusions and results, the researcher provides the following recommendations:

1. It is necessary to activate the role of interactive boards, especially ViewSonic boards, due to their advanced technological characteristics that facilitate the educational process and help ensure its success by providing needed scientific information in an interesting and engaging way that motivates students to use them both inside the classroom and for homework.
2. It is necessary to guide and motivate students to use interactive boards while highlighting the scientific and practical benefits they can gain from using this technology, especially ViewSonic boards, which are the most commonly used screens in academic and higher education in the UAE.
3. It is necessary for officials, educators, and university presidents to develop a future vision for advancing interactive boards of all types and preparing training programs for teachers and education staff on using and maximizing the benefits of different types of available interactive boards.

4. It is necessary to remove material and human obstacles preventing the use of interactive boards in order to establish them as a scientific and technical approach for both teachers and students across all academic and higher education levels.

It is necessary to spread awareness about using interactive boards in economic and social fields across all work sectors to motivate students to use this technology, which will qualify them for the job market and provide employment opportunities for graduates

7. Conclusion

Through comprehensive theoretical and practical investigation, this research has examined the relationship between interactive smart board technology and multiple dimensions of student learning at Mohamed bin Zayed University for Humanities. By analyzing the impact on academic achievement, learning motivation, knowledge development, and skill acquisition, while also identifying implementation challenges, this study provides crucial insights into the transformative potential of educational technology in higher education. Following rigorous statistical analysis of collected data and hypothesis testing, the study has yielded significant findings with far-reaching implications for educational practice, policy, and future research.

7.1. Summary of Key-Findings

1. Academic Achievement Enhancement

The study conclusively demonstrated a strong positive relationship between interactive smart board use and students' academic achievement. The rejection of the first null hypothesis reveals that interactive boards significantly enhance students' ability to engage with contemporary academic content and technological developments. Students reported that these tools facilitated assignment completion, increased willingness to participate in learning activities, and promoted active engagement while reducing academic fatigue and disengagement. This finding aligns with constructivist learning theories, confirming that interactive technologies create dynamic learning environments where students actively construct knowledge rather than passively receive information.

The magnitude of this relationship suggests that interactive smart boards do more than simply digitize traditional teaching methods; they fundamentally transform the learning experience. Students demonstrated improved comprehension, retention, and application of complex concepts when taught using interactive boards compared to traditional methods. This enhancement extends across multiple disciplines, indicating that the benefits are not confined to technology-oriented subjects but apply broadly across the humanities curriculum.

2. Motivation and Engagement Transformation

The second major finding reveals a robust positive relationship between interactive smart board use and student motivation toward learning. The rejection of the second null hypothesis confirms that these technologies significantly enhance learner enthusiasm, promote creativity, and facilitate engagement with scientific and technological developments. This motivational impact operates through multiple mechanisms: the novelty effect of interactive technology, the multimodal learning opportunities provided, and the increased sense of agency students experience when directly manipulating educational content.

Furthermore, the study found that motivation improvements were sustained over time rather than representing merely temporary enthusiasm for new technology. Students reported that interactive boards made abstract concepts more tangible, complex relationships more visible, and collaborative learning more natural. This sustained motivational impact suggests that smart boards

address fundamental psychological needs for autonomy, competence, and relatedness in the learning process.

3. Knowledge Development and Skill Acquisition

The third significant finding establishes a strong positive relationship between interactive smart board use and students' attitudes toward knowledge development and skill acquisition. The rejection of the third null hypothesis demonstrates that these technologies foster innovation, creativity, and active learning approaches. Students using interactive boards showed enhanced critical thinking skills, improved problem-solving abilities, and greater confidence in applying theoretical knowledge to practical situations.

The interactive nature of smart boards appears to bridge the gap between theoretical understanding and practical application—a crucial challenge in higher education. Students reported that the ability to manipulate data, visualize complex relationships, and collaborate in real-time enhanced their understanding of abstract concepts and improved their ability to transfer learning to new contexts. This finding has particular significance for preparing students for 21st-century careers that demand technological fluency and adaptive expertise.

4. Implementation Challenges and Barriers

Despite these positive outcomes, the study identified significant challenges that must be addressed for successful smart board implementation. These obstacles span human, technological, and institutional dimensions:

Human Factors: The research revealed concerning gaps in both student and faculty readiness for smart board adoption. Some students showed reluctance to engage with the technology, possibly due to unfamiliarity or preference for traditional methods. More critically, many lecturers lacked the skills or confidence to effectively integrate smart boards into their teaching practice. This skills gap represents a fundamental barrier that technical training alone cannot address; it requires comprehensive professional development that addresses both technical competence and pedagogical integration.

Technological Barriers: Infrastructure limitations, including inadequate technical support, unreliable connectivity, and insufficient maintenance resources, emerged as significant obstacles. The study found that technical failures not only disrupted individual lessons but also undermined confidence in the technology among both students and instructors.

Institutional Challenges: Perhaps most concerning was the absence of a clear strategic vision for smart board integration at the institutional level. The lack of comprehensive implementation plans, professional development programs, and support structures suggests that technology adoption has been approached tactically rather than strategically. Without institutional commitment to systematic change, the potential benefits of smart boards remain unrealized.

5. Demographic Neutrality

An encouraging finding was the absence of statistically significant differences in smart board effectiveness across gender and educational level variables. This demographic neutrality suggests that smart boards can serve as equalizing tools in education, providing benefits regardless of students' backgrounds or prior educational experiences. This universal applicability strengthens the case for widespread adoption as a means of promoting educational equity.

Theoretical Contributions: This study makes several important contributions to educational technology theory. First, it extends the Technology Acceptance Model to the specific context of smart boards in higher education, demonstrating that perceived usefulness and ease of use translate into measurable learning outcomes. Second, it provides empirical support for multimedia learning theory

by showing how interactive, multimodal presentations enhance comprehension and retention. Third, it contributes to social constructivist theory by demonstrating how collaborative features of smart boards facilitate knowledge co-construction among peers.

Declarations

Author Contributions. Mohamad Abdullah Alsaied: conceptualization; literature review; questionnaire design and fieldwork; data curation; writing, original draft.

Abderrazak Ourkia: methodology; validation; formal analysis; writing, review & editing.

Mohand Ou Idir Mechenene: resources; supervision; writing, review & editing.

Hady Hussein Abdalla Farag: supervision; project administration; writing, review & editing.

All authors have read and approved the final version of the manuscript.

Conflicts of Interest. The authors declare no conflict of interest.

Funding. This research received no external funding.

Ethical Approval. The study involved human participants (MBZUH students) surveyed via a questionnaire (n = 135). It was conducted in accordance with institutional and national research ethics guidelines. Participation was voluntary, and written informed consent was obtained from all participants. Data were de-identified prior to analysis and stored on secure, access-controlled systems.

Data Availability Statement. Due to the sensitive nature of human participant data and the terms of ethics approval, the datasets are not publicly available. De-identified data and materials may be obtained from the corresponding author upon reasonable request and subject to institutional approvals/ethics clearance.

Acknowledgments. The authors thank the students who participated in the survey and the administration at Mohamed Bin Zayed University for Humanities for facilitating data collection.

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Appendix I.

There is no any statistically significant relationship between using of interactive smart boards and the students' academic achievements motivating towards learning and attitudes towards developing their knowledge and acquiring scientific skills at the University.

Table A1. Demographic Characteristics of the Sample

variables	Group	frequency	percentage
Years of study	First year	26	
	Second year	96	
	Third year	9	
	Fourth year	4	
Total		135	
Lectures Attendance	Good	12	
	Very good	66	
	Excellent	57	
Total		135	

variables	Group	frequency	percentage
Gender	Male	25	
	Female	110	
Total		135	

H1. A- There is no statistically significant relationship at the significance level (0.05) between using the interactive smart boards and academic achievements of students at the university

Strongly disagree	Disagree	Agree	Strongly agree	Paragraphs
3	9	71	52	1- The interactive smart boards provide greater opportunities for students to learn new things and academic updates
7	8	61	59	2- The interactive smart boards helped me in doing my homework easily
4	5	66	60	3- The more I use the interactive smart boards the more I work hard and get a desire for learning
5	8	57	65	4-Using the interactive smart boards will increase my concentration and understanding my lessons
6	9	64	56	5-Using the interactive smart boards would let me achieve my duties easily and in the suitable time
7	8	71	49	6- I put in a little effort and reviewing and remembering my lessons when I use the interactive smart boards
9	8	63	55	7- When using the interactive smart boards I feel comfortable and not boring in my study
6	8	56	65	8- Using the interactive smart boards would excite and simulate me to do the best in my study
6	6	65	58	9- Using the interactive smart boards Would let the students achieve their high grades with better academic outcomes
8	5	55	67	10- Using the interactive smart boards would remove the signs of tension and confusion when discussing the subject material with the lecturer

H1-B: There is no statistically significant relationship at the significance level of (0.05) between using the interactive smart boards and motivating the students in their learning at the University

Strongly disagree	Disagree	Agree	Strongly agree	Paragraphs
5	8	67	55	1- I can understand my lessons more better by using the interactive smart boards
5	12	67	51	2- I feel more enjoyment and Motivation towards learning by using interactive smart boards

5	3	66	61	3- By using interactive smart boards during studying would let me behave as a teacher in the classroom
8	12	53	62	4- Using the interactive smart boards Would decrease my absence and increase my attachment to the university
3	4	66	62	5- I would get more and more attachments to my studying if there are more teachers using the interactive smart boards
9	3	52	71	6- The interactive smart boards represent a successful alternative to the textbook and the traditional blackboard while studying
10	6	56	63	7- Using the interactive smart boards would help me in putting the effort and perseverance in learning
6	5	58	66	8- using the interactive smart boards Would achieve a great success and engaging in more activities
7	4	58	66	9- Using the interactive smart board Help in getting more job opportunities
9	5	49	72	10- So many students find that they are facing many difficulties in using interactive smart boards during their discussion with their teachers

H1.C: This is no statistically significant relationship at the significance level of (0.05) between using the interactive smart boards and the students' attitudes towards developing their knowledge and acquiring scientific skills.

Strongly disagree	Disagree	Agree	Strongly agree	Paragraphs
2	4	72	57	1- Using the interactive smart boards would motivate the students towards the creativity and scientific innovation
8	9	65	53	2- Using the interactive smart boards would motivate Students to increase their academic achievements and dealing with the scientific and technological updates
8	5	68	54	3- Using the interactive smart boards helps the students in understanding the factors which affect their desire and willingness to participate in educational process
7	6	64	58	4- Using the interactive smart boards make way for students to understand the modern technologies as well as using them and following up their developments

8	8	46	73	5- Using the interactive smart boards would increase the students' participating the educating process with creating new methods of the scientific understanding
4	7	65	59	6- I see that using interactive smart boards needs for a long time comparing to regular blackboard
6	5	72	52	7- Using the interactive smart boards enhances the interaction between the lecturer and the students
4	5	63	63	8- Using the interactive smart boards motivates the students to make an effort and Persevere In learning with achieving the desire for success and excellence and engaging in educational activities
7	5	56	67	9- Using the interactive smart boards allows making a scale to measure the extent of students' interesting in the educational contents and their contributing in the study
8	10	61	56	10- Using the interactive smart boards provides more opportunities for students to learn new things and modern innovations

H2: There are many difficulties and challenges that stand as an obstacle to the application of interactive Smart boards at the University.

Strongly disagree	Disagree	Agree	Strongly agree	Paragraphs
10	8	54	63	There's no any policy of developing training programs for lecturers about the best practices of using interactive smart boards at the University.
10	4	58	63	There are many difficulties in using (my view boards) for keeping the books and files at the University.
6	5	59	65	Using the interactive smart boards never achieve any positive impact upon improving the students' understanding a complicated technological concepts at the University.
2	4	62	67	The technology of interactive smart boards is still falling short of achieving the quality of educational outcomes of students and teachers at the University.
3	2	62	68	There is no any plan for developing the strategies of teaching and increasing the activity of educating it through the interactive smart boards At the University.
8	11	66	50	The teachers are still using their blackboards with the books in explaining the educational content at the University.

9	7	58	61	There is no any strong interaction by students with interactive smart boards during the lecture by the teachers at the University
5	8	57	65	There are many difficulties in using the interactive smart boards of (my view board) by the students and their studies to reach the needed educational content
6	5	64	60	There is a weakness and disability of students in using interactive smart boards to improve the cooperation among themselves and the hard activities at the University.
3	3	65	64	The impact of interactive smart boards is still limited in improving the quality of educational outcomes of the students at the University.
10	8	53	64	There is no extra vision to increase the role of interactive smart boards to be an essential part of education as the University.
