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EFFECTS OF INTERACTIVE CLASSROOM APPLICATIONS ON THAI AND INTERNATIONAL HIGH SCHOOL STUDENTS' ENGAGEMENT LEVELS

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ABSTRACT

The purpose of this research is to investigate the effectiveness of interactive classroom applications (Quizlet and Kahoot!) on Thai and International high school students' engagement levels in (IGCSE) Business Studies class. The aim is to test students' performance and build a collaborative classroom environment that enhance active learning. This is a mixed method research, collecting and analyzing both quantitative and qualitative data to measure students' cognitive, behavioral and affective engagement levels when using the interactive classroom applications. The study targeted 25 high school students, aged between 15 and 18. The quantitative data was collected using 13 closed-ended questions which was tested for reliability. The qualitative data was obtained from 3 interview questions to gain insights on participants' perceptions. The data was statistically and descriptively analyzed. The results of this study show that there is an increase in students' cognitive, behavioral and affective engagement levels in Business Studies class when using interactive classroom applications. Students also perceive the use of these applications positively and have better learning outcomes. The findings are consistent with previous studies which concludes that students in the digital age are motivated and engaged when using digital devices that they are familiar with in the modern education classroom.

Keywords: *IGCSE, Cognitive Engagement, Handheld Devices, Quizlet, Kahoot!, Technology Integration.*

Introduction

Researchers have claimed that students' participation, cognitive and emotional engagement in instructional activities contribute to their long-term retention of the knowledge and hence their academic achievement (Katharina et al., 2020). However, generating students' engagement in the modern classroom can be challenging within the teaching profession. As the needs of the people are changing, the education system also has to change and this change should be accepted by the people (Anchal, n.d.). Therefore, educators have to accept and understand that new academic discipline has been born. Teaching and learning cannot be done the same way like

It was done in the past but strategies have to be adjusted because students' needs have changed. Things which were once considered luxury has become basic needs now and as these needs grew, education has to grow. In the modern era, where technology is playing a huge role and is undoubtedly changing the face of education, there is a need to shift the pedagogy or the role of teacher in a classroom from traditional style of teaching to the style that best accommodates the interest of the modern generation. However, Mabel et al. (2006) expressed that the willingness to accept and welcome the pedagogical change is a major requirement for a successful technology integration.

Educators must accept that traditional style of teaching methods could be unengaging for this generation of students in the digital age. To involve and engage students of the generation 'z', technology tools have become a seamless part in the teaching and learning process. Using technology in the classroom can help to promote active learning and collaborative environment which leads to pedagogical success (Mabel et., 2006).The information age opens a world of possibilities for educators to demonstrate the value of subjects in a wider life context by connecting student interests to real world

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experiences – creating active learners who see the classroom as a place they want to be (The importance of connecting classrooms to the real world, 2017). Hence, educators must thrive to create a multi-way to transfer the knowledge using different technological tools which creates a fun and engaging learning process.

This paper presents the results of high school students' engagement levels in Business Studies class when interacting with the technology integration. To increase collaboration in the classroom, the researcher integrates a form of technology, termed in this research as 'interactive classroom applications. 'Students access these applications via their mobile phones and other handheld devices. According to the relevant study by Yassine et al., (2019), interactive classroom application (Kahoot!) used in the classroom presented a positive effect on high school students' engagement levels. Students were more focused and were better with retention of knowledge. The interactive classroom applications applied in this study to investigate students' engagement levels are Quizlet and Kahoot! and are expected to produce a positive outcome. A smooth integration of such technology applications in the classroom would be when students have access to technological devices that match the class task at hand, such as their smart phones or other handheld devices. These devices could allow them to build a deeper understanding of the content being taught and enhance a collaborative learning environment (White, 2006). Though there are valid cases to be argued that smart phones are disruptive to learning and should not be allowed in classrooms, they can certainly also become an enriched and useful educational tool and perhaps a powerful class participation tool (Lin et al., 2011). However, when an integration of such devices is required, effective classroom management and proper monitoring of the usage of these devices can support the teaching and learning in modern education.

Problem Statement

The researcher is currently teaching IGCSE Business Studies to Thai and International high school students in Somtawin Witaedsuksa Huaymongkhon School- a private English Program K-12 school in Huahin city, Prachuabkirikhan district in Thailand. The researcher has observed that students' engagement levels in all aspects – cognitive, behavioral and affective are quite low. This also has an impact on their overall grades because students who are disengaged or lacking motivation may hide their learning difficulties and end up performing poorly in exams. In Business Studies class, the researcher usually shares units' slides, assigns case studies, presentations and group activities for students to exchange ideas and extend their knowledge. However, students are still not fully engaged and do not exhibit enough involvement in the teaching and learning process. The researcher feels that these pedagogical activities are not sufficient to enhance the modern generation's engagement levelsin the digital age. Students' lack of involvement could be because they are not extensively challenged and the resources used to support the teaching and learning process may not be of their interest. Since, this generation is technology savvy, integrating diverse forms of technology in the classroom could arouse their participation and involvement.

As technology continues to play an essential part in our world and in our everyday lives, the researcher perceives that this influences how students are expected to be to be taught, too. Many schools currently utilize technology in the classroom such as smart boards and internet or even social media to get students to interact and participate. These digital tools can support the teaching and learning by involving learners to be actively engaged in the learning process in order to gain a deeper and persistent knowledge (Bond, 2019).Therefore, in order to improve students' engagement in Business Studies class, the researcher has implemented the use of interactive classroom applications such as Quizlet and Kahoot! in the teaching and learning process. The researcher has discovered that there are technological applications that canpromote students' performance in Business Studies class such as the online study application (Quizlet), where digital flashcards and educational games are available for them to review terms and definitions and alsoan online real-time quiz (Kahoot!) in a form of gamification that supports formative assessment. By integrating these interactive classroom applications, the researcher expects to provide a thrill from the ordinary, traditional instruction and raise students' participation, motivation and engagement levels in Business Studies class.

Research Objectives

The present research aims at examining the effectiveness of interactive classroom applications on students' engagement levels in Business Studies class; investigating how the interactive classroom applications will have an impact on Thai and international high school students' engagement levels; observing in what direction will students' engagement levels change when interacting with interactive classroom applications and whether or not the changes have any relation with the integration of

interactive classroom applications; and exploring how mobile phones and other handheld devices can be used to support the integration of interactive classroom applications in Business Studies class that contributes to the change in students' engagement levels.

Research Questions

The current paper is guided by the following research questions:

- Why technology integration such as interactive classroom applications will have an impact on students' engagement level in business studies classes?
- What are the methods of integrating interactive classroom applications in business studies classes?
- How is the students' level of classroom engagement when interacting with the integration of interactive classroom applications?

Hypothesis

The researcher hypothesized the following:

H_{01}: Students' cognitive engagement level will not be different from the neutral value when using the interactive classroom applications in Business Studies class.

H_{a1}: Students' cognitive engagement level is positive when using the interactive classroom applications in Business Studies class.

H_{02}: Students' behavioral engagement level will not be different from the neutral value when using the interactive classroom applications in Business Studies class.

H_{a2}: Students' behavioral engagement level is positive when using the interactive classroom applications in Business Studies class.

H_{03}: Students' affective engagement level will not be different from the neutral value when using the interactive classroom applications in Business Studies class.

H_{a3}: Students' affective engagement level is positive when using the interactive classroom applications in Business Studies class.

Research Significance

The findings of this research contribute to the benefit of the students to improve their overall performance in IGCSE Business Studies course and enjoy the new paradigm of teaching and learning. The proposed integration of interactive classroom applications via mobile phones and other handheld devices would provide direction that these technological devices can be used as educational tools to improve students' engagement levels in the classroom and encourage them to competitively interact and participate in class. The interactive classroom applications will help the students to retain meaningful information and exhibit their knowledge in ways that apply critical and analytical thinking. This pedagogy in the classroom would allow students to feel comfortable when interacting online via the use of their mobile phones and other handheld devices. In classroom, when using what feels normal for the students and feels exciting, can benefit the teaching and learning to be much more effective.

Moreover, the survey results are anticipated for educators to create better pedagogical practices by implementing technology as part of teaching and learning tool in the classroom, which are integral to the 21st century education. The findings would further benefit the instructors to enhance the teaching and learning process for IGCSE Business Studies course that is parallel to modern education. This new paradigm of teaching and learning would raise plenty of challenges, ensure accessibility for all students and keep up with the increasingly rapid pace of technological advancement. Furthermore, the survey contributed to the field regarding integration of technology to enhance students' engagement levels in the classroom is also of significance to scholars engaged in the research.

Variables

The purpose of this study is to measure the impact of interactive classroom applications on high school students' engagement levels in Business Studies class.

Independ variable

- Interactive Classroom Applications

Dependent variables

- Students' cognitive engagement level
- Students' behavioral engagement level
- Students' affective engagement level

Literature Review

- **Engagement Theory**

In Melissa and Svenja (2019) study, student engagement is defined as:

The energy and effort that students employ within their learning community, are observable via any number of behavioral, cognitive or affective indicators across a continuum. It is shaped by a range of structural and internal influences, including the complex interplay of relationships, learning activities and the learning environment. The more students are engaged and empowered within their learning community, the more likely they are to channel that energy back into their learning, leading to a range of short and long-term outcomes, that can likewise further fuel engagement.

According to Fredricks, Blumenfeld, and Paris (2004), student engagement is considered as a multidimensional construct that unites three components: cognitive, behavioral and affective. Cognitive engagement involves the effort to comprehend complex ideas and master difficult skills (Fredricks et al., 2004). This is observed through students' level of interest in their educational experiences, including the amount of effort they put in to comprehend and master the material, how they self-regulate themselves and their learning strategies. Behavioral engagement refers to the participation and involvement in academic and social activities. Educators can observe this through meaningful action of students in the classroom and time devoted on task. And the affective or emotional engagement is involved with students' interests and values, their reactions to their teachers and classmates which can be observedvia students' feelings concerning their educational experience towards class contents.

The engagement theory in this research is based on learning in technology-based environments, a new paradigm for teaching and learning in the information age. The role of technology is to facilitate all components of engagement – cognitive, behavioral and affective. Technology chosen would increase the ease of interaction among students and foster creativity, communication and involvement that is needed to nourish the engagement. "Quite simply, student involvement refers to the amount of physical and psychological energy that the student devotes to the academic experience." (Astin, 1984). Therefore, to motivate students in all aspects and make learning effective, students must be meaningfully engaged in learning activities through interaction with others and classroom tasks where technology has a significant role. Educators must be consistent with constructive teaching approaches by incorporating creative and purposeful activities for engaged learning to happen. These activities must appeal to the values and interest needs of the students. For this generation's students to be involved in their learning; the tasks they are performing must be interactive, worthwhile and authentic in order to enhance cognitive, behavioral and affective engagement in the classroom - where technology has what it takes to booststhese engagement levels in the modern classroom.

IGCSE Business Studies

Cambridge's International General Certificate of Secondary Education (IGCSE) is a popular international curriculum which is developed in line with changing needs and is regularly updated and extended. It encourages learner-centered and enquiry-based approaches to learning. The curriculum aims to develop learner's skills in creative thinking, enquiry and problem solving - giving learners the excellent preparation for the next stage of education. So, besides the core curriculum, schools can incorporate the IGCSE curriculum and introduce cross-curricular perspectives. The Cambridge IGCSE is compatible with other curricula and is also internationally relevant and sensitive to different needs and cultures. The Cambridge's Business Studies course for high school aims at developing the learners' understanding of business activities both in public and private sectors. They learn and find out about how business organizations are established and structured, how marketing and production takes place, how they are financed and how their business activities are regulated. The course encourages the learners to apply analytical and evaluation skills to solve business-related case studies. There are many resources and supported materials available both in the 'IGCSE Business Studies Teacher's Book' and the 'Cambridge IGCSE' website.

The Modern Education

In a modern education world, educators are more like facilitators, facilitating a positive approach towards diversity, compassion and responsibility in students in a conceptual and practical way (Olinzock, 2006). The modern education in corporates educational technology to enhance the learning environment where students have an opportunity to connect with the real-world concepts. It is the latest and contemporary version of education that is taught in schools and learning institutions in the 21st century which aims to foster critical thinking, life skills, value education, analytical skills and decision-making skills in students (Modern Education: A Significant Leap Forward, 2021).

The scenario of education now is totally different from what it was in the past. Before, modern education was not considered good and now traditional education is not considered enough. Unlike traditional education which is more of an educator-centric classroom, where students mainly listen to class lectures; modern education involves visualizing, imagining and analyzing skills. Methodologies used in modern education classrooms are more interactive where technology has become a primary source for pedagogical resources. It has profoundly changed the role of educators, learners and the phase of education. Therefore, educators at their best must facilitate the modern generation with the modern technology that will enhance the teaching and learning process of the modern education.

Pedagogy of Technology Integration

Integration is an act of bringing together separate people or things into a single system to have it functioning as one. It can be the connection of data, applications, people, devices, etc. in order to enhance the efficiency of the system and make it more productive. Integration does not only connect but also adds value to the whole system through new functions (Ehrens, 2015).

Technology integration in education is simply defined as technological tools or devices such as computers, mobile phones, tablets, social media platforms, etc. used in teaching and learning to enhance the instruction (Mabel et al., 2006). How technology integration is defined also depends on what kinds of technology are available, how much access does one have and who will be using it. Technology integration is a broad umbrella that covers many varied tools and practices. However, the two basic requirements suggested by Robby (2003) for the adoption of new technology in the classroom are: 1) technology chosen must be pedagogically effective and help students improve; 2) The technology must be available as well as accessible. Therefore, viewing technology integration from a wide perspective, pedagogically, will provide educators with the necessary foundation to implement technology successfully into the classroom. They must ensure that the technology chosen is suitable based on the learning needs of the students and is readily available for tasks at hand. The following is what the National Educational Technology Standards for Students say about technology integration:

"Effective integration of technology is achieved when students are able to select technology tools to help them obtain information in a timely manner, analyze and synthesize the information, and present it professionally. The technology should become an integral part of how the classroom functions - as accessible as all other classroom tools" (NETS-S, 2002).

Moreover, educators must incorporate technological skill and ability to use pedagogical knowledge as a base to guide their use of technology for teaching and learning. They should be able to develop strategies to keep students motivated, use variety of teaching methods and know that all students are different and that they learn at a different pace. It is also important for educators to ensure that students are able to apply and modify the acquired knowledge through technology integration. However, educators must not allow the technology to take the leading role in the classroom. Like Krista (2016) said: “Think pedagogy first, technology second.” The successful technology integration in education would depend on the instructor’s ability to explore the relationship between pedagogy and technology. According to Mabel et al., (2006) study, it involves the ability to select suitable technology for the instruction as well as the ability of instructors to adapt such technology to fit specific learning activities – it should be considered as part of the process of instructional planning.

Interactive Classroom Applications

Research by Carolyn and Julia (2017) claims that educational games are gaining much popularity in the classroom as it increases students’ engagement levels and allows for immediate feedback. However, the use of these tools was often limited within higher education due to doubts regarding the suitability of such activities and the criteria to apply for evaluation. But currently there are some popular eLearning tools that can easily be used to add the ‘oomph’ in traditional classrooms for high schoolers, too. These tools are technology applications that can help arouse students’ engagement and provide meta-cognitive support to higher education classrooms. Therefore, to improve students’ engagement levels in Business Studies class, the researcher has integrated two kinds of interactive classroom applications.

- **Quizlet**

It’s an online study application that allows the learners to study various topics in the application, anywhere, anytime. There are digital flashcards and other interactive study tools and game-mode learning which can help learners review terms and definitions. Students can choose their own study set for the concepts they need to review which can also be downloaded for future use. Basically, it’s a study

aid in an app form that can be accessed via the Quizlet app using mobile phones or other handheld devices or via the web browser. Quizlet's has over 350 million user-generated flashcard sets, 3 billion total study sessions, and more than 50 million active users ("Quizlet", 2021).Unlike traditional flashcards, Quizlet's digital flashcards contain both visual and auditory contents - a great study tool for students to study and retain information. Quizlet allows registered users to create sets of terms and definitions customized for their own needs, for a particular topic. Both students and instructors can register for a free account at www.quizlet.com and though students do not need an account to access to the study sets shared by the instructors, they will need one to construct their own study materials. The application allows for students to recall course materials in variety of ways, which makes them more likely to improve their abilities to analyze complex theories and challenging information. Instructors can easily incorporate this digital application into any style of curriculum in order to enhance modern education in a traditional classroom or any classroom setting to encourage metacognitive learning. "Not only will students enhance their memory and gain a better understanding of the course material, but they also will develop stronger interpersonal relationships with their classmates (Kelly, 2017)."

Figure 1: Quizlet

Figure 2: Kahoot!

- **Kahoot**

Kahoot! (https://getkahoot.com/) is an educational technology used as a game-based, free online learning platform which can be used via computers, tablets and mobile phones anytime, anywhere. The Kahoot! application was designed by Jamie Brooker and Johan Brand in 2015 as a game-based classroom response system that can be played by the whole class in real time ("Kahoot", 2021). Currently, Kahoot! has gained a wide acceptance all over the world with more than 5 billion cumulative users (Hanoa, 2021). The engagement and fun factors of game-based learning have been found to boost learner motivation and sustain retention (Debbita et al., 2018). Kahoot! can be used as a real-time quiz to review students' knowledge as part of formative assessment or used in the classroom as a break from traditional classroom activities. It allows users or educators to self-generate multiple choice questions and many other different question types in minutes by registering a free account at https://create.kahoot.it.Once registered, educators can select the game or quiz type and adapt it to fit their instruction contents or even create their own quiz from scratch. To launch the quiz/game, students can simply access the quiz athttps://kahoot.itor via Kahoot! application and enter the game pin provided on the educator's screen.

Educators can utilize Kahoot!to project quiz questions (as smooth-running slides) to which students respond using their digital devices which can keep them engaged and competitive among their classmates. Carolyn and Julia (2017) found that it was easy for educators to incorporate Kahoot! in the classroom and require no prior training. The music, the color and excitement brought by Kahoot! can

enhance students' focus and excite the normal classroom. Many educators and instructors say that Kahoot! offers a new experience that encourages more focus from the learners. "With Kahoot! people pay more attention to the training, and this is the dream of any trainer!" (Silva, 2019). "Introducing a topic, learning a concept, practicing a skill, or reviewing a lesson while having fun, Kahoot! can do it all!" (Ruffcorn, 2020).

Mobile Phones and Other Handheld Devices

The modern generation is very comfortable with the use of technology, especially with their gadgets like mobile phones, tablets or iPads. These digital devices, particularly smart phones, have become popular with middle and high school students. Examples of the uses of these devices include communication, entertainment, navigation, capturing pictures, and accessing information from the internet. Many researchers have claimed the potential for these devices to foster interactive learning and extend learning opportunities. The mobile infrastructure can be used inside and outside of classrooms, learning everywhere; when walking, in the street, on the bus, in the school, or even on the subway (Lin et al., 2011). Mobile handheld devices may better support student learning than traditional desktop computers because of wireless connectivity, portability and comparative low cost (White, 2006). Mobile technology can inspire and engage students by letting them lead their learning and supporting them in choosing and using the devices they know, love and prefer (Lisa, 2013). However, a successful integration of mobile phones and other handheld devices in the classroom to effectively support the learning process depends on the educator's pedagogical ability to guide and supervise the use of such technology.

There are many schools in the modern education that embrace 'mobile learning' to enhance and extend the teaching and learning experiences. The use of mobile phones, tablets and laptops in classrooms to support the teaching and learning process is emerging because apart from being portable, convenient and accessible, they also allow students to collaborate within their learning environment while permitting educators to come up with innovative learning methods. In the classroom, mobile phones and other handheld devices can be used to connect to the internet, capture pictures of notes and assignments, record audio lectures, create videos and presentations, learn via educational applications, interact and participate in student response system such as the Quizlet and Kahoot! andconnect with other students. The uses of these technological devices can be further extended depending on the educators' pedagogical creativity in order to support the instruction.

These handheld devices are like microcomputers which are ready-at-hand and can enhance the practice of teaching and learning, especially in higher education. Integrating such devices into the classroom, educators can meet the needs of a generation for whom mobile phones are becoming an integral part of their everyday lives. "If we meet children where they are we can leverage their use of mobile devices for powerful learning (Lisa, 2013)." Nevertheless, mobile phones and other handheld devices have induced a change in the classroom from being non-reliance on technology to pedagogy based on technological exploration. These devices can play a large part in 21st century learning and have given opportunities for both educators and students to connect instantaneously from any location. Connecting the use of mobile phones and portable handheld devices to the lesson contents in the classroom can make the learners more engaged in the lesson (Friedel et al., 2013).

Methods

Population

The population for this research is high school students who take IGCSE Business Studies course, which includes both male and female and whose ages are between 15-17 years old.

Sample

The sample or respondents of this research are students from Grade 10 and 11 from Somtawin Witaedsuksa Huaymongkhon School who take IGCSE Business Studies course, which includes both male and female and whose ages are between 15-17 years old. There are total of 25 students. The students are also of multicultural backgrounds – Thais, Americans, Australians, English, Chinese, Germans and Danish.

Proposed Sampling Technique

This research is a mixed-method research, aiming to establish a cause-and-effect relationship between the variables without random sampling. Hence, the sampling technique that has been applied to this research is the purposive sampling which is a type of non-probabilistic sampling where the samples are logically assumed to be representative of the population. There are 25 students from both grades 10 and 11 who take the IGCSE Business Studies and therefore all students were selected as the respondents of this research.

Setting and Procedure

Students' assessment in Business Studies is broken down in the following manner: Exam (30%) and Continuous Assessment (CA, which is 70%) includes participation, attendance quizzes, assignments and other classroom activities. It was observed that students' CA scores were not at a satisfactory level due to students' lack of participation and engagement in the classroom. So, to meet the objectives of the investigation in this study, the researcher decided to incorporate interactive classroom applications in Business Studies course as a strategy to raise students' levels of engagement and to check students' understanding of the material in each unit. The integration of interactive classroom applications took place in Business Studies classes as part of formative assessment to investigate its effects on students' engagement levels. Students were informed a week in advance(after the end of a particular unit) that online assessment will be conducted via the use of their networked handheld devices.

On the assessment day, terms and definitions were reviewed via Quizlet application via sets of Quizlet flashcards that were shared on the tv screen in the classroom. Individual students were selected to read the digital flashcards displayed on the screen. Before flipping over the flashcards, students were encouraged to give the definition of the terms. Students were also recommended to access the Quizlet application outside of class time (and practice via Quizlet games) to have fun and review the terminology required for the quiz.

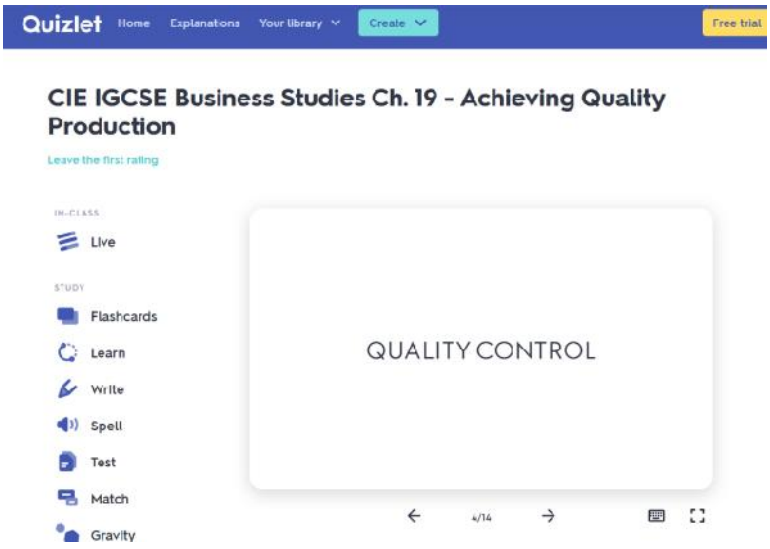

Figure 3: Quizlet Flashcard

Then, to develop collaborative learning and perform formative assessment, students were required to complete the quiz on Kahoot! via their own devices. The game or quiz is in a form of multiple choice and true or false questions. The questions were shared on the tv screen in the classroom and students answered them via their devices by selecting the colored shape that matches their answer choice. Kahoot! features a countdown timer on the screen to keep students on-task, though under pressure, but with a competitive spirit. The type and complexity of questions determine the time limits (set by the Kahoot! quiz creator). In this study, the researcher usually set the time limit between 10-30 seconds for each quiz question.

The Kahoot! quiz is colorful, fast-paced and accompanied by a lively music. Students earn points by answering the quiz questions correctly and quickly. The quiz can be played individually or as a team (as set by the instructor). After students have completed the quiz, Kahoot! will display the podium to reward the top 3 players. The instructor will then get the statistics of students' answers and analyze the results to identify individual student's main strengths and weakness. The report summary in Kahoot! provides a visual overview of analytics. It shows the number of students played, number of difficult questions, marks obtained by each student, how many students haven't completed the game, etc. This allows the instructor to identify knowledge gaps and questions that may need reteaching. The instructor can acquire actionable insights to reinforce students' knowledge and understanding. So overall, the Kahoot! immensely helps to boost students' participation in the classroom and enhance learning in a social and motivating environment

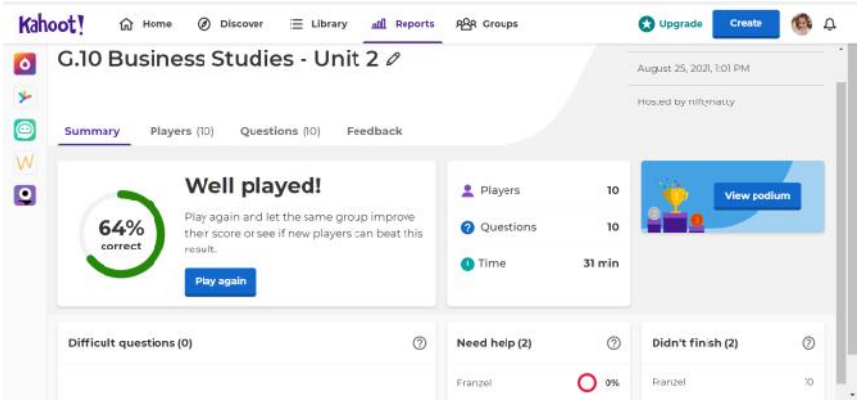

Figure 4: Kahoot! Report Summary

Research Instrument Development

This research employs a mixed method with the inclusion of closed ended questions using a five Likert scale questionnaire and open-ended questions using an interview. The process began with compiling questionnaire items developed from previous researches. Those items were then modified to fit the study purpose, where respondents' feedback on the integration of interactive classroom applications via their mobile phones and other handheld devices will be collected. The Likert Scale questionnaire (employed to measure the dependent variables) is developed and modified from the research: Investigating the Impact of Kahoot! on Students' Engagement, Motivation, and Learning Outcomes: Infrane Directorate as a case study (Yassine et. al., 2019) which was developed based on an inclusive analysis of previous related literature by Carolyn and Julia(2017). The previous study consists of 18 closed-ended questions – categorized into 3 areas: 1). Students' levels of engagement and motivation, 2). Language learning outcomes and 3). Interest in trying ICT in future learning experiences. Some of the questionnaire items from previous research, especially items used for measuring language learning outcomes does not imply to the Business Studies class settings and assessment criteria and therefore has been excluded.

For the study at hand, the researcher's questionnaire consists of 13 closed-ended questions, categorized into 3 areas(see Appendix 1):

- Students' cognitive level of engagement when using interactive classroom applications
- Students' behavioral engagement level when using interactive classroom applications and
- 3]. Students' affective engagement level when using interactive classroom applications.

To check the reliability of the survey, the researcherhas conducted a reliability analysis to measure its internal consistency.

Table 1: The Alpha Reliability Analysis of Scales

Scales	Cronbach's alpha
Cognitive engagement (4 items)	0.679
Behavioral engagement (4 items)	0.761
Affective engagement (5 items)	0.738

Note: The reliability test shows that the set of items in the questionnaire are correlated to each other. Serving as a piece of evidence, research conducted by Ursachi et al. (2013) states that the general excepted rule is that Cronbach's alpha of 0.6-0.7 indicates an acceptable level of reliability.

Also, to collect in-depth data and to further explore respondents' non-verbal cues and behavior, an interview with 3 open-ended questions (see Appendix 2)was conducted to measure the independent variable. One of the interview questions is developed from the study - Using Kahoot! in the Classroom to Create Engagement and Active Learning by Carolyn and Julia (2017). The previous study consists of only 1 open-ended question 'How would you describe your experience using Kahoot! in this course?' This question has been modified and included in the researcher's study. The other 2 open-ended questions included in the study are designed by the researcher to generate an in-depth information during the course of the interview and to collect reliable qualitative data. Experts involved (the researcher's supervisors) were asked to check the effectiveness of the instrument.

Data Collection

Before the data collection process, the researcher requested permission from students' parents or guardians. Permission to conduct survey with students has also been obtained from school administration. The survey link was shared with the respondents or students and was administered via google docs. It employed a self-ministered questionnaire where time was allowed and students' responses were completely anonymous. The researcher was able to see that students have submitted the survey but was not able to identify students' individual responses. Out of 25 students, 24 students submitted the questionnaire survey. Then, upon completion of the Likert scale questionnaire, the researcher appointed the students and administered a face-to-face interview session via video call in messenger application. 16 students took part in the interview, individually. The interview was a flexible, semi-structured interview with 3 open-ended questions asking students to describe their experiences of using interactive classroom applications in business studies class via their mobile phones and other handheld devices.

Proposed Data Analysis

In order to test the research hypothesis, this study employed one sample t-test method to determine the direction of students' engagement levels (on the Likert scale) and test if data is different from the neutral value (3.4). If the value is in the positive scale or higher and the specific mean data is significant, the null hypothesis will be rejected. Study being a mix of quantitative and qualitative research, descriptive analysis of the contents collected from the interview were conducted to observe certain trends and patterns in order to identify the effectiveness of the integration of interactive classroom applications in Business Studies class.

Results and Discussion

- **Quantitative Analysis**

This section discusses the data collected for this research regarding the use of interactive classroom applications such as Quizlet and Kahoot! as motives to increase students' engagement levels in Business Studies class. The collected data using Likert scale questionnaire (from 24 respondents) for this study was analyzed using the Jamovi software. Tables 2-4 will present the results of the questionnaire in three areas, with the overall mean ranked for each item along with their respective standard deviations and the p-value. The results will be presented in the following order:

- Results on students' cognitive engagement level when using interactive classroom applications
- Results on students' behavioral engagement level when using interactive classroom applications
- Results on students' affective engagement level when using interactive classroom applications

Table 2: Results on Students' Cognitive Engagement Level

Survey Items	Mean	SD	P-Value
1. Conceptual understanding	4.50	0.722	<.001
2. Knowledge enrichment	4.29	0.806	<.001
3. Retention of materials	4.21	0.779	<.001
4. Knowledge reinforcement	4.50	0.843	<.001

Note: SD = Standard Deviation; the survey was conducted using the Five Point Likert Scale (5 strongly agree – 1 strongly disagree); 24 respondents participated in the survey; the hypothetical value to compare differences in mean scores is set at 3.4

Results in Table 2 portrays the responses and overview of students' psychological investment toward learning activities when using the interactive classroom applications in the following ways:

- 62.5% of respondents strongly agree that the interactive classroom applications help them with better conceptual understanding of the contents taught in Business Studies class with the mean score of 4.50.
- The mean score for the second item is at 4.29, where 48.8% of respondents strongly agree and 41.7% of them agree that the interactive classroom applications enrich their knowledge in Business Studies.
- 41.7% of them have responded that the interactive classroom applications improve their skills in retaining meaningful materials shared in Business Studies class while 37.5% of them strongly agree to this, for which the total mean score is at 4.21.
- 66.7% of respondents strongly agree that the interactive classroom applications allow them to reinforce their knowledge in Business Studies. The mean score is 4.50.

It can be observed from the results that students' cognitive level of engagement is in the positive direction when using the interactive classroom applications in Business Studies class. The mean score of each item in Table 1 is significantly greater than the predetermined value of 3.4; the standard deviation values show that the data set are close to the mean; and the p-value<.001indicates that the result is statistically significant which indicates strong evidence against the null hypothesis - 'students' cognitive engagement level in business studies course will not be different from the neutral value when using the interactive classroom applications.' Hence, this null hypothesis can be rejected.

Table 3: Results on students' behavioral engagement level

Survey Items	Mean	SD	P-Value
Interact and participate	4.33	1.007	<.001
Stay focused in class activity	4.42	0.881	<.001
Share ideas in class	4.29	0.955	<.001
Increased collaboration	4.21	0.884	<.001

Note: SD = Standard Deviation; The survey was conducted using the Five Point Likert Scale (5 strongly agree – 1 strongly disagree); 24 respondents participated in the survey;the hypothetical value to compare differences in mean scores is set at 3.4

Table 3 reflects students' participation, efforts and performance in class when using the interactive classroom applications in the following ways:

- With a mean score of 4.33 for the first item, 58.3% of students strongly agree that the interactive classroom applications have encouraged them to competitively interact and participate in Business Studies class.
- 58.3% of the respondents strongly agree that the interactive classroom applications have allowed them to stay focused in class activity, having the mean score of 4.42.
- 58.3 % of them also strongly agree that the interactive classroom applications have allowed them to share their ideas in Business Studies class with their classmates and teacher with the mean of 4.29.
- The last item in table 2 has a mean score of 4.21 where 45.8% of respondents strongly agree that the interactive classroom applications have increased the spirit of collaboration among students in Business Studies class.

The result shows that there is an improvement in students' behavioral engagement level in Business Studies class when using the interactive classroom applications. All the item's mean score is higher than the hypothetical value (3.4); the standard deviation values indicate that the concentrated data are not far out from the mean value; and the p-value <.001 shows that the result is statistically significant and hence the null hypothesis – 'students' behavioral engagement level in business studies course will not be different from the neutral value when using the interactive classroom applications' can be rejected.

Table 4: Resuls on Students' Affective Engagement Level

Survey Items	Mean	SD	P-Value
Feel comfortable	4.46	0.658	<.001
Diverse and interesting	4.25	0.737	<.001
Online learning perception	4.13	0.947	0.001
Suitable for the course	4.38	0.770	<.001
Enjoyed using	4.54	0.779	<.001

Note: SD = Standard Deviation; The survey was conducted using the Five Point Likert Scale (5 strongly agree – 1 strongly disagree); 24 respondents participated in the survey; the hypothetical value to compare differences in mean scores is set at 3.4

The results in Table 4 indicate students' feelings, emotions and overall perception toward the interactive classroom applications in following ways:

- Significant number of students, which is 54.2% strongly agree that they feel comfortable when interacting online via interactive classroom applications, with the mean score of 4.46.
- The same number of respondents - 41.7% strongly agree and 41.7% agree to the second item that the contents and online activities shared via interactive classroom applications are diverse and interesting; having the mean score at 4.25.
- 41.7% of students strongly agree and 37.5% of them agree that the interactive classroom applications have positively shaped their perception of online learning for which gives the mean score of 4.13.

- The mean score of 4.38 for the fourth item shows that 50% of students strongly agree that the interactive classroom applications are suitable to use in Business Studies course.
- With the mean score of 4.54 for the last item, 66.7% of respondents have enjoyed using the interactive classroom applications in Business Studies classes.

The result from the questionnaire survey, therefore indicates that there is an increase in students' affective engagement level in Business Studies class when using the interactive classroom applications. The mean scores are higher than the neutral value of 3.4; the standard deviation values show that data points are close to the mean; and the p-value <.001 and 0.001 indicate that the result is statistically significant. Hence the null hypothesis claiming that 'students' affective engagement level in business studies course will not be different from the neutral value when using the interactive classroom applications' can also be rejected.

Qualitative Analysis

The following section presents and analyses the data collected for three-opened questions via interview sessions. Students were asked to share their experiences about the use of interactive classroom applications (Quizlet and Kahoot!) in Business Studies class. The qualitative responses were analyzed using inductive thematic and narrative analysis. The results emerged from summarizing the qualitative data from each of the three open-ended questions will be discusses as well as quoted as follows:

- **Question 1**

Students reiterated that the interactive classroom applications make learning more fun and engaging, catches interest, increases their excitement, especially when competing via Kahoot! game and that they really enjoy doing the quiz via Kahoot! as it is quite entertaining. One said that "how each question in the game is timed, makes me want to compete and win!" Other students mentioned that the applications allow them to participate and interact in class "I get to compete with friends and participate in class" and "there's a lot more interaction between me and my friends and also with the teacher." Few students highlighted that it is good that they get to review the terms via Quizlet before the quiz, which helps keep their memory fresh before practicing and testing their knowledge via Kahoot!

However, a couple of students also brought up a negative experience or limitation to using Kahoot! which was the internet connection. "It kicked me out because I had and unstable internet connection"; "I knew the answer straight away but I had to click the answer many times to select it because of my limited Wi-Fi signal."

- **Question 2**

Students mentioned that they like it because they can play and learn at the same time via interactive classroom applications. "The game helps boost my brain, makes me think quicker and improves my brain activity." Quite a few students said that it's very easy, fun and accessible - "My favorite is Kahoot! I like it because it is very easy to use with our phones, everyone can do and join and it's fun."; "I like the music in Kahoot! It makes me feel excited and I also like that we can change our names on the quiz, it's more fun!" Moreover, students like the interactive classroom applications because they have the opportunity to participate in class and increase their confidence level. "I feel more confident after reviewing from Quizlet application and with Kahoot! I like it because it's an interactive way of learning rather than just having a whiteboard and slides"; "It creates a friendly environment and I can also participate. It can help a shy person like me to also prosper in class"; "I feel very connected with Quizlet. The flashcards on there are very useful for my memory and make me confident to participate in the quiz." Some even said that they like how the Quizlet flashcard is displayed and how Kahoot! reveals the correct answer right after each question. "When I see the term on Quizlet flashcards, before it flips, I try to guess the definition. So, it's a good way to check my knowledge"; "I really like Kahoot! because when you get something wrong, you remember it – why you got it wrong and what's the correct answer." Few others also added that Quizlet is very convenient for them to review the concepts for the quiz and Kahoot! is very challenging because of the timer that puts a pressure, yet fun.

Nevertheless, one student did mention the drawback of Kahoot! "I really like Quizlet but Kahoot! is not my type. The problem is the time limit. I need to take time to read and understand the question but I'm stressed out and can't cope with the running time on screen. But with continuous use, I might get enough practice and be able to challenge myself."

- **Question 3**

"Definitely better!" This is what several students said. "I get to review through Quizlet, keeps my memory fresh and challenge my knowledge through Kahoot!"; "I'm definitely better. Quizlet is the best way to jump start the mind and helps me remember everything. And Kahoot! makes class fun so I learn better." Students are also more confident and interactive in class. "I know I'm better because I'm more confident in class and when I see good results on the screen, I just love it!"; "I'm sure I got better because I can remember more concepts much easier. I get to look at words on the Quizlet flashcards for few seconds – get to think about it first and then see the definition and that's when I realize I know more now." One also compared learning via Quizlet to learning from the book. "I'm better because it makes me learn in a better way. When using only books to review, you have to summarize the main points yourself but with Quizlet, the summary is there. And Kahoot! gives me a chance to practice and by practicing more, I'm better." One student also shared that with the short attention span, interactive classroom applications could grab focus and attention in a fun way until the end of class. Thus, making the student better and excel in class.

There were a few who highlighted that they're not sure if the interactive classroom applications have made them better in class but it definitely has increased their engagement level. "I may have gotten better; I didn't notice but it's definitely fun and engaging!"; "I don't know if I'm better but I do pay more attention because it's engaging so it makes me focus more."; "Don't know if I got better, but I'm sure I'm learning more."

A couple of students felt that they ranked the same in class even when interacting with interactive classroom applications. However, they were still positive towards the applications and would love to continue to use, if not both, (the Quizlet and Kahoot!) then one of it. "I feel I'm the same. The applications are testing what I know, which is good"; "I don't feel any change because of the timer in Kahoot! – it pressures me, I have to be quick so I just answer whatever. But because of Quizlet, I get to review a lot and increase my knowledge, which is great."

- **Discussion**

To investigate students' engagement levels, the researcher has integrated the use of active teaching models and gamification elements (termed in this study as 'Interactive Classroom Applications' – Quizlet and Kahoot!) in Business Studies class in the teaching and learning process. This study investigated the effects of these applications to see whether the integration made any changes to student's cognitive, behavioral and affective engagement levels and gather their perceptions towards the technology integration. Students used their mobile phones and other handheld devices to participate in class activities shared via interactive classroom applications. And the study met the goal by achieving improved levels of students' engagement.

According to previous studies (White, 2006;Astin, 1984; and Bhamanbijar et al., 2019), students' lack of participation in class may be due to lack of environment that enriches students' dynamic learning. Educators require using different methods that involve students as much as possible which can be done through expanding the range of participatory forms through which students can contribute to the task and enhance their own learning. Having students engaged and enthusiastically take part in the classroom is pivotal as it's one of the main active learning strategies where students can find opportunities to learn and practice new knowledge. The studies by Carolyn and Julia (2017) and Yassine et al. (2019) also claim that gamification (like Kahoot!) in classroom can foster students' engagement, enhance constructive discussions with peers and allow for more interaction with the instructor – building a collaborative environment. The researchers stated that teachers should teach the 'Net generation' the way they want to learn (Carolyn and Julia, 2017). Hence, to support the previous researches, this study at hand focuses on how the application of technology and gamification used via mobile phones and other handheld devices in Business Studies class could positively impact students' participation, engagement and learning outcomes. Consequently, the study has obtained the following relevant data concerning the topic under investigation:

- **Impact on Students' Cognitive Engagement Level**

Interactive classroom applications have immensely increased students' cognitive engagement level in Business Studies class. The results obtained in the study prove that the integration of interactive classroom applications has expanded students' knowledge and memory. They were able to retain meaningful materials and better understand the terms and concepts which were practiced and reviewed via Quizlet. Also, the Kahoot! helped them to reinforce and apply their knowledge.

- **Impact on Students' behavioral Engagement Level**

The results from the study confirm that the use of interactive classroom applications in Business Studies class have tremendously improved students' behavioral engagement level. The applications have raised the rate of students' collaboration and participation in class. The Quizlet application kept them focused and engaged and they enjoyed the competitive interaction via Kahoot! This has also led to students sharing more ideas and opinions in class after taking part in the Kahoot! quiz.

- **Impact on Students' affective Engagement Level**

The integration of interactive classroom applications has also enhanced students' affective engagement level in Business Studies class. Results display that the students had fun and enjoyed using the interactive classroom applications. Students conceded that the contents shared on Quizlet are diverse and interesting and the Kahoot! is challenging because of its competitive nature. They stated that both the Quizlet and Kahoot! are easy to access and use and that they feel comfortable when learning via those applications. Thus, they want to continue the use of interactive classroom applications in Business Studies class for future learning experiences.

In this study, the findings displayed a positive effect on overall students' perception on the integration of interactive classroom applications in Business Studies class. Students affirmed that the interactive classroom applications have a positive impact on their learning outcomes. Though, one student mentioned that the time limit in Kahoot! is stressful, the student still wants to continue using Kahoot! and is confident in overcoming the challenge.

Therefore, the statistical and descriptive results show that this study has accomplished the objectives by achieving increased level of students' cognitive, behavioral and affective engagement. The interactive classroom applications have boosted students' participation in Business Studies class, leading to a significant improvement in their overall grades in Business Studies course. Thus, the results of this study are statistically significant and indicate strong evidence against all the null hypothesis.

Conclusion and Future Works

This study at hand was conducted with Thai and international high school students in Somtawin Witaedsuksa Huaymongkhon School in Thailand. The aim of this study was to investigate the effects the interactive classroom applications have on students' engagement levels (cognitive, behavioral and affective) in Business Studies class. It was designed to determine students' perceptions towards the integration of interactive classroom applications like Quizlet and Kahoot!In agreement with previous studies, the finding of this study is also evident that students in the digital age are more engaged when taught digitally and learn better when using technological devices that they are comfortable with such as mobile phones and other handheld devices. It has proven that the integration of technology and digital devices in the modern classroom is a compulsion, not an option as it does make a huge difference in students' cognitive, behavioral and affective engagement levels. Therefore, the use of interactive classroom applications such as Quizlet and Kahoot! in Business Studies class via mobile phones and other handheld devices is a successful integration of technology. These applications have popularized students' engagement, motivation, learning outcomes and shaped their overall perceptions of online learning and also has boosted the teaching and learning practices.

However, in this study, when using Kahoot! the researcher had set a time limit for each (multiple choice and true and false) questions at 20-30 seconds depending on the nature of the questions and this may put some students under pressure. Hence, if similar research was to be conducted in the future, it is highly recommended that future researchers when starting to use Kahoot! with students or their samples should precede with a time limit that is longer (which can be up to 4 minutes in Kahoot!) to eliminate students' stress. Also, for future work, if any unexpected internet issues are encountered either at the host's end or the participants' end when using the applications, future researchers are strongly suggested to prior inform the participants that Quizlet link for flashcards or the link for Kahoot! quiz will be shared to those who were disconnected from the challenge to take part in a self-paced quiz so they do not panic and feel left out. The researcher or Kahoot! host can send a reminder to make sure that participants complete the challenge before the deadline expires and further check the game report to see who has completed it. Evenfor a self-paced Kahoot! quiz, the Kahoot! allows the host to announce the end of challenge results and share scores with participants to acknowledge the winners. As a result, this will ensure that all participants have an equal chance to participate in class activities without having to worry about time limits and internet issues and fully enjoy the integration of interactive classroom applications.

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Appendixes

Appendix 1: Questionnaire Survey

Items	Statement	SA	A	N	D	SDA
		1	2	3	4	5
1	The interactive classroom applications have helped me with better conceptual understanding of the contents in Business Studies course.					
2	The interactive classroom applications have contributed to the process of enriching my knowledge in Business Studies course.					
3	The interactive classroom applications have improved my skills in retaining meaningful materials shared in Business Studies course.					
4	The interactive classroom applications have allowed me to practice and reinforce my knowledge in Business Studies course.					
5	The interactive classroom applications have encouraged me to competitively interact and participate in Business Studies class.					

6	The interactive classroom applications have allowed me to stay focused in class activity.					
7	The interactive classroom applications have allowed me to share my ideas in Business Studies class with my classmates and teacher.					
8	The interactive classroom applications have increased the spirit of collaboration among students in Business Studies class.					
9	I feel comfortable when interacting online via interactive classroom applications.					
10	The contents and online activities shared via interactive classroom applications are diverse and interesting.					
11	The interactive classroom applications have positively shaped my perception of online learning.					
12	I think interactive classroom applications are suitable to use in Business Studies course.					
13	I have enjoyed using the interactive classroom applications in Business Studies classes.					

Note: Questionnaire items 1-4 intend to measure students' cognitive engagement level; questionnaire item 5-8 intend to measure students' behavioral engagement level; questionnaire items 9-13 intend to measure students' affective engagement level; SA=Strongly Agree; A=Agree; N=Neutral; D=Disagree; SD=Strongly Disagree

Appendix 2: Interview Questions

Items	Questions
1	How would you describe your experience using interactive classroom applications in Business Studies course?
2	What do you like best about the interactive classroom applications used in Business Studies course?
3	Do you feel you are better or worse at Business Studies after using the interactive classroom applications in Business Studies Course? Why?

Note: A description of students' experiences regarding the use of interactive classroom applications in Business Studies course were collected via interview session after the completion of questionnaire survey.

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