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THE EFFECTIVENESS OF DIGITAL LEARNING MATERIALS ON STUDENTS' ACADEMIC ACHIEVEMENT AND MOTIVATION IN THE GEOMETRY

MOHAMED ALY ABBAS MOHAMED HELAL

UNIVERSITI PENDIDIKAN SULTAN IDRIS

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ABSTRACT

This study determines the effectiveness of digital learning materials on students' academic achievement and motivation in the topic Geometry. The research design is quasi-experimental. A sample of 60 participants out of 200 target populations were carefully chosen using cluster probability sampling. A three-week intervention was carried out. The instruments used are a set of pre-test and post-test on the topic Geometry. The motivation survey that was given to the treatment group only. A descriptive analysis was used to describe students' achievement on the geometry topic, while an independent t-test was used to determine the differences between the two teaching strategies the digital learning and the conventional learning. The survey was designed to measure the extent of students' motivation after using the developed digital learning materials and also analyzed through descriptive statistics. Meanwhile the correlation coefficient is revealing the relationship between digital learning materials and students' motivation. The finding shows that there is a significant correlation between digital learning materials and students' achievement and motivation in the topic geometry. It can be concluded that the use of digital learning materials remains very pertinent in theteaching and learning process of students in the world in order to help students study at theirown convenience and especially during the world pandemic. The study also recommended that managers of schools should augment on the budget for digital learning materials inorder to cater a teaching platform that allows students to meet their teachers, make a discussion, watch videos, play educational games, do interactive practicing, and presentations about the concepts from their Geometry books. These digital learning materials have to be manipulated according to students' needs to help them understand and learn concepts in Geometry. The implication of the study shows that the developed digital learning materials can be used as a teaching aid in improving students' understandingand motivation towards Geometry.

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KEBERKESANAN BAHAN PEMBELAJARAN DIGITAL TERHADAP PENCAPAIAN AKADEMIK DAN MOTIVASI PELAJAR DALAM GEOMETRI

ABSTRAK

Kajian ini menentukan keberkesanan bahan pembelajaran digital terhadap pencapaian akademik dan motivasi pelajar dalam topik Geometri. Reka bentuk kajian adalah kuasi eksperimen. Sampel 60 peserta daripada 200 populasi sasaran dipilih dengan teliti menggunakan pensampelan kebarangkalian kelompok. Intervensi selama tiga minggu telah dijalankan. Instrumen yang digunakan ialah satu set ujian pra dan ujian pasca bagi tajuk Geometri. Tinjauan motivasi yang diberikan kepada kumpulan rawatan sahaja. Analisis deskriptif digunakan untuk menerangkan pencapaian pelajar dalam topik Geometri, manakala ujian-t bebas digunakan untuk menentukan perbezaan antara dua strategi pengajaran iaitu pembelajaran digital dan pembelajaran konvensional. Tinjauan ini direka bentuk untuk mengukur sejauh mana motivasi pelajar selepas menggunakan bahan pembelajaran digital yang dibangunkan dan juga dianalisis melalui statistik deskriptif. Manakala pekali korelasi pula mendedahkan hubungan antara bahan pembelajaran digital dengan motivasi pelajar. Dapatan kajian menunjukkan terdapat korelasi yang signifikan antara bahan pembelajaran digital dengan pencapaian dan motivasi pelajar dalam topik geometri. Dapat disimpulkan bahawa penggunaan bahan pembelajaran digital kekal sangat penting dalam proses pengajaran dan pembelajaran pelajar di dunia untuk membantu pelajar belajar mengikut keselesaan mereka sendiri dan terutamanya semasa pandemik dunia. Kajian itu juga mengesyorkan bahawa pengurus sekolah perlu menambah bajet untuk bahan pembelajaran digital untuk memenuhi platform pengajaran yang membolehkan pelajar bertemu guru mereka, membuat perbincangan, menonton video, bermain permainan pendidikan, melakukan latihan interaktif dan pembentangan tentang konsep daripada buku Geometri mereka. Bahan pembelajaran digital ini perlu dimanipulasi mengikut keperluan pelajar untuk membantu mereka memahami dan mempelajari konsep dalam Geometri. Implikasi kajian menunjukkan bahawa bahan pembelajaran digital yang dibangunkan boleh digunakan sebagai bahan bantu mengajar dalam meningkatkan kefahaman dan motivasi pelajar terhadap Geometri.

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LIST OF ABBREVIATION

AUETTLQ	A structured questionnaire referred to as the "Awareness and Utilization of E- Learning Technologies in Teaching and Learning Questionnaire"
CCSSM	California Common Core State Standards: Mathematics
CCTM	Cognitive Constructivist Theory of Multimedia
CPU	Centre Processor Unit
D.L	Digital learning
DIMS	Difficulties initiating & maintaining for intents & purposes sleep
E-Learning	Learning Using Technology
GCC	Gulf Cooperation Council
ICT	Information and Communication Technologies
LMS	Learning management system
MAT	Mathematics Achievement Test"
MS Teams	Microsoft Teams
NCES	National Centre for Education Statistics
NCTM	National Council of Mathematics Teachers
OECD	Organization for Economic Co-operation and Development
PISA	Programme for International Student Assessment
SMAT	Students' Mathematics Achievement Test"
SMPQ	School Management Practices Questionnaire"
SRAQ	Self-Regulatory Attributes Questionnaire"
TEQ	Teachers' Effectiveness Questionnaire"
SPSS	Statistical Package for the Social Science

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CHAPTER 1

INTRODUCTION

1.1 Introduction

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There is no doubt that the interest in employing digital learning in the educational process has become one of the necessities of the times at present due to what the world faces from the spread of the Covid-19 virus, which in turn has affected all areas of the individual, including the educational field.

Digital learning refers to using advanced information communication technology in the learning process, where advanced Technology consists of electronic media (Kumar et al., 2018). It is a new pattern of education imposed by the latest scientific and technical changes in the world today due to the inability of traditional teaching strategies and teaching methods to keep pace with these changes, given the changing role of both teacher and student. Digital learning is now considered one of the

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most critical educational environments in the information age. Over the present century, the world has witnessed a revolution and rapid changes in Information and Communication Technologies (ICT) and the Internet in all aspects, particularly in the education sector. This has prompted educational institutions and experts in curricula to introduce radical changes in their policies and academics, getting to respond and align with this alteration and development (Singh & Mishra,2020).

Digital learning is one of the best-known distance learning methods and is widely used around the world. Digital learning is the best option currently available for distance learning. The main reason for this is the Internet. The Internet makes it easy to create digital content that can be stored, accessed, and interacted with on both sides. The term "digital learning" is frequently used as it covers any form of computer-based communication, such as learning through the Internet. Digital learning methods include web-based courses and computer-based communications such as Zoom and Skype. These types of digital learning have the potential to make learning active (Gunawardhana, 2020).

According to the researcher, digital learning aims to support students' learning and motivate the students to make the learning style more flexible, efficient, and practical, which is reflected positively in students' achievement. In this research, digital learning materials are the treatment to motivate the students to understand geometry and achieve better mathematics achievements. In the United Arab Emirates, education has long been viewed as a priority for the state's socioeconomic development, although the quality of education remains problematic.

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According to international evaluations such as the PISA (The Programme for International Student Assessment), the scores of United Arab Emirates students in mathematics are often below average. They were placed 48th out of 65 countries in mathematics, and the students needed to be more motivated to make better progress in mathematics (Summaries, 2018).

As the queen of all sciences, mathematics should receive significant attention and importance. As a science of numbers, it aims to enhance and illuminate the mind through better problem-solving methods. As this mathematical world becomes more and more complex, everyone must have enough knowledge and understanding of mathematics to survive. The National Council of Mathematics Teachers (NCTM) asserts that those who understand and apply math will have opportunities that others do not. Mathematical competence opens endless opportunities (Aguanta & Tan,2018).

1.2 Research Background

Education is one of the tools for social integration, achieving personal development and national awareness, and promoting unity, economic, political, scientific, cultural and technological development. Teaching mathematics is the cornerstone and an indispensable tool for the scientific and economic progress of the person and the nation. It is an essential part of human thought and logic in its attempt to understand the worldview of the environment in which it lives. Thus, mathematics plays an essential role in human life. Mathematics also provides an effective way to build mental discipline and encourages logical thinking. Mathematics prepares one for the world of

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the future. Thus, mathematics is a compulsory subject in education as it is essential to human life (VaraidzaiMakondo & Makondo,2020).

Technology has been implemented to varying degrees and inequalities throughout the globe in mathematics courses, where substantial gains may be achieved. Integration of Technology into mathematics education serves several aims and objectives. There are several justifications for using digital learning materials in mathematics education, including practical concerns (easy-fast-exact), student motivation and interest, and the cognitive benefits it involves a better understanding of abstract mathematical concepts (Dockendorff, 2020)

New technologies and digital learning are being employed in an increasing number of schools. The Abu Dhabi Department of Education and Knowledge announced the introduction of the New School Model in 2010, intending to improve the education system in Abu Dhabi, United Arab Emirates. The strategy was founded on Technology, a rich resource environment, and a student-centred approach. E-learning was recognized as a critical method for successful teaching and learning that needs to match the United Arab Emirates Economic Vision 2030, where technology skills serve as a foundation for more advanced learning (Samsonova, 2021).

Teaching and learning with new Technology are dynamic and essential to the present educational system. The value of several conventional instructional strategies is likely restricted when teaching complicated mathematical topics. Multimedia technologies are likely one of the most exciting innovations of the information age, they will create an appropriate learning context that gives the learner control over the

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learning environment, and the digital teaching and learning process is more effective than the traditional method of teaching (GebreYohannes et al., 2016). The tremendous rise of multimedia Technology over the past decade has resulted in significant changes to the educational system (Nusir et al., 2013).

Human resources should be prepared to gain knowledge, Technology, and skills through education. As a result, education in the 21st century plays a critical role in educating the next generation to compete in a globalized world. The function of education in the 21st century is becoming increasingly crucial in preparing the future generation to have particular abilities, such as learning and innovative skills, skills in using Technology, media, and information, and skills in working and surviving (Mayasari, Kadarohman, & Rusdiana, 2016).

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In the 21st century, education has been compelled to undergo considerable changes. One of the transformations is the shift from an industrial to a learning society (Malik, 2015). To deal with these developments, learning principles should be built to promote universal education. The modifications brought about by the reformation of the educational process. This reformation is viewed as an attempt to bring the situation and learning process in line with recognized standards (Häkkinen et al., 2017).

Using Technology in education needs to develop digital learning materials or visual media. Visual media is mainly used to deliver a message or information, comprising two-dimensional elements. Visual material, such as images in various publications such as newspapers, magazines, books, posters/signs on the streets, and graphics, are used daily and are experienced on numerous websites on the Internet

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through the computer's screen. The rationale is that visual materials are more efficient and allow for picture representation, resulting in cognitive recognition processes identical to those we observe in the real world (Nicolaou et al., 2019).

Technology allows us to learn using new learning styles. Distance learning via the Internet in all sectors of education, including mathematics, online distance learning has demonstrated tremendous growth. More schools and universities are promoting distance learning education programs and offering diverse specialities and degrees to appeal to a broader range of students. The number of institutions offering online or distance learning math classes increased by 14% between 1994 and 2001, according to the National Centre for Educational Statistics (NCES, 2003a). These programs served an estimated student population of 837,892 people. Students usually choose an online course because of the additional resources (including media), the self-directed learning style, the ability to receive quicker instructor feedback, and general pleasure in the learning experience (Chekour, 2017).

1.3 Problem Statement

Education is a significant government objective to build a strong, knowledge-based economy and minimize reliance on oil in United Arab Emirates (Gallagher, 2019). Mathematics is one of the core subjects that requires development in the way of teaching to help United Arab Emirates students understand the subject very well and score high in international benchmark tests such as PISA, which is one of the challenges in education, in addition to using digital learning materials to motivate students to learn

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mathematics and to reduce students' anxiety toward mathematics and the difficulties in learning mathematics using the traditional methods of teaching. The GCC's education systems are relatively new by global standards, but this has allowed them to be very dynamic, frequently outpacing other markets with their capacity to swiftly and successfully integrate the newest Technology and innovations into the classroom. Countries in the GCC have a unique chance to develop best-in-class standards in E-learning as schools continue to close throughout the globe to stop the spread of Covid-19. Countries like the UAE are in an excellent position to show the rest of the world how to utilize Technology as a solution to prevent disruptions in education during the pandemic teachers receive real-time information from digital learning that demonstrates to them how their students are performing and needs more attention, and who should be commended for their dedication. For the core subjects, especially Mathematics, using Technology in education offers a range of interactive and learning aspects (Simon, 2020).

The Programme for International Student Assessment (PISA), a series of standardized tests created and administered by the Organization for Economic Cooperation and Development (OECD) to assess student's performance at the age of 15 which is Grade 10 students, shows that UAE students' performance is acceptable comparing to the students from other Middle Eastern countries, but still not ranked high among the other countries in the world. The national agenda of the UAE calls for the nation to place among the top 20 countries, according to PISA. Students must be motivated to learn mathematics to improve their performance and results on the PISA exam, which is a significant portion of the test. The UAE government uses PISA as one instrument to make things right. It could be the most crucial tool the government has

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for determining how effectively the students are being educated in the UAE since it makes it easy to compare The UAE students' performance with that of students in other countries. All schools in the UAE are concentrating on assisting their students to be ready for the PISA exam, especially mathematics, as the UAE government has started evaluating the schools using the PISA test scores for their students (Saman, 2018).

Mathematics anxiety is one of the problems for students in the United Arab Emirates; according to a survey, students in the United Arab Emirates are more anxious about mathematics than students in any of the 20 other countries that participated in the survey, including the UAE. According to the report, 25% of UAE students find mathematics stressful, with female students feeling more pressure than male students. A survey of 1,783 students from 20 different nations was conducted. Longer hours could be connected to reports of increased anxiety. According to a thorough 2018 analysis, young people in the UAE study longer than those in 78 other high and middle-income nations. The Organization for Economic Cooperation and Development (OECD) study involved testing 4,000–8,000 students from 79 various countries. Students in the United Arab Emirates studied the most, although their math test results were somewhat below average. These statistics should cause parents and kids in the UAE great concern, and a big part of the anxiety stems from how mathematics is traditionally taught to the students (Nandkeolyar, 2022). Student anxiety in reaction to mathematics is a critical concern for teachers since there is a relation between the amount of mathematics anxiety and students' perceived achievement. Thus, schools should develop new teaching methods to inspire students to study mathematics (Al Mutawah, 2015).

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Geometry is a branch of mathematics that students find challenging and fearful. Solving geometry problems is a common source of frustration for students. Students need help grasping the provided problem, selecting proper problem-solving techniques, creating mathematical models, and completing accurate mathematical processes when solving geometry problems. (Sulistiowati, Herman, & Jupri, 2019). Using user-centred game-based education software impacted students' academic achievement and attitude toward learning, according to a study done by Demir, Ü. (2022) to examine the Impact of game-based geometric education software as a digital Learning on student achievement in geometry.

Geometry is seen as a challenging subject among students. According to research by Juman et al. (2022), most teachers teach geometry in a conventional way. The study planned to evaluate the effectiveness of activity-based teaching approaches in teaching geometry versus the conventional way. The study's findings indicated that students struggled more with studying geometry, such as sketching diagrams for a given geometric issue and using more than one theorem to solve a given geometry problem. Furthermore, the findings of the teaching experiment show that student-centred learning approaches are more effective than traditional ways of teaching geometry.

Using Technology in education started in the 1960s when computers were first used. The Internet made a significant change in education when it started to be used in the education process in the 1980s, then the development in online education started upgrading very fast; there are many expressions for online education such as electronic learning, E-learning, learning using Technology and digital learning (Vanderpool, L. W., 2009).

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Digital learning has become a popular learning approach in schools due to the vast growth of internet technology and its importance. Nowadays, digital learning has a competitive advantage, and many schools have preceded it, which has an excellent Impact on students' academic achievement (Thabet & Kalyankar, 2014).

E-learning is a sort of online learning that involves using digital learning materials and electronic systems (Noesgaard & Ørngreen, 2015). E-learning is an educational approach using online electronic applications and digital learning resources. There is much instructional potential in E-learning resources. Electronic educational materials and digital literacy have several significant advantages that can improve educational quality. The Slovenian E-um web portal for elementary and secondary levels is a top-notch educational portal that compares mathematics instruction and learning on its internal and other online platforms. Both students and teachers place a high value on the supportive comments posted by E-um users. According to Slovenia's Ministry of Education and Sport, during Slovenia's E-learning promotion month, the E-um portal had the most significant number of visits from both elementary and secondary schools (Elesini & Tomažin, 2018).

Digital learning has an impact on the student's academic performance, according to a study done by According to a study conducted by Franklin & Nahari (2019) to evaluate the influence of electronic learning on academic performance in Saudi Arabia; the digital learning has an impact on the student's academic achievement. There were 163 students in the sample. The findings showed that synchronous lectures, technological proficiency, and online instruction all indirectly affect students'

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performance. Additionally, the acceptability of online instruction and technical proficiency directly affect academic achievement.

The research study was conducted by Emmanuel et al. (2019) to examine the effects of synchronous and asynchronous E-learning on students' academic achievement. Some National open university of Nigeria students were surveyed to gather information for this study. The results demonstrated that students' attitudes about synchronous and asynchronous E-learning impact their academic achievements. According to the findings, only 60% of respondents are aware of the differences between synchronous and asynchronous E-learning. Asynchronous and synchronous E-learning modes were only positively perceived by 55% of respondents as impacting their academic achievement. Only 52% of respondents believe that the National Open University's curriculum must be revised to improve the effectiveness of the E-learning method for students.

However, the need for this research is dictated by the fact that there is still disagreement between the research results concerning the effectiveness of modern education compared to traditional methods. Also, all this research were before the covid-19 crisis and the pandemic, when using Technology in education was to develop and enhance education. The previous research focused more on using Technology and the Internet in teaching using digital learning materials such as YouTube videos, PowerPoint presentations, worksheets, and sometimes very few basic games. However, there were problems using these digital learning materials, such as not helping all students' levels to be self-learners and motivating them to focus and study. E-learning can take many forms, depending on the source or delivery channel. The channels or

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platforms used to deliver the information are the most critical part of the educational process. Like any other system, E-learning and educational platforms have some disadvantages. Being flexible is only sometimes good because it might lead to laziness, which reduces productivity. The following are some of the critical drawbacks of E-learning (Srivastava, 2019). Low motivation has nothing to glance over; students with low motivation may only sometimes attain the established targets. Students are responsible for the course's routine and organization, which might lead to lethargy and low motivation. Students may drop out of the course prematurely due to a lack of a set schedule and deadlines.

Technology-dependency, computer apps are used to deliver the study materials in E-learning. Some people may take a long time to learn how to use these applications. Other problems, such as a bad Internet connection or device malfunction, might make learning challenging and time-consuming. Compatibility issues, because there are so many different learning systems, study materials created with one system may differ. For example, mobile devices, such as iPads, prevent flash videos from being played in their browsers. Some countries put restrictions on the number of websites that can be accessed. Therefore, access to websites may not be accessible everywhere. Reliability of the content, the information available on the Internet could be more accurate. Others intentionally mislead readers and provide incorrect information. As a result, readers must exercise caution when looking for information and ensure that the content is reliable before studying it. Social isolation for some pupils and lacking a genuine classroom or classmates may be detrimental. Due to the lack of real people surrounding them while learning, students may sometimes feel socially isolated. In this research, the researcher focused more on the digital learning materials and combining these digital

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learning materials in a teaching process, arranged together in a specific order to serve the teaching targets and to facilitate the teaching process for the students to avoid all the previous problems. Below is a comparison between the general digital learning materials used by other researchers and the developed digital learning materials by the researcher to be used in this research.

The researcher developed new digital learning materials in this research to fill the gap in the old digital learning materials used by the other researchers. In this research, the digital learning materials are animated videos, the interactive video, games, the live worksheet, and the instructional PowerPoint presentation. The strength of the animated video as a digital learning material in this research, the video is designed to be full of animation and attraction to the students. The video explains the concept with differentiated levelled practices that will gradually move the students from one level to another concerning the standards' needs. In contrast, videos on YouTube or any other educational website have some disadvantages points such as the content being boring and not attractive enough to the student, malicious or distracting content, issues related to the quality and scientific accuracy of the content, privacy concerns, and misbehaviours, the inability to control the continuity of electronic links before it is deleted Mathar, E. Y. (2019). In this research, there is another type of educational video, which is the interactive animated video; in this part, the researcher will extend the benefits of the video by developing a new interactive video using the Edpuzzle website to allow the students to interact while watching the video and solve multiple-choice and critical thinking questions on the topic simultaneously.

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Moreover, the researcher will add an interactive game in the teaching process about the geometric topic using the word wall website to make the teaching process more attractive to the students. In contrast, in the other Online educational game, it is tough for the students to find a game designed for the topic he is studying and supports all the topic's targets. Also, the live worksheet has been developed as a levelled worksheet embedded in the textbook containing three levels of skills and challenging tasks; the worksheet will be developed as a live worksheet on the live worksheet website, and the student will solve and get the grade on his solving directly after finishing since the worksheet is developed with the answers. In contrast, the online worksheets on any other website are very general and sometimes the contact needs to match the student's needs. If the answer provides it, it will be challenging for most students to understand the steps.

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Additionally, a PowerPoint presentation will instruct the student to guide him on moving from one task to another. It will be supported by the links for each activity based on the visible learning, which makes the students self-learners and will help them interact with the teacher during the levelled tasks. The PowerPoint presentation contains coaching and explicit instruction for every student to grow according to his pace of learning; the PowerPoint presentation contains interactive and supportive links in addition to resources and practice websites which enhance the concept.

Nowadays, digital learning has become necessary in our life after covid-19, and distance learning that forced all educational institutions to use digital learning through online educational platforms. Educational institutions were using these platforms to help students learn, but the gap between the amount of Technology used, and students'

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achievement after using these platforms is still there. Nowadays, schools use Technology to teach students the skills to be a self-learner which is a challenge for schools, teachers, students, and parents, and that motivated the researcher to conduct the current research by focusing on digital learning materials and how to make it more influential in motivating the students. Students need a teaching platform that allows them to meet their teachers, have a discussion, and watch videos and presentations about the concepts from their mathematical books; these digital learning materials have to be manipulated according to students' needs to help them understand and learn. Covid-19 and the pandemic were the reasons that pushed schools around the world to use online educational platforms and digital learning materials to help students to learn.

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1.4 Research purpose

This research aims to develop digital learning materials and test their effectiveness on students' academic achievement and student motivation in mathematics among students of the experimental group.

1.5 Objectives

The main objectives of this study are to determine the following points:

1. To develop digital learning materials through MS Teams in teaching mathematics for high school grade 10 students.

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2. To determine whether there is a significant improvement in students' achievement for the experimental and control group based on the pre-test and post-test.

3. To determine whether there is a significant difference between the experimental and control groups regarding the effectiveness of the digital learning materials using the MS Teams is concerned for the experimental group.

4.To determine whether there is a significant correlation between the use of digital learning materials as a motivational education tool and the mean scores of students in the post-test.

1.6 Research Questions

1. What is the design of the digital learning material in teaching geometry for grade 10?

2. Are there any differences between the sample of experimental and control group ranks in the post-assessment on the scale of academic achievement before any intervention is given in studying mathematics?

3. Based on the pre-test and post-test, is there any improvement in students' achievement for the experimental and control groups?

4. Are there any differences between the means of the pre-test and post-test for the experimental and control groups regarding the effectiveness of the digital learning materials using the MS Teams is concerned for the experimental group?

5. Is there a statistically significant correlation between the use of digital learning materials as a motivational education tool for students in learning geometry and the mean scores of students in the post-test?

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1.7 Research Hypotheses

The hypotheses below are developed according to the research questions.

For the second research question, the null hypothesis is:

H02: There is no significant difference between the sample of experimental and control group ranks in the post-assessment on the scale of academic achievement before any intervention is given in studying mathematics.

For the third research question, the null hypothesis is

H03: There is no significant improvement in students' achievement for the experimental and control groups based on the pre-test and post-test.

For the fourth research question, the null hypothesis is

H04: There are no significant differences between the means of the pre-test and post-test for the experimental and control groups regarding the effectiveness of the digital learning materials using the MS Teams is concerned for the experimental group.

For the fifth research question, the null hypothesis is

H05: There is no statistically significant correlation between the use of digital learning materials as a motivational education tool for students in learning geometry and the mean scores of students in the post-test.

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1.8 Conceptual Framework

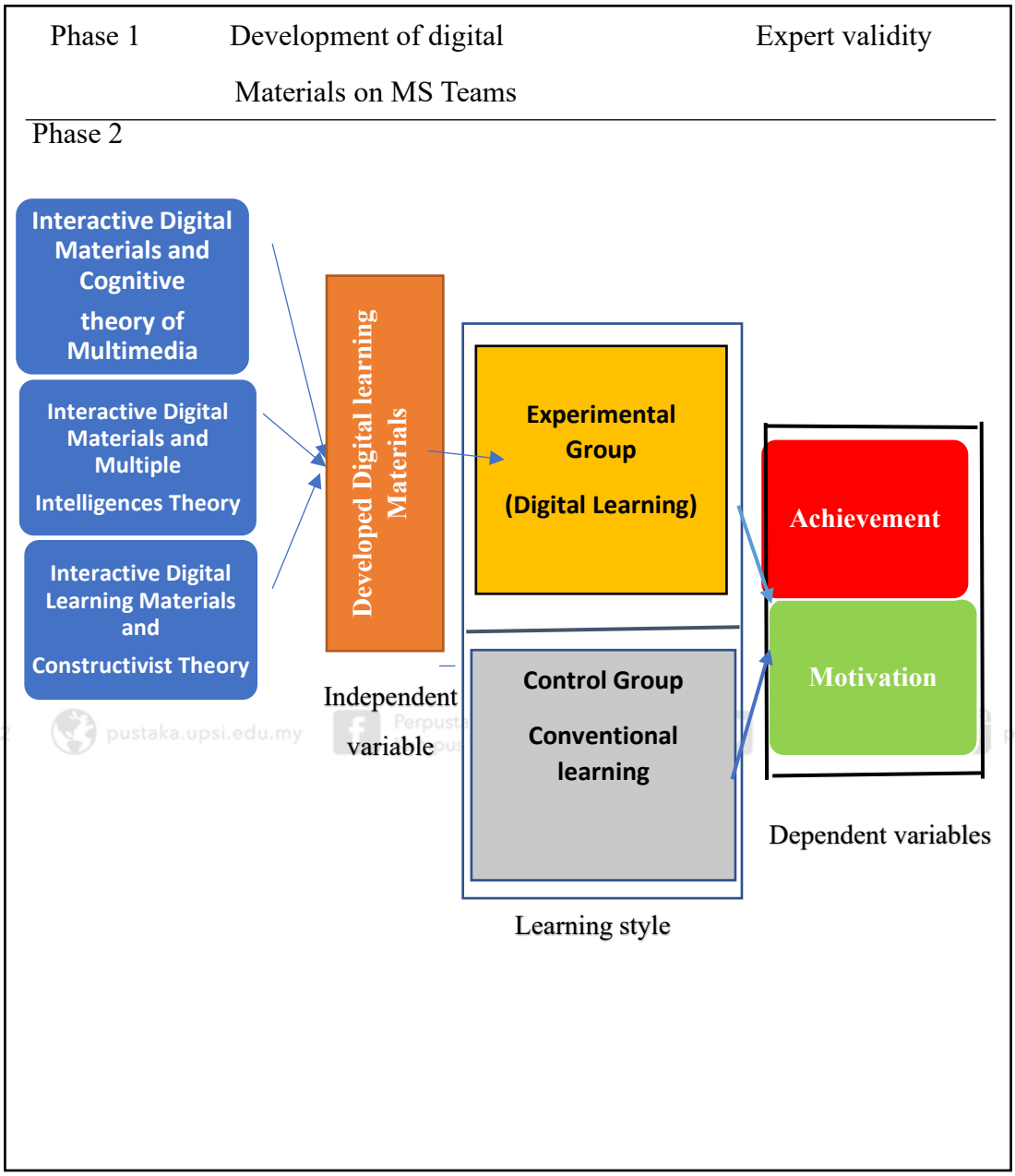

Figure 1.1. Conceptual Framework

The conceptual framework begins with identifying the relationship between the variables in this research. In this research, the independent variable is the advanced digital learning materials by the researcher, which will be the treatment of the experimental group. Each group will study using a different learning style. The control group will study the geometric topics following the conventional way of teaching, while

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the experimental group will study using the manipulated digital learning materials developed by the researcher. The dependent variables in this research are the student's academic achievement (pre-test, post-test) and the student's motivation.

The conceptual framework is divided into two phases; phase 1 is the development of the digital learning materials, which is the treatment in this research, and will be given to the treatment group to test the effectiveness of the developed digital learning materials on the students' motivation and students' academic achievement after the analysis of the pre-test, and post-test result. Phase 2 in the conceptual formwork showing the relationship between the variables and the theorems that were utilized in the process of developing the treatment, which is composed of the digital learning materials, the interactive digital materials and cognitive theory of multimedia, the interactive digital materials and multiple intelligences theory, and the interactive digital learning materials and constructivist theory, in addition to the cognitive load, were used to develop the digital learning materials which were going to be given to the experimental group as a treatment and then to test the effectiveness of the treatment on the student's motivation and students' academic achievement. The treatment will include the advanced digital learning materials presented and explained to the experimental group through the MS Teams educational platform. Following the treatment, the experimental and control groups will hold a post-test to measure the improvement made by the students after using the developed digital learning materials.

In this research, the digital learning materials will be the treatment for the researcher to adopt and develop to meet the student's needs in the sample of the experimental group, which leads to more motivation for the students, and this will

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reflect directly on their academic achievement. The treatment is animated videos, interactive videos, games, live worksheets and instructional PowerPoint presentations to guide the students to move from one task to another quickly will be developed concerning the content of the student's curriculum. Clear instructions will help students become self-learners and facilitate the learning process to motivate the students to learn and make better achievements. The control group will use the conventional way of learning using the textbook, notebook, and available online learning materials, such as YouTube videos.

1.9 Research Significant

The Scientific Importance of the Study:

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This study is considered a new reference for researchers and academics, as it shows the effectiveness of digital learning materials on students' academic achievement in mathematics. Also, this study may constitute a basis where the researchers move from it to a more spacious field towards research and investigation about the effectiveness of digital learning materials in education and how to use it to improve academic achievement.

The Practical Importance of the Study

It is essential to understand the effectiveness of digital learning materials on students' academic achievement and motivation in mathematics. Firstly, this study will enrich the professional lives of researchers by serving as a knowledge resource. Secondly, the findings, implications, and recommendations of this study will be beneficial to creating plans and implementing action plans to implement digital learning

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materials in education as well as develop digital learning materials to improve academic achievement, more over the study will be a valuable model of developing the digital learning materials to help the learners and motivate them, especially in United Arab Emirates schools.

Finally, the literature review, findings, and study discussions can be helpful for further research.

1.10 The Research Scope

This research is about determining the student's academic performance in mathematics through the MS Teams program based on digital learning.

The researcher is interested in developing digital learning materials through the MS Teams program to improve academic achievement in mathematics for grade 10 high school students to cope with implementing technology in teaching.

1.11 Research Limitation

This research aims to study the effectiveness of digital learning materials through MS Teams on the student's academic achievement and motivation; this research was undertaken with various research limitations in mind, such as study procedures, requirements, a field of study, sample of study and location.

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i. Procedures of study

MS Teams is the only educational platform used to present the digital learning materials in this research. As a result, the researcher had to train the high school teachers assigned to the control and experimental groups on how to use the platform to teach the students in both groups how to use it if they were unfamiliar.

ii. Requirements

This research required each participant of the treatment group to have good internet service and a modern device such as a laptop, iPad, or tablet to study, practice and interact with the teacher throughout the online learning process. Therefore, the school had to provide them with internet access to interact with the assigned work during the experiment.

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iii. Field of study

There are six branches of mathematics for high school in the United Arab Emirates. However, this research focused only on one mathematical branch in high school, geometry for grade 10, with four topics on the properties and attributes of triangles.

iv. Sample of the study

There are just 60 students in grade 10 who participated in this research. A larger sample size would improve the sample's success rates. Thirty students represent the treatment group, whereas 30 represent the control group.

v. Location of study

This research involved only one of the private schools in Sharjah, United Arab Emiratis, which is the only available zone for the researcher to run the research.

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1.12 Operational Definition

Digital learning

Digital learning is defined by Chitra & Antoney (2018) as all educational activities conducted by individuals or groups working online or offline, synchronously or asynchronously, using networked or freestanding computers and other electronic devices. Yoon et al. (2012) reported that Jay Cross proposed digital learning for the first time in 1999. (E-Learning). With the development and expansion of technology tools, numerous definitions and terms, such as internet-based training, web-based training, online learning, network learning, and distance learning, have emerged. According to Doris Holzberger et al. (2013), digital learning is the distribution of digital media (such as texts or images) over the Internet, and the learning materials and teaching strategies provided are meant to improve student learning, increase teaching effectiveness, or promote the development of the learner's knowledge and skills. To overcome limitations imposed by space, time, and schedule and to accomplish individualized learning centred on learners, computers and network technology media have generally been applied to learning scenarios, including synchronous and asynchronous network learning (Kaklamanou et al., 2012). Digital learning refers to delivering mathematics content to students via internet technology to boost their achievement. Any learning that uses technology or instructional methods that skillfully use technology is called digital learning. Hybrid or blended learning occurs under the direct supervision of a teacher in a school or other facility away from home and, at least in part, online with some student autonomy over time, place, path, or pace (Kumar Basak., 2018).

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It includes using numerous techniques, such as blended learning and virtual learning. Often confused with online learning or E-learning, digital learning includes the topics mentioned earlier (Rob Martens, 2012). In this research, digital learning uses internet technologies and MS Teams programs to deliver mathematics content for students to motivate them to improve their academic achievement.

Digital learning Materials

Digital learning materials are the tools that boost student interest and motivation and facilitate idea comprehension. It requires creative, immersive, and information technology-advanced learning material (Hariyono, Widhi, & Ulia, 2021). Teachers can use Digital learning materials to help their students achieve their educational goals (Astuti & Bhakti, 2018). Digital learning materials are increasingly recognized as having educational value in formal and informal settings. Accurately assessing the significance of digital products for educational purposes requires a deeper understanding of their fundamental qualities and pedagogical potential (Ellen van den Berg & Peter Blijleven Leanne Jansen, 2004). In this research, digital learning materials are developed and designed by the researcher, such as animated videos, interactive videos, educational games, the interactive worksheet, and instructional power-point presentations, which guide the participants to use the digital learning materials in a specific sequence according to to motivate them to make a better achievement.

Motivation

The word "motivation" refers to the reasons behind someone's actions. It is what motivates people to act in the way they do. The mechanism that starts, directs, and sustains goal-oriented behaviours is known as motivation (Lens & Vansteenkiste,

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2020). Block et al. (2013) stated that extrinsic motivation could direct the start and bottleneck phases of learning. If it became independent, it would be pointless to have extrinsic rewards, so it switched to autonomous learning. Intrinsic as well as extrinsic encouragement can complement each other. On the other hand, learning often requires some driving force and extrinsic encouragement, as some rewards are usually learned for parental desires, added goals, and acquisition. Motivation for learning is a mediator between stimulus and response.

If students are given natural resources that enable them to be visually engaged and interact with what they teach in class, they will be more motivated to learn (Maulana, F. I., & Purnomo, A., 2021). In other words, learning motivation is the personal views of a learner on relations, and because of separate viewpoints, learners will present different needs for knowledge acquisition. In this research, the researcher developed digital learning materials to motivate the students to learn and achieve better.

Achievement

Academic achievement can be defined as "the degree to which students accomplish the reasons or objectives for which they were sent to school" (Owan et al., 2019). Katz et al. (2011) suggested that the terms academic success, learning result, academic achievement, or learning achievement reflected the same concepts, i.e., the academic learning outcome of students or the continuing outcome through the history of learning. The learning outcome is an indicator for assessing the learning impact of learners (Lubega et al., 2014) as well as a significant factor for evaluating the quality of teaching. In this research, students' achievement is measured by the level obtained

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by the student on the academic achievement scale after analyzing the results of the pre-test and post-test prepared by the researcher.

The Control Group

The control group is the standard used to make comparisons in an experiment. A control group and one or more experimental groups are often included in experiments (Godby & Earick, 2022). In this research, the control group consists of 30 participants that will study the assigned geometric topics for the research using the conventional method of teaching and compare the result of the control group with the results of the treatment group to test the effectiveness of the advanced digital learning materials by the researcher.

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The Treatment Group

The research participants exposed to some manipulation or treatment in the independent variable of interest are referred to as the treatment group (Tikkanen, 2017). In this research, the treatment group consists of 30 participants that will study the assigned geometric topics for the research using a treatment which is the advanced digital learning materials, and then analyze the data to test the effectiveness of the digital learning materials on the students' motivation and students' achievement.

MS Teams platform

MS Teams lets teachers quickly interact with students, exchange files and websites, establish a OneNote class notebook, and distribute and grade assignments. Using OneNote class notebooks and end-to-end assignment management, teachers can create engaging classes and give quick, effective feedback (Pal & Vanijja, 2020). In

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this research, MS Teams is the educational platform to make interactive learning between the teacher and the experimental group to present the new manipulated digital learning materials developed by the researcher to the students to motivate them and facilitate the educational process to increase achievement in geometry for grade 10 students.

1.13 Summary

In this chapter, the researcher presented background about digital learning and its effect on student's academic achievement and motivation in mathematics, which is reasonably significant. It started with the problem regarding the variables of the present research in a significant way. The purpose of the research was introduced, which is reasonably significant. The research questions were a critical part of this research paper because they guided the argument and inquiry with the research's importance, definitions of key terms and assumptions, and limitations.

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