THE EFFECTS OF USING LUMIO SMARTBOARD ON LEARNER ENGAGEMENT IN LEARNING VOCABULARY FOR 10TH GRADERS AT A HIGH SCHOOL IN HANOI

ẢNH HƯỞNG CỦA VIỆC SỬ DỤNG LUMIO TRÊN BẢNG TƯƠNG TÁC ĐỐI VỚI MỨC ĐỘ THAM GIA HỌC TẬP CỦA HỌC SINH TRONG VIỆC HỌC TỪ VỰNG CHO HỌC SINH LỚP 10 TẠI MỘT TRƯỜNG TRUNG HỌC PHỔ THÔNG Ở HÀ NỘI

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ABSTRACT

The paper reports how Lumio affects English vocabulary learning outcomes for 58 10th-grade students at a high school in Hanoi. The objective of the study is to examine how Lumio on interactive smart boards impacts student participation during vocabulary learning activities. Data were primarily collected through pre-tests and post-tests, supplemented by survey and interview data for quantitative and qualitative assessment. The research reveals that students who used Lumio on Smartboards achieved better vocabulary test results and showed more engaged participation in classroom activities compared to students who received traditional teaching methods. Students expressed through surveys and interviews that Lumio's interactive elements helped them stay focused and actively participate in classroom activities. The research findings support the adoption of Lumio as an educational resource to enhance English vocabulary learning while offering teachers an effective teaching resource that suits modern high school students' needs.

***Keywords*:** *Lumio, Smartboard, learner engagement, vocabulary learning, English teaching.*

TÓM TẮT

Bài báo nghiên cứu về sự ảnh hưởng của việc sử dụng Lumio trên bảng tương tác đối với kết quả học từ vựng Tiếng Anh của 58 học sinh lớp 10 tại một trường trung học phổ thông ở Hà Nội. Mục tiêu của nghiên cứu là xem xét cách sử dụng Lumio trên bảng tương tác thông minh tác động như thế nào đến mức độ tham gia của học sinh trong hoạt động học từ vựng. Dữ liệu được thu thập chủ yếu thông qua bài kiểm tra đầu vào và đầu ra, kết hợp với dữ liệu khảo sát và phỏng vấn nhằm phục vụ phân tích định lượng và định tính. Kết quả cho thấy, học sinh sử dụng Lumio trên bảng tương tác đạt điểm kiểm tra về từ vựng tốt hơn và tham gia tích cực hơn trong các hoạt động so với những học sinh được dạy theo phương pháp truyền thống. Qua khảo sát và phỏng vấn, học sinh cho rằng các yếu tố tương tác của Lumio giúp các em tập trung hơn và chủ động tham gia vào các hoạt động trên lớp. Những kết quả này ủng hộ việc áp dụng Lumio như một công cụ giáo dục nhằm nâng cao việc học từ vựng tiếng Anh, đồng thời cung cấp cho giáo viên một tài nguyên giảng dạy hiệu quả, phù hợp với nhu cầu của học sinh hiện tại.

Từ khóa: *Lumio, bảng tương tác thông minh, mức độ tham gia của người học, học từ vựng, giảng dạy tiếng Anh.*

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1. INTRODUCTION

In the field of English language teaching, vocabulary mastery is a significant phase to improve language skills [1, 2]. Because vocabulary knowledge serves as the foundation for developing other language skills, educators have increasingly sought innovative tools to

enhance learners' motivation and active participation in vocabulary lessons.

In recent years, various technological innovations have been designed to help students enhance their engagement in learning vocabulary [3-5]. One of the most popular technologies that has many benefits is the Interactive White Board - IWB [6]. The IWB is a giant sensitive board that is connected to a computer and digital projector, which reflects the computer's image onto a big touchable computer screen controlled by an electronic pen or finger [7]. The Interactive White Board is recognized for its potential to make material presentation more engaging and interactive, assisting learners in acquiring knowledge more quickly and effectively [8].

Students can enhance their vocabulary through various learning approaches like game-based activities that promote active participation in vocabulary lessons [3]. Games bring multiple benefits to both language teachers and their students. They support learning the target language when students are involved in games and have fun without noticing their progress. Another advantage of using games in a foreign language setting is to make the stressful moment go away. In a language learning atmosphere, a stress-free environment must be provided [9].

Arzfi and Montessori [10] suggest that Lumio by Smart is an innovative and collaborative digital learning platform designed for teachers and students to interact and collaborate on learning wherever they are. Educators can apply Lumio on Smartboard, which integrates several modern teaching support activities such as "Shout It Out!", mind maps, matching games, fill-in-the-blank, and many others. However, while the use of Lumio on smartboards has become more common in classrooms, research specifically investigating their impact on learner engagement in high school vocabulary learning remains limited. While vocabulary is a fundamental element of English comprehension and communication, students often experience with low engagement when learning new words, particularly in technology-enhanced or online English lessons [3]. As a result, Lumio on Smartboard plays a significant role in making vocabulary lessons more engaging for students.

However, despite the growing adoption of Lumio on Smartboards in classrooms, there is a distinct gap in the current literature regarding the specific impact of this tool on high school students' engagement in vocabulary acquisition. This becomes a challenge, especially in high schools in Hanoi, which are still at the development stage in terms of adopting technologies in learning, and less research has been done with regard to the use of smartboards for language learning. This study, therefore, closes this gap by investigating the differential impact of Lumio Smartboards on learner engagement among 10th-grade learners, especially through learning the target vocabulary items.

The primary aim of this study is to investigate the impact of using Lumio on interactive smart boards on learner engagement in learning vocabulary. To achieve this aim, the research will address the following research questions:

RQ1. How does Lumio on IWB affect 10th-grade learners at Nguyen Hue High School on learning English vocabulary?

RQ2. What are the differences in learner engagement levels between classrooms using Lumio Smartboard and those using traditional methods?

2. LITERATURE REVIEW

2.1. Learner engagement

Research about learner engagement in the educational field has continued to receive ongoing attention throughout the last few years. The field of engagement research started by studying classroom behaviors - such as attendance, task completion, and participation but now focuses on psychological states, complex interactions, and social elements which affect student learning experiences [11]. Kahu [11] stresses that psychological engagement through intrinsic motivation and interest and strategic learning task investment defines student engagement because it goes beyond their actions to include their mental and emotional states. Fredricks et al. developed a model that established three fundamental dimensions of engagement, which include behavioral, emotional, and cognitive aspects [12]. Students demonstrate their behavioral engagement through their classroom activities, which include their level of attention and effort, and their ability to persist and actively participate in discussions while following classroom rules. Students express their emotional responses to classroom settings through their interest levels and their feelings about teacher-student and peer relationships. The most elusive aspect of learning engagement involves students' deep investment in processing and applying new information through self-

regulation and strategic learning, and challenging content acceptance [12, 13]. Research indicates that students need to show high emotional and cognitive engagement to learn vocabulary effectively at a deep level, which lasts over time [14].

Despite its importance, the assessment of student engagement faces significant obstacles because of its complexity. Behavioral engagement remains preferred because it is easy to measure and observe, typically involving actions such as attendance and participation [15, 16]. However, emotional and cognitive engagement requires more subjective assessment methods, including surveys, interviews, and journals, in order to fully capture students' feelings, motivation, and depth of learning strategies [16, 17]. Notably, students who learn with interactive technology may show different patterns of enthusiasm and persistence than those who learn in traditional classrooms and contextual settings, and with technological tools. The implementation of technology-based learning platforms with interactive tools leads to changes in student engagement, which demand fresh assessment techniques to identify and understand these modifications [17, 18].

Therefore, this research focuses on behavioral engagement because it allows for structured observation and effective comparison between Smartboard-based vocabulary lessons. The research method delivers valuable and measurable results, but scientists recognize that emotional and cognitive elements need investigation for a complete student engagement assessment. The research applies theoretical principles to technology-based classrooms to understand how Smartboards enhance vocabulary learning through interactive methods for Hanoi high school students.

2.2. Technology/ ICT in language teaching and learning

Information and Communication Technology (ICT) covers a wide variety of tools and resources, including computers, mobile phones, the internet, projectors, apps, and interactive boards, that help people send, receive, store, and use information in different ways. According to The UNESCO Institute for Statistics [19], ICT is "a diverse set of technological tools and resources used to transmit, store, create, share or exchange information" (p.120). This broad definition highlights ICT's essential role in almost every aspect of modern life, including education.

In education, ICT does not only mean having computers in the classroom. It includes learning platforms and online resources, using emails or video conferencing for communication, creating lessons with PowerPoint or Prezi, and even language learning apps on students' smartphones [20]. The World Bank further points out that ICT in schools involves empowering teachers and learners, promoting student-centered learning, and supporting the development of 21st-century skills such as creativity, problem-solving, and communication [21].

One of the biggest advantages of ICT is that it creates many new ways for students to learn languages [22]. Students can listen to real-life conversations, watch English videos, or practice pronunciation with speech software. Interactive tools such as Smartboards or language-learning apps offer games and quizzes that help with repetition in a fun way. When students write in online forums or record themselves speaking, they get more authentic practice and can receive feedback from teachers or even classmates instantly.

Research shows that students are more engaged and motivated when lessons use a mix of technology [23, 24]. For example, interactive boards help teachers present new words using pictures, sounds, and movement, which helps students remember them better [25]. Digital classrooms also help shy students participate, since they can join discussions online when they might feel nervous doing so in person.

Technology also makes learning more flexible [26]. With mobile devices and the Internet, students can study anytime and anywhere, not just during school hours. This helps students review lessons at their own pace, try extra practice, or catch up if they miss class.

For the purposes of this research, the definition of ICTs that will be followed is the one proposed by PSP Outsourced IT [20], which considers ICTs as a useful tool for teaching and learning.

The integration of ICT in education has transformed the educational process by introducing new tools and resources that create effective teaching and motivate students. Technology can support language acquisition by providing learners with new methods of experiencing interactivity and immersion, which is part of the essential development of language skills.

2.3. Lumio on Smartboards used in education

Interactive White Board (IWB)

Interactive White Boards (IWBs) were originally created for business settings, but have now become a

popular and permanent feature in many schools and universities, especially in language classrooms [27]. The electronic whiteboard operates under the names of digital whiteboard or electronic whiteboard. The IWB system consists of a large touch-sensitive screen that connects to a computer and projector system to display computer content on the board through finger or pen touch commands [28].

This technology brings together many older classroom tools such as chalkboards, basic whiteboards, TVs, overhead projectors, CD players, and personal computers into a single device [29]. One of the most remarkable features of IWB system is that it allows teachers to access multimedia materials immediately during any lesson and use a combination of text with pictures, videos, audios, sites, schemes, and group games [30]. The IWB system allows physical operations of the surface by direct touch commands, where object movement, annotation, typing, highlighting, and games are all included [31].

Research studies have demonstrated that IWBs create an optimal learning environment that boosts student motivation, involvement, and maintains their focus [31, 32]. Teachers use IWBs to enhance classroom management because these tools enable them to keep students interested and engaged while delivering teacher-led instruction [28, 33]. IWBs can also help teachers feel more confident and less stressed, since much of the material can be prepared in advance and delivered more smoothly [34].

Students have a higher interest in IWB-based interactive lessons compared to traditional blackboard and whiteboard teaching methods. They show higher levels of participation through their physical involvement by moving words or images around, taking part in interactive quizzes, and solving problems on the board [28, 31, 35]. The research by Karsenti [32] found that IWBs enhance student focus and motivation while promoting active participation during multimedia-based activities, including video, games, and class discussions.

IWB systems enable teachers to support different learning approaches through their educational content. The visual learning style benefits from IWBs through their animated graphics and colorful content, which make lessons memorable. Teachers can also use recordings and sound effects to support auditory learning, while kinesthetic learners benefit from hands-on activities at the board [36, 37]. The different learning options available on IWBs, according to Coyle et al. [38] help students absorb information better and understand lessons more deeply.

In the context of language teaching, IWBs make it easy to integrate vocabulary, grammar, listening, and speaking with appealing digital content. Teachers use IWBs to show new words through images and audio while creating interactive stories and providing immediate feedback, and using games for spelling, sentence building, and meaning practice. Bidaki and Mobasheri in their research in 2013 suppose that IWBs create a more enjoyable, motivating environment for language learners, leading to better engagement and more successful learning experiences [34].

According to Beeland [39] and Duran [40], when foreign language classes incorporate IWB technology, students develop better focus and mutual support for learning. The technology enables students to work in groups on the board while responding to questions as a team. Interactive white boards in language classrooms offer teachers and students advanced educational tools that create better learning experiences through enhanced student participation and enjoyment. The combination of multimedia resources, interactive games, and flexible content access on IWBs makes vocabulary and grammar learning both enjoyable and memorable while promoting student participation from all classes.

Lumio on Smartboards

The educational platform Lumio from SMART Technologies enables interactive learning through its digital features, which work best with Smartboard technology in educational environments. The software exists as both a website application and Smartboard integration, which helps teachers develop interactive educational content through dynamic activities and collaborative workspaces. The platform provides teachers with access to thousands of pre-made templates, games, and lesson activities such as Monster Quiz, Word Search, and Speedup, which allows them to create engaging vocabulary lessons and general learning content that motivates student participation [41]. Teachers can also create new activities or import existing materials like PowerPoint slides or PDFs quickly and add interactive multimedia elements. The platform allows teachers to use activities for immediate classroom work or assign them as homework, which supports students in practicing their vocabulary throughout the day.

Previous studies on IWB and technology integration supposed that those technology has a positive impact on student engagement, motivation, and outcomes [22, 27, 32]. Building on these findings, Lumio on Smart can be considered as a promising tool in modern classrooms to support both teachers and students [41]. The Universal Design for Learning principles in Lumio help teachers create inclusive learning spaces through diverse content interaction methods [41]. The built-in assessment features and dashboards in Lumio provide teachers with immediate access to student performance data for individualized support and feedback delivery [41]. Research studies demonstrate that students participate more actively when using interactive learning platforms such as Lumio, which work with interactive whiteboards for language and vocabulary education [42, 43]. By making lessons more interactive, varied, and student-centered, Lumio shifts classroom dynamics away from rote memorization and toward enriched, technology-driven engagement and retention.

Overall, the literature suggests that Lumio on Smartboard functions as a leading tool in modern classrooms by successfully blending multimedia presentation with high-level interactivity and gamification. This combination is effective in creating a more student-centered learning environment, which is vital for maximizing behavioral engagement and improving the successful acquisition of vocabulary.

3. METHODOLOGY

Participants

The research involved 58 students who attended two English classes, 10A9 and 10A10 at a Hanoi high school in the first semester of the 2025 - 2026 school year. Among these participants, there were 27 male students and 31 female students. The age of the participants averaged at sixteen, which is typical for grade-10 students in Vietnamese context. The two classes maintained the same English language skills at the A2 proficiency level at the beginning of the study. They used the same English textbook which is Global Success 10 from Vietnam Education Publishing House, and English lessons were given to them with five periods each week. According to curriculum and expected learning outcomes, students have to reach B1 level after three years in high school (grading 12). Moreover, both classes learnt English vocabulary in traditional methods and they have never approached Lumio on Smartboard in learning vocabulary before.

Research Method

The research design used quasi-experimental methods to study how Lumio Smartboards affect student engagement during English vocabulary learning. The experimental group received vocabulary lessons through Lumio on Smartboards, but the control group received traditional teaching methods.

The participants completed a vocabulary assessment before starting the study. The experimental group was taught vocabulary using Lumio on Smartboards in every lesson after the test, and the control group was taught vocabulary using traditional methods. After 8 weeks, both groups underwent a post-test to measure changes in their vocabulary levels. The comparison of results between the experimental and control groups was possible thanks to the pre-test and post-test design.

To determine the learner engagement while using Smart Lumio Board, a survey questionnaire was delivered after the experiment to measure the students' behavioral engagement during their vocabulary lessons in terms of students' concentration, active participations, their interest in the lessons, and their willingness in task completions. In addition, the interview data was conducted to capture the students' feeling and experience with Lumio application.

Data collection tools

The primary data collection tools for this research included pre- and post-tests, Google Forms surveys and interviews.

Pre-tests and Post-tests: These tests were adapted versions of a standard vocabulary test from Cambridge A2-level. Each test consists of 25 multiple-choice questions designed to assess learners' vocabulary knowledge. The test was administered within a 30-minute time limit. The content of the test was designed to focus on multiple aspects of learners' vocabulary knowledge, including word meaning (6 items), usage (9 items), synonyms/ antonyms (4 items), and context application (6 items). Each correct answer was 0.4 points, giving a maximum score of 10, and the same scoring rubric, test format, as well as content coverage were used for both tests. The tests were administered under similar classroom conditions. During the test, students completed the tests individually without using any reference materials. The tests were conducted in the same classroom setting and invigilated by the English teacher to maintain testing conditions, and another

teacher was asked to check test scores independently for minimal biasedness and consistency in marking.

Google Forms surveys: a questionnaire was applied through Google forms to collect quantitative data on students' behavioral engagement in vocabulary learning when using Lumio on Smartboards. Google forms surveys included 22 Likert-scale using a five-point scale ranging from strongly disagree to strongly agree. All questions were divided in to four main aspects: students' concentration, active participation, interest, and willingness in task completions.

Interviews: Besides quantitative data, semi-structured interviews with five students from the experimental group were also collected. Each interview lasted about 3 - 5 minutes and was conducted after the eight-week intervention. All questions were classified into three dimensions, including participation, persistence when facing difficulties, and the level of effectiveness during the learning process. All interviews were conducted in Vietnamese to ensure that students could express their thoughts clearly and comfortably. Answers of all participants were audio-recorded, then the recordings were transcribed and translated into English for analysis. To ensure that the data was credible, the transcription was compared with the recordings before proceeding with coding.

Research process

The research was carried out in 8 weeks and consisted of 6 steps.

Step 1: Preparation of research materials (Beginning of Week 1)

The research materials were prepared by developing the pre-test and post-test assessments based on a Cambridge A2-level vocabulary test, a Google Forms survey, and semi-structured interview questions.

Step 2: Participant selection and research design (Week 1)

Participants were selected through identifying two English classes at the same level at high school in Hanoi and obtaining voluntary participation from interested students. 10A9 was assigned as the experimental group and 10A10 served as the control group. A quasi-experimental design and non-random allocation of the participants were selected based on existing timetable. The use of intact classrooms helped maintain normal classroom conditions and ensured the ecological validity of the study.

Step 3: Pre-test assessment (Beginning of Week 3)

The pre-test was administered to evaluate the vocabulary levels of both the experimental and control groups under the same conditions and at the same time. During the test, students did the test individually without any reference materials, and testing environments were applied to both groups to ensure comparability of vocabulary levels.

Step 4: Using Lumio on Smartboards (Weeks 3 - 7)

From week 3 to week 7, the researcher conducted the Lumio Smartboards with the experimental group, while the control group continued with traditional methods. The intervention lasted five weeks and was integrated into every English lessons. Both groups received the same content of vocabulary items from the same textbook and taught by the same teacher. The mode of vocabulary presentation and practice was different between two groups, with Lumio-based interactive activities applied in the experimental group only.

Step 5: Post-test assessment (End of Week 7)

The post-test was conducted to measure changes in vocabulary levels for both the experimental and control groups immediately at the end of Week 7. The post-test was equivalent in format, content, coverage, difficulty level, and scoring rubric to the pre-test.

Step 6: Data collection (Week 8)

Following the post-test, the experimental group completed the Google Forms survey, and five students were invited for semi-structured interviews. All data were collected, organized, and stored securely for further analysis.

4. RESULTS AND DISCUSSION

4.1. The effectiveness of using Lumio on Smartboards for learning English vocabulary

Table 1. Comparison of Students' Pre- and Post-test Results

Gain (Pre-test & Post-test)	Control Group		Experimental Group	
	Number of students	Percentage (%)	Number of students	Percentage (%)
Gain < 0	17	56.6	7	25
0 < = Gain <1	9	30	13	46.4
1<= Gain < 2	3	10	7	25
Gain >= 2	1	3.4	1	3.6
Total	30	100	28	100

The data in Table 1 describe how the control group performed differently from the experimental group. The

control group showed more than half of its students either no improvement or a slight score reduction. In contrast, only one-fourth of the students from the experimental group maintained their current level. The experimental students outperformed the control students because 25% of them achieved score gains between 1 and 2 points, whereas only 10% of the control group students reached this level. Moreover, the number of students who gained 2 points or more remained equal between the two groups.

Table 2. A Comparison of Students' Pre-test and Post-test Average Scores

Group	Average Score (Pre-test)	Average Score (Post-test)
Control Group	5.99	6.0
Experimental Group	6.01	6.66

The findings of Table 2 indicate the performance of the students during the pre-test and the post-test. The test results reveal that students from different groups achieved different levels of learning success. The control group, which applied traditional teaching methods, showed a small increase in their average score, 5.99 at the pre-test, and 6.01 at the post-test. The minor variation in the performance of the students implies that conventional teaching methodology did not increase the performance of the students, but did not improve their vocabulary skills within the time span of the research.

The experimental group, who were given Lumio instruction, on the other hand, improved their learning outcomes significantly. The average of this group went up by an average of 6.0 to 6.66, thus a 0.66 point increase was achieved. This group achieved outstanding gains in the mean test scores due to the integration of Smartboard with Lumio, which offered effective learning on vocabulary.

The results of the research conducted in this study were similar to those of [44] Hoa and Trang (2020), as students in this study exhibited the same pattern of vocabulary development. Although the control group test scores in the two studies reflected the same result of little improvement, the experimental groups that applied interactive technology platforms showed higher vocabulary performance gain. These results underline that interactive tools may assist students in improving their vocabulary in comparison with traditional ones.

4.2. Students' Engagement on Using Lumio on Smartboards for English Vocabulary Learning

The 22 questionnaire items were grouped into four dimensions of behavioral engagement and presented in a sequential way to clarify them. Specifically, students' concentration was measured by items 1-4, and 21, their active participation by items 5-9, and 16-18, their interests within the lessons by items by 12, 15, and 22, and their willingness in task completion by items 10, 11, 13, 14, 19, and 20.

Table 3 showed the results that Lumio seemed to help students pay attention better (Mean = 3.86, SD = 0.87). Notably, students could avoid accessing unhelpful online pages (Mean = 4.04) and distractions from external factors also dropped (Mean = 3.71). In particular, when compared to traditional methods, students showed a high level of agreement (Mean = 4.0, SD=0.77) that Lumio helped them maintain focus in vocabulary learning. These figures demonstrate that Lumio's interactive learning environment has created a strong appeal. This finding is supported by the research

Table 3. Students' Concentration in Vocabulary Learning

Items	Students' responses					Mean	SD
	1	2	3	4	5		
1. I pay attention to the interactive board screen when the teacher uses Lumio.	2 (7.1%)	1 (3.6%)	4 (14.3%)	18 (64.3%)	3 (10.7%)	3.68	0.98
2. I do not get distracted (talking or looking elsewhere) during Lumio lessons.	0 (0%)	4 (14.3%)	5 (17.9%)	14 (50%)	5 (17.9%)	3.71	0.94
3. I carefully observe the vocabulary, images, and examples displayed on Lumio.	0 (0%)	2 (7.1%)	4 (14.3%)	17 (60.7%)	5 (17.9%)	3.89	0.79
4. I feel more focused when learning vocabulary with Lumio than with the traditional board.	0 (0%)	1 (3.6%)	5 (17.9%)	15 (53.6%)	7 (25%)	4	0.77
21. I do not open other pages or do unrelated things while using Lumio.	0 (0%)	1 (3.6%)	6 (21.4%)	12 (42.9%)	9 (32.1%)	4.04	0.84
All						**3.86**	**0.87**

Note for students' responses: 1 means "Strongly disagree", 2 means "Disagree", 3 means "Neutral", 4 means "Agree", and 5 means "Strong agree"

Table 4. Active Participation in Lumio-based Activities

Items	Students' responses					Mean	SD
	1	2	3	4	5		
5. I actively click or answer questions directly on Lumio when asked.	0 (0%)	2 (7.1%)	4 (14.3%)	18 (64.3%)	4 (14.3%)	3.86	0.76
6. I actively participate in vocabulary games or exercises on Lumio.	0 (0%)	1 (3.7%)	4 (14.8%)	14 (51.9%)	8 (29.6%)	4.07	0.78
7. I enjoy going to the board to interact with Lumio (choose answers, drag-and-drop, matching, etc.).	0 (0%)	0 (0%)	6 (21.4%)	18 (64.3%)	4 (14.3%)	3.61	1.03
8. I answer vocabulary questions on Lumio even when I am not very sure.	0 (0%)	0 (0%)	8 (28.6%)	15 (53.6%)	5 (17.9%)	3.93	0.6
9. I take part in group activities using Lumio without needing reminders.	0 (0%)	1 (3.7%)	4 (14.8%)	14 (51.9%)	8 (29.6%)	4	0.82
16. I cooperate well with classmates when doing vocabulary exercises on Lumio (e.g., answering or discussing together).	0 (0%)	0 (0%)	6 (21.4%)	18 (64.3%)	4 (14.3%)	3.89	0.69
17. I share ideas or vocabulary suggestions with my groupmates when using Lumio.	0 (0%)	0 (0%)	8 (28.6%)	15 (53.6%)	5 (17.9%)	3.93	0.86
18. I help my classmates understand how to use Lumio when they have difficulties.	0 (0%)	1 (3.7%)	4 (14.8%)	14 (51.9%)	8 (29.6%)	3.89	0.92
All						**3.9**	**0.81**

Note for students' responses: 1 means "Strongly disagree", 2 means "Disagree", 3 means "Neutral", 4 means "Agree", and 5 means "Strong agree"

Table 5. Learning Interest in Interactive Vocabulary Tasks

Items	Students' responses					Mean	SD
	1	2	3	4	5		
12. I try to understand new words through examples or games on Lumio.	0 (0%)	3 (10.7%)	5 (17.9%)	12 (42.9%)	8 (28.6%)	3.89	0.96
15. I try to recall the vocabulary that appeared in Lumio activities after the lesson.	0 (0%)	1 (3.6%)	5 (17.9%)	13 (46.4%)	9 (32.1%)	3.86	0.8
22. I feel more responsible for my vocabulary learning when studying with Lumio.	0 (0%)	1 (3.6%)	8 (28.6%)	13 (46.4%)	6 (21.4%)	4.07	0.81
All						**3.94**	**0.86**

Note for students' responses: 1 means "Strongly disagree", 2 means "Disagree", 3 means "Neutral", 4 means "Agree", and 5 means "Strong agree"

results of Choir et al., due to their finding that Lumio significantly enhances student attention during the learning activities [45].

Table 4 revealed results for the aspect of active participation, which showed a high level of student interaction when using Lumio (Mean = 3.9, SD = 0.81). The biggest highlight was the enthusiasm for participating in games and vocabulary exercises (Mean = 4/07, SD = 0.78), along with a high level of self-motivation in group activities without needing teacher prompting (Mean = 4.0, SD = 0.82). Moreover, 78.6% of participants shared answers freely even when unsure (Mean = 3.93, SD = 0.6). Learners also showed strong engagement be teaming up and helping others when using Lumio (Mean = 3.89). These figures confirm that Lumio is not only a teaching aid but also a key factor in encouraging students to participate more actively and confidently in their lessons.

As shown in Table 5, the results in terms of interest revealed an overall positive level, with a mean score of 3.94 (SD = 0.86). When learning with Lumio, learners showed clear responsibility toward learning words, marking the highest mean score within this dimension (Mean = 4.07, SD = 0.81). Furthermore, games used in the tool expressed students' interest because they could make active efforts to understand new vocabulary

Table 6. Willingness to Complete Assigned Learning Tasks

Items	Students' responses					Mean	SD
	1	2	3	4	5		
10. I try to complete all vocabulary tasks on Lumio even if they are difficult.	1 (3.6%)	1 (3.6%)	8 (28.6%)	12 (42.9%)	6 (21.4%)	3.75	0.97
11. When I make mistakes in a Lumio exercise, I try again to correct them.	0 (0%)	4 (14.3%)	6 (21.4%)	14 (50%)	4 (14.3%)	3.82	0.9
13. I try different ways to find the correct answer when learning with Lumio.	0 (0%)	1 (3.6%)	3 (10.7%)	18 (64.3%)	6 (21.4%)	3.64	0.91
14. I do not give up when facing difficult vocabulary sections on Lumio.	1 (3.6%)	1 (3.6%)	8 (28.6%)	12 (42.9%)	6 (21.4%)	3.93	0.77
19. I complete all assigned learning tasks during Lumio-based lessons.	0 (0%)	4 (14.3%)	6 (21.4%)	14 (50%)	4 (14.3%)	4.04	0.69
20. I follow the teacher's instructions carefully when using Lumio.	0 (0%)	1 (3.6%)	3 (10.7%)	18 (64.3%)	6 (21.4%)	3.93	0.9
All	**1 (3.6%)**	**1 (3.6%)**	**8 (28.6%)**	**12 (42.9%)**	**6 (21.4%)**	**3.85**	**0.86**

Note for students' responses: 1 means "Strongly disagree", 2 means "Disagree", 3 means "Neutral", 4 means "Agree", and 5 means "Strong agree"

through games (Mean = 3.89). Then, after the lesson, they continued keeping effort to practice vocabulary that appeared in Lumio activities (Mean = 3.86). These findings indicate that Lumio not only generates momentary interest but also fosters a more autonomous and sustained learning attitude among students. As indicated in the research conducted by Le & Nguyen, Lumio can be viewed as an effective learning tool for students who prefer physical classroom participation instead of text-based learning [46].

In terms of willingness in task completion, Table 6 showed clear intent to engage fully with class activities. (Mean = 3.85, SD = 0.86). 85.7% tried to finish every assigned task set by Lumio without delay (Mean = 4.04, SD = 0.69). Even when facing difficulties in vocabulary exercises, 75% of students stated that they did not give up (Mean = 3.93, SD = 0.77) and continued to follow the teacher's instructions closely (Mean = 3.93, SD = 0.9).

Moreover, 71.4% of students attempted to solve difficult tasks and they progressed in a learning cycle through correcting their errors (Mean = 3.82). Although a small number of students still experienced difficulties in completing more complex tasks (Mean = 3.75), the overall data provide evidence that Lumio effectively fostered students' persistence and sense of responsibility toward achieving learning objectives.

In addition, informal interviews with 5 students from the experimental group contribute to the validation of the research findings. The students in the experimental group affirmed that Lumio on Smartboard offered them the positive benefits of learning. They claimed that English vocabulary learning was easier with Lumio, and they were also engaged during the learning process. In particular, S1 explained "*Previously, I usually struggle with memorizing vocabulary, but when using Lumio I can remember new words longer*". S2 and S4 also found that Lumio made their learning vocabulary easier and more lively through visual images and examples. Furthermore, S2 said that "*Lumio helps me learn much faster compared to just taking notes in a notebook*". Moreover, S4 said "*After joining activities on Lumio, I am interested and want to learn more*", while S5 highlighted the combination of learning when playing vocabulary games. The findings of the research are similar to those reported by Osipova and Bagrova [47], who found that Lumio was more effective in terms of vocabulary retention and that students enjoyed using Lumio on Smartboard as a reflection tool. The implementation of Lumio for vocabulary learning produces better results than conventional approaches.

In conclusion, the findings of the surveys, along with the answers provided by students in the interview, prove that Lumio has a positive implication on English vocabulary learning at the high school level. By focusing on four dimensions of engagement, including concentration, active participation, enjoyment, and task persistence in vocabulary learning, Lumio is considered as an engaging learning environment. Moreover, Lumio's features of gamification were very popular among students, as they believed that it was a good tool to initiate and enhance engagement in the learning process, as well as make lessons more exciting and easier to memorize. These outcomes reaffirm that interactive activities and games provide a unique opportunity to memorize English vocabulary quickly, as well as increase the interest of the students studying the English vocabulary [46].

5. CONCLUSION

This study allowed the researcher to examine the impact of the application of Lumio on Smartboard on the engagement of learners during vocabulary learning among 10th graders in a high school in Hanoi. The research focused on two main questions: "How does Lumio on IWB affect 10th-grade learners at Nguyen Hue High School in learning English vocabulary?" and "What are the differences in learner engagement levels between classrooms using Lumio Smartboard and those using traditional methods?". The results related to the first question indicate there is a tremendous positive effect, which implies an increase in the understanding of the vocabulary and a higher retention. Pre-test and post-test results revealed better improvement in the students who studied the English vocabulary using Lumio through Smartboards than students who studied through conventional means. The data collected through the questionnaires as well as interviews were analyzed and indicated positive responses from the students. Lumio helped to create a stronger grasp of the English vocabulary, and at the same time, active and engaged learning was promoted among the students. To sum up, this paper shows that the implementation of Lumio as an instrument in the teaching of English vocabulary can be potentially useful in this particular setting of this high school. The study not only highlights the progress in understanding and memorizing knowledge by the students, but it also highlights the positive attitude of the students towards such an innovative way. Such results lead to the integration of Lumio into learning vocabulary with high schoolers, as it provides teachers with a creative, innovative teaching tool that would better address the needs and preferences of the learners.

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