

**The use of Technology in Education: A Study About the
Impact of Using Nano-Learning in Teaching English as A
Foreign Language in Higher Education Institutions in the
United Arab Emirates.**

استخدام التكنولوجيا في التعليم: دراسة حول تطبيق آلية التعلم بالنانو في تدريس
اللغة الإنجليزية كلغة أجنبية في كليات التعليم العالي في دولة الإمارات العربية
المتحدة

by

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of the requirements for the degree of
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ABSTRACT IN ENGLISH

This study case focuses on the changes made in the education sector during the pandemic of COVID-19 and how to use the impact of the pandemic on future learning through using the nano-learning strategy in teaching English as a foreign language at the academic level. The study includes 90 students who are learning English as a foreign language in different institutions in the Emirates of Dubai in the UAE and is supported by English language tutors. The methodology instruments varied from students' questionnaires to teachers face to face interviews and an online interview with a specialist in nano learning strategy in teaching and learning. The study revealed the essential role of technology nowadays in developing new learning environments and the need for immediate changes in the educational system of learning new curricula due to the technological background that the new generation developed in the world of the 21st century.

ABSTRACT IN ARABIC

تركز هذه الدراسة على التغييرات التي تم طرأت على قطاع التعليم أثناء جائحة COVID-19 وكيفية استخدام تأثير الوباء على التعلم في المستقبل من خلال استخدام استراتيجيات التعلم بالنانو في تدريس اللغة الإنجليزية كلغة أجنبية على المستوى الأكاديمي. تضمنت الدراسة عددًا من الطلاب الذين يتعلمون اللغة الإنجليزية كلغة أجنبية في مؤسسات مختلفة في إمارة دبي في دولة الإمارات العربية المتحدة ويدعمها عدد من معلمي اللغة الإنجليزية. تباينت أدوات المنهجية من استبيانات الطلاب إلى مقابلات المعلمين وجهاً لوجه ومقابلة عبر الإنترنت مع متخصص في استراتيجيات التعلم بالنانو في تعلم نطاقات جديدة. كشفت الدراسة عن الدور الأساسي للتكنولوجيا في الوقت الحاضر في تطوير بيئات تعليمية جديدة والحاجة إلى تغييرات فورية في النظام التعليمي لتعلم المناهج الجديدة بسبب الخلفية التكنولوجية التي طورها الجيل الجديد في القرن الحادي والعشرين.

DEDICATION

I would like to dedicate this work to my father who believed in me and in my abilities and has been supporting my educational journey toward success.

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I was fortunate that Dr. Tendai Charles was the coordinator of my dissertation because he guided me toward creativity in the modules and supported me in the process of completing this work. He has all the characteristics of a successful teacher in being supportive, a great listener to all my points, patient toward my questions, and adjusting my ideas.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Teaching development involves identifying current potential gaps within the modern technology evolution along with the new century's need to establish clear organisational methods as an essential contributor to learning growth. However, conflicting views and an overall lack of research regarding technological methods to help manage the classroom development in a highly dynamic environment where the learning process is rapidly and continuously evolving. Views related to the first decades of technology expansion in teaching and learning were highly enthusiastic about the inclusion made in the education field "*One of the most attractive options is that Technology itself will open up more subjects that are roughly along the current curricula trajectories but that are more learnable and provide students and teachers with easier routes to assessing the quality of understanding acquired*" (DiSessa 1988)

This chapter will introduce the study by first identifying the concept of Nano-Learning, providing background and context followed by the research problems, aims, objectives and questions, the significance, and finally the limitations.

1.1.2 Background

Teaching through technology is considered an extension of the field of education. The use of technology went through several stages of development toward raising the educational outcome quality. The first addition of technological tools in education related to the early 1920s (Cuban 1987) and due to the conclusive feedback, the field of education focused on implementing different technological devices to serve the learning system.

This study is based on George Siemens's view on the connectivism theory '*encouraging learners to use technology that leads to decentralisation and fragmentation of information in*

order to form a coherent narrative and connect end point'. (Raymond et al.,1988, p.49-50)
Learners need to link the curricula to the actual environment to alter the learning.

Learning has become an individual quality, according to connectivism, and individuals are able to learn independently in the case of the availability of educational materials and resources that aid in this through technology, as well as in studies that emphasise the role and effectiveness of technology in developing the learning of students in a short period of time. The development of online applications and platforms play a role in teaching users new knowledge as TikTok platform that is consider as a source of learning in a short duration of time, affirmed a positive attitude among learners to receive knowledge and practice with real situations in a short time (Basch et al. 2021). Moreover, in an article related to the use of smart boards and assessing learners' interaction with the new technology, learners developed positive behaviour toward using IWB through interacting using digit and touching tools with smart boards to be involved in the learning process (Gashan & Alshumaimeri 2015).

Nowadays, the world is dealing with the 'YouTube generation'; a generation who uses websites or social media platforms that provide a short clip of presented knowledge and plays a partial role as a learning resources (Roben, Cole & Armstrong 2013). Using technology in the classroom helps learners to combine the content knowledge and the external intellectual environment and the development.

1.1.3 Statement of the problem

Due to the pandemic of Covid 19, the educational institutes were forced to change the learning system to technological input where learners use technical devices to receive the content. (*BBC News 2020*) practice and get the required feedback. As a consequence, to the online learning students developed an e-learning behaviour on how to deal with online websites and definite platforms and through the progression of the case of COVID-19 countries tend to change the learning system to a 'blended approach' (Hoic-Bozic, Mornar & Boticki 2009). where learners master online learning and are able to engage with the educational system through a screen.

1.1.4 Purpose of the study

This research aims to identify and evaluate the method of nano-learning in teaching English as a foreign language and assess the strategies related to the method. This study plays an essential role in the future of the teaching structure in the schooling system where it is going to provide precise, clear, and acquirable digital content.

1.2 Research Questions

This research paper is trying to analyse the effectiveness of using small or tiny units of learning as a part of the curriculum objectives and find out the positive side the Nano-learning system can offer to the learners of multi-intelligence levels.

1.2.1 Questions of the paper

Q1. What is the nature of Nano-learning and what do teachers of EFL wish to achieve through the application of educational technology in school curricula?

Q2. What extent of development does the Nano-learning system add to teaching English as a foreign language in the educational system?

1.3 Relevance and Importance of the Study

This research is inspired by the development of 21st-century skills in education which encourage the use of new skills in teaching and help for faster and easier acquisition. The study focuses on teaching students' content for 45 minutes in a shorter period of time and under less pressure on the teacher. Each lesson of the Nano-learning curriculum includes the main lesson steps of using, image or short video, case study, question or exercise, response, and feedback. The use of these strategies will provide a new addition in the teaching and learning field especially during any pandemic or independent learning as well as during the use of hybrid learning systems combining face-to-face instruction with online instruction, methods such as blended and hybrid IDMs are made possible (Olapiriyakul & Scher 2006). This technique can be used when students miss the lessons or for an intensive learning system, as well as new learning strategies that universities can adopt.

CHAPTER 2: LITERATURE REVIEW

2.1 Nano-Learning Method

Teaching has transformed from elementary material to advanced tools to improve the quality of education. Currently, the educational field deals with curricula that have been designed digitally by computers and introduced to students while they are at home following specific presentation, practice, and assessments tools to alter the learning process. Having a digital curriculum leads to what is known as distance learning (Kaplan & Haenlein 2016) which occurs through access to the Internet. As a consequence of the Internet, an online learning environment created and revived more due to the pandemic of COVID- 19 (Stern n.d.) and with a slight recovery from this, blended learning occurs and applies around the country of UAE (*Return to schools and other educational facilities for the academic year 2021-2022 - The Official Portal of the UAE Government* n.d.).

As a result of new learning methods such as online learning, blended learning, and distance learning, this research presents a mechanism for using an electronic curriculum instead of paper at a time when dealing with a generation raised on the availability of electronic devices that provide easy access to needed information via approved search engines or websites. As a result of the COVID-19 pandemic, educators must place a greater emphasis on e-books and the use of online platforms to promote self-learning in a simple, precise, and direct digital environment

2.1.1 A Brief Background about the use of technology in the field of education

- The use of simple electric devices in classrooms

By the commencement of the scholastic system, the classrooms and the schools were different from today. Nowadays, the cognition distribution of the content is different due to the transmutations in the world of technology and the magnification of nano-technology. The use of technology to enrich the education field started in the 1920s in the audio-visual ages (Sampath 1981). Since then, technology has been used to serve and deliver knowledge.

The revolution of technology in education started with the introduction of computers in some universities and schools in the 60s. In the book, *Technology of Education*, the writers discuss their assumption of the computer's future in schools' accidental revolution of machines in technology that computers are going to be ubiquitous and will be the centre of teaching (Nickerson & Zodhiates 1988).

2.1.2 The introduction of computers in classrooms

By 1970 the introduction of a computer in every school in England (Passey 2014) started even though the computer was available at schools, there was no sufficient use due to the lack of adequate programs and software students and teachers can easily use. Lately, a software called Zork (David et al. n.d.) was released and students were highly interested in using the computers since Zork works on presenting limited vocabulary words with a source of interaction in the forms of questions, puzzles, and magic. As a result, students were waiting in line to be part of Zork. However, this interaction was considered “to present a reasonable, if limited approximation to the intelligent response” (Arthur Tatnall 2014). At Dartmouth University, John Cami and Thomas Curtis noticed the number of enthusiastic students using the computer so they developed software, helping to interact directly with the computer group of students in the state of individuals and that helped to spread the revolution of using multimedia and the computers (David et al. n.d.).

A decade later, the Internet network spread and helped connect computers which result in dramatic growth in the World wide web (Arthur Tatnall 2014) through introducing emails, videos, enormous digital media, and enabling two ways of communication. (*BBC NEWS / Technology / How the web went worldwide* n.d.).

2.1.4 The influence of using computers supported by the Internet

The study of K. James (1991) performed a meta-analysis of 4,444 studies at primary, secondary, tertiary, and adult levels. He found that computer learning could increase scores from the 10th to the 20th percentile and shorten the time it takes to reach a goal by one-third. Furthermore, he

found that computers improved classroom performance by about half a standard deviation smaller than the one sigma difference achievable through peer learning. However, this analysis did not include new studies using advanced technologies and new educational paradigms and the continuous development of machines in technology that delivered smaller devices and smaller software.

Technology, provides language learners with an abundance of resources (Bull & Ma 2001) and several studies emphasised the role of using computers as a modern technological device and the impact of the software in the classroom and one of these studies as Bayraktar concluded that “computer-assisted instruction was effective in science education” (Nickerson & Zodiates 1988), moreover, “the usage of appropriate technology resources can be beneficial to students to raise the language acquisition” (Douglas H. Clements & Julie Sarama 2003). In addition to that, “the application of computer-based language activities in teaching English helps improve cooperative learning in learners’ (Jeremy Harmer 2007).

Another study conducted a meta-analysis on the effectiveness of computer-assisted instruction in science education and this study, which looked at the research about high school science instruction, used data from 42 studies, and revealed computers, for example, are more successful when utilised in simulation or teaching modes, and the result of from the 50th percentile to the 62nd percentile in science (Bayraktar 2001). Furthermore, researchers looked at the effect of computer-assisted instructions on reading achievement. This meta-analysis found 17 research studies that met the criteria for inclusion in the analysis. The authors concluded computer assistant instructions do have a positive effect on reading achievement (Soe 2000). These two studies are some of the more specialised meta-analyses. Most of the best known and most often cited analysis, cast, and even a broader net. “Almost all of the more general meta-analyses used similar procedures to sue Cookie and Chunk. “Bankrate Drones, Kulik and Kulik 1985 colleague. Bankrate, Downs and Williams 1983 Kulick Kulik and Vanguard Downs 1985.1991 Ryan 1991” reported the general conclusion that computers are good in schools” (Nickerson & Zodiates 1988). In addition, “The 15 or so meta-analysis of computers in schools is cited over and over in literature. Support increased use of technology in education. For example, the widely cited Malik and Report's catcher in 1999 begins its discussions. Of the data with me to analysis. By James Colic, 1994. The report also reveals a

large number of the strongest research studies on computers as a learning tool.” (Johnson & Maddux 2003)

2.2.1 Definition of main concepts of nano, nanotechnology, and learning.

The term ‘nano’ was first introduced as a prefix to qualify for quantification of a content of a metre by The General Conference on Weights and Measures (CGPM) in 1960. The word nano has the Greek inception spelt as ‘νανος’ which means dwarf and nanus with a single ‘n’ in Latin, 19th century. According to Joachim, C et al, (2000) nano have Greek and Latin inchoation and each was defined discretely and each can be quantified according to a statistical approach and individual approach of a phenomenon. In integration to that “nano is one billionth of or 10^{-9} part of a thing, for example, $1 \text{ nm} = 10^{-9} \text{ m}$ (Joachim, Plévert & Crisp 2009). “Nanomaterials consist of nanostructured materials and nanoparticles, which can be defined as nano-sized complexes of interrelated atoms and or molecules” (Abdullaeva 2017) i.e. the nano is a bite-sized of the prodigiously minute size of a more sizably voluminous unit or atom. According to the Oxford dictionary, Nano is a minute quantification unit and profoundly diminutive in the field of technology, in another view “this can avail reach adequate results in exploration or analysing the materials at the nanoscale” (Kharisov & Kharissova 2021).

2.2.2 The progression of nanotechnology

Therefore, the words nano and technology are attached to present small bites of units in the digital world to present innovative material or work which makes progress in the specific area of the investigation. "The simplest definition of nanotechnology is technology at the nanoscale"(*Nanotechnology: An Introduction - Jeremy Ramsden - Google Books* n.d.). The definition has shifted from a specific technological goal to a research category that encompasses all types of research and technologies dealing with the special properties of matter that occur below the given size threshold’ (Kharisov & Kharissova 2021)

‘The scope of using nanotechnology in the learning and teaching system is quite new and under progression in some countries, however, the use of technology to enrich the education field started in the 1920s in the audio-visual ages and since then the technology has been used to serve to deliver knowledge.

Between 1995-2000, the digital age has transformed due to the existence of the Internet which allows people to search, explore and engage with each other in a sort of interactive community. The effectiveness of the digital world in the education field developed to through time and started to add nanotechnology i.e., the move from big equipment such as desktop computer, projector, cassette player, DVD player, or television in the classroom to smaller devices where each learner has a single device and follows specific techniques that promote learning with problem-solving or specific function performance. Joachim believes nanotechnology is an approach where individuals can be analysed through a tunnel scope, and this can be presented as students' performance in a certain topic and measured through specific measurement data. Nowadays, to measure students' performance teachers tend to use platforms that have easy online access or can be downloaded in the device as Kahoot which allows teachers to create online pages with different questions that can create interaction with learners and the content. 'This is a modern technique that can be applied during the session to assess students' comprehension in a fun way of learning and as advantage of this strategy is, it helps reduce the learning period. This application is downloadable on the mobile phone as well, so teachers can check students' performance in a smaller unit and in a time of 30 seconds' (Chiang 2020). Furthermore, the application is called Quizlet, which allows learners to engage and interact individually to the content and teachers follow the students' performance as the previous application. 'Language learning through Quizlet raises students' words' meaning and vocabulary capacity' (Gilbert Dizon 2016). Moreover, Socrative is a platform that helps teachers to design and plan a quiz for students to answer individually which can be applied at the end of the learning period and this application guides teachers toward students' performance for each question or data presented. "Collaborative learning and engagement of students in the class improves student learning performance" (Awedh et al. 2015). In addition, the application Formative can be a teacher assistant due to the various options to present to the teacher. It allows teachers to use audio, video, images, type a variety of questions, and upload any document to the students to interact with. This application helps clarify the content and can guide to minimise the lesson through a digital lesson as the purpose of this paper (*Formative / Real-Time Formative Instruction* n.d.). Additionally, Quizizz is a platform that creates an assessment too during the class to help break the classroom routine and add fun procedures or it could be delayed for students to be engaged at home. This application was similar to the previous but noticed it 'raised students' motivation to learn and answer the questions in EFL classes'

(Zuhriyah & Pratolo 2020). Each platform is secured by a private teacher's account and a teacher who controls the participants in the presented activities, and this creates a safe learning environment. In addition to that, these learning websites represent the main goal of this paper through creating a digital version of a lesson with multi-learning resources that help entice students in a short period of time that can occur either in the classroom or in a distance supported by immediate feedback.

2.2.3 Definition of learning under the scope of technological equipment.

Historically, many theorists developed various theories that proposed diverse motivators. Some theorists believe the human level of motivation is raised toward the environment, but others argue that claiming human beings' behaviour is caused by the organism, not in the environmental force (Grusec 1992).

According to Bandura's social learning theory, humans learn by psychological elements that go through four phases: paying attention, remembering, repeating, and reproducing, and the prosperity in these stages leads to originate motivation, which leads to reproduce this cycle again (Bandura Albert 1971). Therefore, the participation of online applications or platforms as presented earlier supported with proper images, illustrations, or through observing videos helps raising the first stage of learning in his perspective and the use of these multimedia raises students' awareness of recalling the presented information in a later stage, therefore, through the use of presented stages, students can discuss the content by a discussion section either verbally in the classroom or in the online platform or through practice section that helps repeat the content. Finally, the success of the three stages can help students to reproduce the presented content again by the evaluation stage. Bandura believes learning occurs through interaction with the content.

In the learning theory of Sweller, applying the ARCS model of motivation can be the main design to help gain learners' attention to the learning process by using the proper stages of attracting learners toward satisfaction. Appendix A: ARCS

Sweller believes that learning is best accomplished by breaking down information into small bits, having prior knowledge, and avoiding distractions. According to Reigeluth (1983) in the

elaboration theory, learning occurs in stages, from simple to complicated, as in the creation of a standard curriculum, and this can be efficiently implemented using brief clips, images, or puzzles that are appropriate for the student's level.

According to the community of practice, the interaction between a group of learners who share the same interest raises the capacity of understanding the content as well as memorising the new knowledge. Recently the interaction phenomenon has changed, and it can be a manner of an online community of discussion through using appropriate blogs or platforms through video, audio, or written form one advantage of it is it can be recorded, and participants can go through it several times. Therefore, Wenger (1998) explains the dimensions of a successful practice related to real situated cognition. Learning a foreign language exists in the situated learning theory and can be applied through virtual online trips to collaborate with peers and instructors digitally. This view helps learners to engage with the virtual world and interact with real people who share the same thoughts and ideas. And it leads to collaborative learning and enhances the problem-solving technique among learners, as well as creating a learning community that raises the possibility of critical thinking (Wenger 1998). The idea of Wenger can be applied in a web source as the flipped classroom, or blended learning environment. Appendix B.

Moreover, Skinner agrees with this perspective, claiming that providing appropriate reinforcement promotes student productivity and participation (Skinner 1958). This is often utilised in online gaming platforms for the four basic skills of learning English, particularly during the Covid-19 pandemic.

Unfortunately, some discussion and competing platforms do not assist a large group of students in problem-solving situations, and learning cannot be focused on students who have a limited understanding of the learning topic. However, some of the theorists are difficult to be applied depending on the e-learning as Vygotsky in the social development theory because it requires a specific help from the teacher to deliver the content and guide the learners to reach the Zone of Proximal Development (ZPD) to avoid any struggle in a learning situation (Vygotsky 1978).

Further explanation of the Experiential learning theory helped simplify how learning can occur in a digital world and through providing samples or models to be observed by the learners through steps of observing, thinking, planning, and doing. In this view, learners are stimulated through materials presented prepared by the teacher and reflect on the learning content to build

a context, finally creating self-learning. Successful learning occurs through a balance of different aspects in the cycle (Kolb 2014). Appendix C.

The importance of social learning theory is also applicable to learning through a digital environment (Falk & Kim 2019). It encourages learning to be more in an oriented social context and suited to the content and provides learners with modelling, coaching, scaffolding, articulation, reflection, and explanation.

According to the previous learning theories, the nano learning environment can be created through the digital world to attract learning and design curriculum, however, a social context is required.

2.3.1 Learning English as a foreign language under the scope of technology

Learning English as a second language or as a foreign language witnessed a lot of changes in the past decades. Learning a new language must evolve receptive approaches so production can be revealed. The process of acquiring new understanding, knowledge, behaviour, skills or values, attitudes, and preferences depends on the person's interest. The main aim of the learning process depends on how to maintain the new knowledge in the long-term memory to preserve the information through the appropriate learning strategies. Humans' brains are unique depending on previous experiences and providing the learning choice helps learners to acquire the new knowledge in an appropriate environment.

According to scientists each human being's brain has billions of neurons, and each has from 1000 to 10,000 connections to other neurons (Ellenbroek & Youn 2016). This concludes students don't have identical brains and that creates different learning styles of students which must be taken into consideration during the learning period and the instructor must use relevant to the learner's interest, meaning and enjoyment. According to cognitive conflict, learning occurs when a teacher introduces the knowledge that catches students' interests and is related to prior knowledge or previous experience and uses multiple solution paths. As a consequence, the development of technology helps provide several types of learning sources and media to support different learning preferences such as the use of images, videos, interaction, audio, and fun learning materials. All of these resources can be found on one device like a computer or a

smaller device such as a tablet. The existence of the computer is essential and plays an essential role in learning a new language and helps raise the learning quality as well (Liu et al. 2002). In addition to that, the use of computers with multimedia provides essential resources for the language learner (Bull & Ma 2001). Moreover, the use of computer-based language activities improves cooperative learning among learners and helps create a positive learning society (Harmer 2007).

However, the use of the multi resources media in the computer must be applied appropriately to the learners (Clements, Clements & Sarama 2003). Due to the various resources' computers can provide, teaching becomes easier when prepared with various activities. This provides a variety of learning experiences for the learners. (F. Larsen & Anderson, 2011). Studies supported the view that language learning development and teaching methods have been improved due to the revolution in the technology of applying computers, the internet, and learning applications (Gilakjani & Sabouri 2014) & (Kamila, Shyamlee & Phil 2012). Furthermore, the application of technology helps enrich the learning environment with several methods and provides alternatives as making teaching interesting and more productive in terms of advancement (Patel 2013).

Having the appropriate methods in teaching that encourage students to engage and create opportunities to work and experience helps create a positive atmosphere in the learning environment and this makes students the centre of learning (Dawson, Cavanaugh & Ritzhaupt 2014). Additionally, providing learners with a learning device supported with multi resources help students to gain the responsibility of their learning instead of depending on the teacher as the only source of knowledge (Drayton et al. 2010). Device learning increases students' responsibility toward the content and raises their awareness toward the received context; as consequence, each student is responsible for personal behaviour.

The development of the technology in learning arose over time, aiming for clear and precise learning where learners receive the content and engage in peers or group discussion through a device in a verbal or written discussion context. This development was made clear in the last two years due to the pandemic of COVID-19 and the creation of the online learning system. The online learning system is new, and it is the teachers' responsibility to provide students with suitable activities to help students' full engagement during the online session (Egbert 2020). Many reliable applications and platforms were created to teach a second language and are being

used in classrooms. According to a study by D.Irita & G. Julia (2020) the use of ‘Chabot’ application helped participants of the application to enhance and increase their knowledge of the English language through talking and expressing the language as well as observing the appropriate pronunciation of utterances. (Dokukina & Gumanova 2020). The changes of learning English as a Foreign language through devices lead to improve students’ knowledge and organise fruitful work (Kerimbaeva et al. 2017). Due to the existence of technology in daily life and being a reliable resource, the use of technology must be linked to the implemented learning culture and society (Moreira dos Anjos Santos et al. 2018). The existence of online sources help raises awareness toward the flipped classroom method and students create a self-confidence attitude toward the learning content with less anxiety in using technology (Webb & Doman 2019). “Strengthen the teacher’s role in technology-facilitated language through a systemic evaluation of technological devices’ and ‘ Having a device with multi-media that supports learning changes the learning policy and produces a type of informal learning that can result the same as the formal one (Stockwell 2021).

Moreover, online learning, or learning via devices such as a laptop or tablet, provides a variety of reliable materials such as films, animated images, and documents in different formats, and the entire lesson plan is based on digital tools. Furthermore, instructing students via online resources improves their meta capacity for autonomous learning, allowing them to build flipped classroom techniques or use the offered lesson as a post-learning tool. The strain on the teacher to re-explain the entire lesson is reduced by having online classes that students can access at any moment due to unforeseen circumstances. Finally, using digital resources is thought to be less expensive and time consuming. (B. Olga, et al. 2021)

2.4 Theoretical Framework

The current study, constructed on four main theories which will help enhance the topic of this paper and analyse the content of nano learning through using: 1. Connectivism theory in George Siemens perspective, 2. Connectivism theory in Dowin 's view, 3. The constructivism and behaviourism relations in online learning, and 4. Cognitive Load Theory of John Sweller to answer the main questions of this paper.

2.4.1 Connectivism theory in George Siemens perspective

Learning theories developed through time for the account of learning outcomes. The connectivism theory is the main theory that is based on the new revolution of learning through technology that tries to simplify learning in the 21st century due to the existence of multi resources and online interactive communities. George Siemens a professor of Distance Education Centre, a researcher, and a strategist at Technology Enhanced Knowledge Research Institute (*Dr. George Siemens / The Texas Center for Educational Technology* n.d.). He introduced the connectivism theory in 2005 by online article along with Stephan Downen who is a researcher and a philosopher in Digital Technologies Research Centre at the National Research Council of Canada (*Stephen Downes / OEB* n.d.). Siemens published the first article about connectivism in 2004: *Learning as a Network Creation* (Smith & Porath n.d.), while *the article of An Introduction to Connective Knowledge* was published by Downes one year later (Latchem 2018). Siemens believes improving society depends on improving the individuals through a well-prepared context of teaching and learning which is based on various principles. The view of Connectivism is a modern framework based on understanding through technology. It focuses on using the Internet to develop websites, platforms, applications, search engines, new technologically innovative tools related to the online discussion forums in the educational field. The theory based on addressing the new learning environment toward the transformation and technology learning new content is about understanding and building a new context, not about memorising facts or repeated information. The video (George Siemens 2013) illustrates "In the past, education was more like a wheel... the instructor was at the centre of Learning....and today the instructor's role is still critical... and the textbook is still important, but they are no longer the centre part... they are a node in the overall network with enormous knowledge nodes competing for what you do".

‘The application of network principles to characterise both knowledge and the learning process is known as connectivism. Learning is defined as the production of new connections and patterns as well as the ability to manage around existing networks/patterns. According to connectivism, Knowledge is defined as a particular pattern of interconnections, whereas learning is defined as the ability to manage the existing networks/patterns. Connectivism highlights the fluid nature of knowledge and connections based on context, whereas other theories only pay partial attention to it. As a result, it is becoming increasingly important that

we focus on our relationships with one another and the context in which those interactions occur, rather than on premade or pre-defined knowledge. A space of knowledge connection benefits from the context just as much as it benefits from the content' (Barnett, McPherson & Sandieson 2013).

Receiving new information changed in the past twenty years due to the existence of the internet and because of that a need for new learning theories to support learning toward technology. Recently, people's knowledge capacity has changed due to the existence of the Internet and the multi-resources provided by various websites. "People have much more knowledge than appears to be present in the information to which they have been exposed" (Thomas K. Landauer & Susan T. Dumais 1997) i.e. in the past, children at school used to receive information or knowledge from limited resources like books or libraries, unlike today. The changes in technology and the internet being part of daily life and being an easy method to use helped extend and raise people's knowledge of the world. Consequently, connectivism based on George Siemens' view relies on four major learning theories which are chaos, network, complexity, and self-organisation theories. The main principles of Siemens theory are, that learning occurs when dots are connected to create a knowledge network and diversity of opinions is expected during the perception period which might happen in non-human appliances such as laptops or tablets. Furthermore, Nurturing and maintenance are required to keep continual learning because the learning process in Siemens's view is continuous. After all, learners develop self-esteem toward learning which leads to critical thinking.

2.4.2 Connectivism theory in Downs's view

Stephen Downes works with the Digital Technologies Research Centre at the National Research Council of Canada specialising in new instructional media and personal learning technology. His degrees are in Philosophy, specialising in epistemology, philosophy of mind and philosophy of science (*Stephen's Web ~ Page 152* n.d.) emphasises the essential role of connectivism in the current diversity of learning resources and the Internet age. In terms of analysing this theory, Downes defines knowledge as a set of connections formed by actions and experience from a device to

the neuron systems to form a vast network of connections which creates new learning in a less restricted environment supported with appropriate activities and tools to maintain the self-directed learning and perfect interaction environment among the society (Downes 2008).

While Siemens believes a digital network qualifies the receiver neuron system, Downes argues that by separating the device from the receiver as the digital device plays a role of a source only. " The human mind and society are two spread networks that interact with each other through a process of emergence where the other network creates patterns and recognitions where the other network proceeds those patterns" ((4) *Five Minutes on Connectivism - YouTube* n.d.). In short, the theory of connectivism holds that information is shared throughout a network of connections, and that learning is defined as the ability to establish and traverse those networks.

“Education today is about learners understanding relationships, not simply memorizing facts.” (George Siemens: Changing Schools, Changing Knowledge - YouTube 2013). Relating this to a study was conducted on newly graduated students from Harvard University and asked, “why do we have Four Seasons?” The majority couldn't answer because students are exposed to facts just to memorize and repeat. (George Siemens: Changing Schools, Changing Knowledge - YouTube 2013). According to Siemens, naming things is considered to be low-level knowledge and not recommended in a digital world of interaction with the learning material can occur.

Even though Connectivism tries to analyse the impact of using technology in learning or acquiring new knowledge, the theory of *Distributed Cognition* is an extension of Cognitive Science that claims that ‘human knowledge and cognition do not alter by individuals but through memorizing facts, information, and naming items around’. This perspective was discussed in Vygotsky's *Mind in society* (L.S. Vygotsky 1978) and (Minsky 1988). In addition to that, this perspective is supported by Verhagen who believes ‘connectivism is a pedagogical view ‘more than being a learning theory and “I think that we should forget about connectivism.”’ (Pløn Verhagen 2006)

Kolb and Hill asserted the role of connectivism as important in the digital age, however, it plays a role of a tool rather than being a viable theory (Rita Kop & Adrian Hill 2008). Moreover, Kerr (2008) claims that connectivism is a tool that supports the main learning theories and not a new learning theory (Kerr, B 2008). Furthermore, learning occurs, but individual learning requires a collaborative learning environment, and to conclude that the connectivism theory does not promote alone (Bandura Albert 1971). Supported by Miller and Dollard in Social Learning Theory, learning to alter in the social learning context and through experiencing the content (Miller & Dollard 2003).

Furthermore, situated cognition believes what the learning system need is a model, not a new theory or a new concept (Anderson 2004). Again, according to LaaN Theory, connectivism misses some aspects related to reflections, error dictation, correction, and inquiry (Mohamed Amine Chatti, Ulrik Schroeder & Matthias Jarke 2012).

2.4.3 Constructivism and Behaviourism view on online learning

Constructivists believe that students build new information on their own and then utilize it to build on past knowledge and experiences. The learner is the centre of attention, and instructors serve as facilitators or guides, providing suitable and enriching materials. The adult learning style is strongly supported by this idea. Based on constructivism, the online teacher serves as a facilitator, monitoring and providing a safe, constructive, and inspiring online learning environment, as well as a tutor, providing each student with the necessary skills and knowledge (Parke 2000).

The behaviourists believe in the "black box" idea, which states that a response to stimuli may be measured statistically while ignoring the impact of mental processes. The behaviourists' approach to learning was used to create early computer learning systems. Learning, according to the behaviourists' school of thinking, is a change in observable behaviours generated by external stimuli in the environment (Alomyan & Green 2019).

2.4.4 The Cognitive load theory.

In a classroom, a teacher deals with multi-level and different personalities of learners of different backgrounds and delivering the contexts to every student in the appropriate way requires a well- understanding of intellectual skills. Moreover, in two to four hours of classes student's brain cannot function for a long period, and the student can understand better in the first few minutes of the session. According to several studies done by John Sweller, 'short-term memory is limited and cannot work effectively with pressure or overloading information which lacks the learning process' (Sweller, Ayres & Kalyuga 2011). According to Sweller et al (2011), Cognitive Load Theory is "*The total amount of mental effort being used in the working memory*" and the amount is categorized as germane, intrinsic, and extraneous. Therefore, the effort of working memory to manipulate new information is considered to be stored in a limited memory. This memory might get overloaded due to the number of information presented or due to the hours being spent in the learning. Therefore, a lot of effort depends on the teachers to help learners empower their short-term memory to transform the information into their long-term memory.

A teacher can help learners process the information through using a simple presentation with appropriate tools and focusing on the main elements and state of unnecessary information. For instance, using simple images, short videos, sounds, graphics, main words, and easy to follow visual presentation represent the main principles of this view, which help reduce the cognitive load and increase retention. His view is based on multimedia supported principles derived from the cognitive perspective. Mayer constructs a branch of the e-learning concept based on the five principles of the cognitive load theory and it evolves about how to promote learning through educational technology which is similar to the connectivism view (Richard E. Mayer 2003). However, to enhance the efficacy of multimedia communications based on the characteristics of how humans process information during learning, people learn better when visuals and words are combined. See Figure 4

Therefore, multimedia learning is a unique concept of e-learning theory that believes that instead of one or three formats, deeper learning can be encouraged by using formats of audio, visual, and text. E-learning theory also emphasizes the need for personalization. According to this principle, presenting words conversationally and informally can aid in effective learning (Mayer & Moreno 2003). Mayer's views exclude multimodal learning as a means of knowledge

transmission and response reinforcement. For instance, they are promoting recall through drill and practice methods. Rather, the theory adopts a knowledge creation viewpoint.

2.5 Similar Studies

- A study conducted in Kuwait Process 23 classes of Grade 5 for one semester to investigate the impact of using a blog on writing went through three stages that include tutor blog, class blog, and learner blog. The study confirmed results of improvement in students' dictation, raising of students' motivation toward learning, students writing length and vocabulary increased, and educators were enthusiastic about using technologies. One main impact to include is participants agreed on using social media to help for better learning and suggested names of specific applications to include in learning as clear evidence for the young learners or the coming generation is building new methods to learning which is related to technology (Al-Qallaf & Al-Mutairi 2016).
- In 2019 a study upon the impact of videos to improve students' achievement on spoken English in EFL classrooms, a questionnaire study was conducted in King Khalid University on 48 students who observed pre and post-tests to measure the influence of using YouTube videos on students speaking skills. The study revealed the positive impact of educational videos of YouTube to help raise students' competencies and speaking in comparison to the 48 students who have observed the spoken language through tapes only (Albahiri & Alhaj 2020).
- A study in 2020 was conducted on 26 students of pronunciation classes in Yemeni EFL students at the College of Education in Socotra. The study included qualitative and quantitative research methods through questionnaires, structured interviews, and a pre and post-test on students' achievement. The data revealed a positive attitude toward using the videos and visuals as being resources for learning and high self-dependency on learning before the class and using the same materials as sources for post-learning. The quantitative data confirmed the high results of students'

achievement in the post-test. The correlation $r = 0.779$ with $p < 0.001$, two-tailed (Bin-Hady & Hazaea 2021).

- Teacher perceptions of the effectiveness of using handheld devices in Saudi. If all classrooms practice is a study of 108 students of FL in Saudi University that applied qualitative data to investigate the teachers' attitude or perception toward using tablets or smartphones in the classroom to engage students in the learning process. The results were confirming the positive impact of using tablets and the results of this study show that teachers believe that mobile learning boosts students' happiness and motivation. However, teachers were not familiar with the use of these devices and felt a need for more training on how to apply them in the classroom to serve the teaching process (Al-Mubireek 2020).
- In 2010, a study on 123 senior students of the Applied English Department of a Polytechnic University in Taiwan followed both quantitative and qualitative methods to collect the required data on the impact of using the software program in learning English. A questionnaire was conducted to gather students' backgrounds about learning the language through software and another one to measure students' attitudes toward the effect of using the learning software. Moreover, interviews of 40 minutes were conducted among the teachers to reflect on the learning through programs (Soong 2012).

2.6 Summary

This chapter discusses a variety of educational theories that are important in teaching English language, as well as what is related to learning through computers or tablets supported by the Internet. It focuses on connectivism theory viewpoints and the extent to which it is activated with modern learning, as well as cognitive load theory, which links between the use of devices and the reduction of pressure on the brain, which contributes to the assimilability of the English language and the existence of both constructivism and behaviourism in learning thorough digital curriculum. Finally, the presentation of various studies on the use of technology in the classroom helped students be more efficient in learning the second language by increasing their

motivation. In terms of comprehending academic content and enhancing pupils' abilities in linguistic vocabulary, as well as the correct way of pronouncing words, through the use of audio and video appropriate to the content of the subject as well as to the level of students.

CHAPTER 3: METHODOLOGY

3.1 Introduction

Through the provided literature on the role technological devices that can offer in the learning process of acquiring English as a foreign language and the extent of knowledge a learner can receive during a period through following a specific small device supported by a digital curriculum, a research study launched to measure the extent of avidity to use devices in learning and interacting with the curriculum. Furthermore, analyse the role of the teacher in a time where the Internet network plays a part in the teacher's role through providing the knowledge to the students. Moreover, analyse the impact of using digital tools on students' behaviour in cognitive perspectives, and measure the extent of using technological devices to teach the second language.

This research is based on the view of connectivism which emphasizes learning can occur and acquire through a digital device for a specific duration if it was supported by attractive visual and auditory materials. This view was suggested by Siemens in 2004 and Downes in 2005 that is practised through the MOOC platform and the cognitive load theory which emphasizes the role of connectivism through providing learners with the appropriate tools that attract the brain cognition in a short period: therefore, this research is based on a qualitative method to explore the extent of using digital platforms in learning new knowledge.

This chapter begins with the main questions the paper is trying to answer; then the scope of the targeted participants and the reason for selecting them for this project. Next, a review on collecting and analysing data; followed by a discussion of the extent of validity and reliability that have been used in this paper. Finally, a description of the ethical consideration that has been applied to this research.

3.2 Research Questions

The research questions specify which sources should be cited, how an argument should be structured, and what a paper should accomplish. The research question narrows the topic and ensures that the work follows a logical path. Furthermore, the research question informs the

reader about the content of the study (White 2017). The qualitative method of this research is trying to answer the following questions:

General hypothesis question:

1. Does technology develop a new learning theory?

Null hypothesis: learning English as a foreign language through technology is not effective.

Alternative hypothesis: learning English as a foreign language through technology is effective.

These hypotheses are suggested before conducting the survey and the literature review section provides valuable information related to the history of technology in the education field and how it helped develop the learning system along with several views that support the role of technology in teaching. However, some argumentative views lack further expected development in relation to individual learning and the result of the finding will confirm the suggested hypotheses.

Sub-Research Questions:

Q1. What is the nature of Nano-learning and what do teachers of EFL wish to achieve through the application of educational technology in school curricula?

Q2. What extent of development does the Nano-learning system add to teaching English as a foreign language in the educational system?

The previous chapter of the literature review presented historical background on the use of technological devices in the education field to serve the learning process and due to the positive impact of this, several studies confirmed the positive role of using computers and tablets in learning, and the essential role of different applications to help interact with other learners and with the teachers outside the campus. However, some studies showed that the

missing of a powerful Internet network and sometimes lack of experience in using modern devices or specific devices on teachers slow down the learning process.

3.3 Participants

This research study is conducted in the United Arab of Emirates among foundation level students of English courses during the influence of COVID-19 where most classes were blended. It took two months to collect the required data. The total size of the participated students is 90 students from a total of 14 different universities in Dubai and Sharjah. And participants number of 4 English teachers took part in one-on-one interviews from different universities. Additionally, data were collected through an online interview conducted with a European company that advertises for nano learning. Due to the current circumstances of COVID- 19 the number of the sample size being processed in this research will be circulated among all the participants.

3.4 Research Methodology

This qualitative research “examines the qualities ... of communication phenomena” whereby “data tend to be continuous rather than discrete, and the emphasis is on description and explanation more than on measurement and prediction”(Jablin & Putnam 2001).

This research paper focuses on qualitative methods for exploring and investigating the extent of using technology in learning English. The research uses a variety of methods, such as intensive interviews or in-depth analysis of historical materials, and it is concerned with a comprehensive account of some event or unit and measuring people’s attitudes toward the new changes in learning and acquiring new knowledge in a digital concept, (King, Keohane & Verba 2001). The grounded theory method is going to answer the main questions of the paper through analysing the semi -standardized

interview of the nano learning founder and extract the result to two dimensions of open codes and axial codes to finally form a theory. This study has a wide range of data that needs to be analysed and developed based on previous theories and hypotheses to construct a new one to collect students' experience with the new changes in learning through using a tablet instead of books and reflect on their experience of previous and new learning methods to develop new learning methodology (Anselm Strauss & Juliet M. Corbin 1998). And can be applied to the teachers' structured interviews to analyse teachers' thoughts on the changes the academic system faces during the pandemic of COVID-19 and find similar ideas the instructors suggest as well as what might help serve the teaching process and what should be avoided or be taken in consideration. Moreover, reflect on the teachers' experience in teaching a foreign language through their expertise in teaching and the changes that have been added to the education system and how powerful these changes are concerning technology, devices, applications, communication, and types of assessment. This theory is being processed because all the participants have experienced the phenomenon of learning through a tablet. This research design seeks to develop previous theories not always suitable for participants' understudies "can help forestall the opportunistic of theories that have dubious fit and working capacity" (Glaser & Strauss 2017).

3.5 Data Collection Method

As the aforementioned in the previous section, research is planning to investigate the impact of using the new technology of the 21st century and two main analyses are used to develop a new learning theory.

3.5.1 One-on-one Interview

The interview is a social context which is commonly used for qualitative research. An interview is used as a collecting data tool that includes discussion and interpretation in observing the body

language of the interviewee with a focus on their intonation, eye contact, the visual cues that allow for improved communication (NG Fielding & H Thomas 2008). There are three main types of interviews to collect data of a qualitative; standardized interviews, semi-standardized interviews, and unstandardized interviews and they are sorted according to the types of data collected and the extent of information needed to adjust the accuracy of the results (Earl R. Babbie 2001). Since this research is seeking for specific answers to pre-prepared questions and pursues experience on the topic, a flexible approach is needed to be applied (Coughlan 2009). Therefore, a semi-standardized interview has been conducted because some questions need direct answers with the impact of teachers' backgrounds and this influence is expected to change and adjust some questions during the interview. Consequently, open-ended questions were applied to four English tutors of different institutes in the emirates of Dubai. The interview phase includes an introduction that requires a self-resume and experience of the teacher in the field, core questions which require open-ended answers related to the topic and discussions between the interviewer and the interviewee, and a conclusion that includes the interviewee's suggestions and ideas as well as reflection on their experience.

3.5.2 Online- interview

The online interview is following a semi-standardized interview with the company's interviewee who is responsible for developing the method of nano learning in acquiring new knowledge. This semi-standardized interview is following the distance concept since the interviewee is living in another country and due to the technology, an online interview is suggested to help answer the questions and narrow down the main topic of the paper (Rabionet 2009). The use of online interviews has been raised due to the Covid-19 pandemic impact on people (Patel et al. 2020). According to Back, 2010 using video calls as a source of communication to interact and discuss with another part helps extend a new way of communication and helps rely on new concepts of evidence. Similarly, in an online context, respondents are more inclined to communicate their deeper feelings than in traditional interviews. Moreover, an online interview is considered to be a scientific social collection tool to analyse and interact with a partner or a group of people (Richard C. Hanna et al. 2005). There are two types of online interviews asynchronous and synchronous interviews. The asynchronous interview does not require the presence of the participant while the other one is set on time in relation to the other part of engagement which requires texting or voice engagement and video call. This research requires a video call interaction with the other part to

answer pre-prepared questions and discuss the influence of nano learning in the field of practice. The recorded information needs to be analysed critically through the data obtained and interpreted and its authenticity (Orgad 2009). Online interviews provide greater spontaneity than online asynchronous interviews, enabling respondents to answer immediately and interact with one another (Henrietta O' Connor 2001).

The basic design of the online interview is based on emailing the participant to ask for a permission to conduct the interview and sharing a summary about the research topic. The second phase is to decide on appropriate time and application to start the interview. The interviewee has to answer pre-emailed questions that starts with introducing the company and their role in applying the concept of nano learning. Then discuss core questions related to the systematic design of the term and finally discuss their reflection or feedback on the process as well as the expected usage of the nano learning application.

3.5.3 Questionnaire

A questionnaire is a scientific method that refers to a set of questions to measure various social issues, people's opinions, attitudes, and preferences (Gillham 2008). The questionnaire can take different forms as handed out, face to face with presence of the researcher, or mailed through post or emails. These forms of the questionnaire can be either closed questions as yes or no, fixed number or responses scales, multiple choice or open questions which allows participants to provide an explanation or long responses (BOLTON 2022). Since the research, tries to explore new learning methods among learners of the 21st century, questions were applied among 90 students from 15 colleges around UAE using closed answer questions following both electronic and handed out questionnaires. The questionnaires follow a dichotomous scale in which major participants' level of agreement with the provided statements. The logical sequence of the question is designed upon the view of four main learning theories as cognitive behaviourism, constructivism and connectivism. This questionnaire was distributed among learners at the same time as teachers' interview as a way to measure teachers' responses to the students' attitude toward the changes the education system face.

3.6 Data Analysis

3.6.1 using grounded theory to analyse the collected data

Grounded theory is a term that refers to well-organized procedures that go through specific conditions to create a set of concepts to provide a theoretical explanation to conduct a study on a phenomenon that employs a variety of methods and variations of people's experiences, as well as data collection. It is an inductive approach to generating a theory based on qualitative research data that is regarded to be using codes. The grounded theory is based on analysing data in a social context. It is formed to evaluate the gathered information to create a new theory related to language learning in a new learning context (Martin 1986). The grounded theory is a qualitative research method that enables two deriving new theories based on the collected data from the real world.

The education system is facing a new transformation in knowledge delivering content and this new phenomenon needs to be adjusted towards a new learning methodology concerning the technology. Therefore, building a new theoretical frame or concept based on a current phenomenon influenced by the COVID-19 pandemic and the data collected from the students' review in the questionnaire help to develop a new concept about learning through nanotechnology. Hopefully, a new theory Will be derived based on the data that has been collected.

The main two reasons behind using the grounded theory are the random use of curriculum supplements for teaching English as a second language due to the new circumstances and teaching through technology i.e., some of the students are forced to use books, notes, notebooks, websites, and the university or the institution's private platform to get access to the information or to study the content. The second reason is the lack of a clear theory that explains the new learning through technology. The process of this research paper is based on analysing the data of each student in the questionnaire and transcript of the analysis.

The first step of the analysis is called open coding where each of the data analysis breaks into individual excerpts and collects more through comparing the data to the main code of nano learning to build the theoretical sampling to explore the relationship between the categories and

make connections between them and group the codes under categories and building systematic relation to the other categories. Sorting the information or the analysed data into codes helps find the connection between them and leads to the final step which is selective coding which represent the core coding of developing a new theory related to nano learning.

The open code: is to maintain a connection between the codes and the data to form an explanation through using theoretical ideas from the literature and asking comprehension questions. At this phase, the questions are classified under a clear theoretical learning theories framework, and there is a requirement to establish a link between these learning theories and the essential parts to produce a nano learning structure. At this stage, the focus of the study is on the nano learning founder's interview, which focus on the nano learning conceptions and on the English teachers' interviews. The questions designed to measure the extent of using learning theories in the content of nano learning and the relate these questions to the second stage of axial coding of the teacher's preferences in the current teaching strategies and each question in the interview relates to one of the statements in the questionnaire to help build a framework of students' needs and what teachers' capabilities are in helping to design an appropriate learning environment that suits students' new learning styles by incorporating new technology. Teachers also reflect on their experiences with the new learning system and analyse the changes that the educational system is facing in terms of learner attitudes, context, delivery methods and resources, and assessment tools. The questions were aimed analyse the design of nano learning concept and the teachers' use of nano technology strategies indirectly. Finally, measure students' preferences based on the previous two investigations to create a new learning theory.

3.6.2. Content Analysis

Patterns within a piece of material, for instance, words, phrases, or images or across many pieces of information or sources of communication are evaluated using content analysis. This type of analysis is used to determine the frequency with which an idea is shared or discussed, or to uncover patterns of deeper underlying meanings. It requires to combine vast volumes of text into codes, summarize these into categories, and tabulate the data to determine the frequency of certain concepts or variables using content analysis. As a result, the content analysis incorporates a dash of quantitative thinking into a qualitative process. At this phase,

the online interview that emphasises the main concepts of nano learning is analysed separately to code the main criteria of this system and joined with the axial code of the of the teachers' and students' analysis to reach designing new selective coding when a core code ties all the categories together and produces a new theory.

3.7 Credibility and Authenticity

3.7.1 Credibility:

The degree to which the results are accurate and considered as relevant and believable by participants is referred to as credibility. Results are creditable due to the number of the participants and long-term attendance during observation of lengthy interviews or field involvement with participants. Investing enough time to become acquainted with the location and context, to screen for disinformation, to create trust, and to become acquainted with the data in order to obtain rich data. To strengthen the trustworthiness of the outcome of this qualitative research, it used three methods for data collection as face-to-face interview, online interview, and questionnaire. Using this technique of triangulation means using various data collection methods (Sim & Sharp 1998). Returning data, analytical categories, interpretations, and findings to the people who collected the data. It strengthens the data, especially because the researcher and responders have diverse perspectives on the data (Lincoln & Guba 1985).

3.7.2 Authenticity:

Authenticity refers to how well researchers reflect the diverse viewpoints and values of their study participants while also fostering change among people and systems. Both trustworthiness and authenticity include criteria that might assist a researcher to determine how rigorously the data were collected. Regarding the requirements of authenticity, fairness was achieved by asking both students and teachers for their views regarding the nano learning, as opposed to

merely asking teachers who may be biased. Upon reflection, this could have been further improved by investigating the views of curriculum designers too. Conducting a survey with the past participants raises the validity and reliability of the qualitative research.

3.8 Ethical Considerations

Ethical consideration is a mandatory requirement and needs to be carefully thought over, before and during the research process. According to the authenticity and credibility of the research project, four main questions were suggested before conducting the study on the participants. The first question related to whether the researcher is going to harm the participant physically or internally, and the answer is “no” because all the methods collection techniques applied with physical distance and all the questions formed to reflect on the teaching and learning without any personal questions. The second question answer if the participants are informed earlier and got previous consent and the answer is “yes”. The researcher got approval from all the participants to start the structured interview through a text messages and got approval from the online interview through an email. Finally, the approval of the students through their agreement to answer the questionnaire. The third question investigates whether the researcher invades the participants' privacy, and the answer is “no personal questions were discussed”. The final question is related to if there is any deception or manipulations involved that might affect the result of the study and the answer is “no”.

3.9 Summary

This chapter is starting by stating the questions of this research with clarification. And the appropriate participants of the study and how they were selected and the procedure of the study. The three types of data collection methods were used and described as a data analysis procedure. Finally, trustworthiness is facilitated in terms of credibility and authenticity. The first paragraph of this chapter clarifies the research questions. Also included are the study's appropriate participants, how they were chosen, and the study's protocol. A data analysis

procedure was created using the three different types of data collection methods. Finally, in terms of credibility and authenticity, trustworthiness is enabled.

CHAPTER 4: FINDINGS

4.1 Introduction:

The previous chapter explained the appropriate methodology being used for the data analysis to answer the questions of this paper through analysis based on qualitative data from an online interview with the nano learning creator, face-to-face interviews with different academic teachers, and a questionnaire to measure students' attitudes toward learning under the notion of nano learning.

The findings were measured using the grounded theory approach, (1) the open coding section reveals the main terms and concepts of designing a nano-learning system by creating codes of the learning elements through technology and the learning theories included in the structure of the online interview of the nano-learning creator. (2) the axial coding section reveals the teachers' opinion from the semi-structured interview along with the students' views from the questionnaire on learning through devices and using applications toward learning and acquiring a new language to build relations between the participants' views of the main concept of nano-learning. (3) the selective coding segment suggests an online learning theory for nano-learning to develop language learning.

To ensure ethical consideration, the names of the participants are not revealed and assigned numbers and symbols instead, throughout the analysis.

The conclusion from the data collected to answer the study questions is presented next, followed by created codes and extracted themes.

4.2 Open Coding:

4.2.1 Online interview findings

There are different approaches to explaining and analysing the concept of open coding interview data and the first data analysed is the online interview of the Nano Learning founder.

The interview is analysed and processed using the open coding approach “*making notes, codes, or segmenting information into dimensionalised categories*” (Corbin & Strauss 2015). It helps explain how individuals experience a new phenomenon and identify steps in the process. This part explains “How technology is used in nano learning?” What is the basis of nano learning? And how is it created?”

Nano-learning

The main terminology in this research paper is based on the concept of nano-learning and a thorough discussion of the reasons for this existence; “*In our company, the application of nano learning is actually derived from various techniques and methodologies and delivered in micro-lessons*”. and “*The terms "microlesson" and "nano-learning" are often used interchangeably*”.

Nano-learning is new and established to contemporary with the revolutionary of technology and emerge with learning and teaching strategies; “*It is a continuation of pedagogical principles*”

What is nano-learning and what is the reason for developing this methodology?

“*Nano learning is a methodology developed and supported by micro-learning, and it entails using technology to support the learning process with appropriate multimedia to be delivered in a short period of time at a low cost, and to ensure that every participant receives the material, all of which is supported by a final evaluation stage to ensure that learning takes place.*”

How is it applied and practised?

“*In our company, we provide online courses and studies, in some of them were like using micro-lessons as a reflection assignment or as an interactive exercise mid-week in the middle of the participant's everyday life.*” Moreover, “*It is location-based learning and online courses*”

According to the interviewee, nano-learning is “*a pedagogical theory*” and delivered during micro-lessons. The method used is micro-lessons to introduce short learning lessons delivered in the notification through phones; “*It is really or widely used now through mobile learning, so it is multimedia-rich. It helps to narrow and defined any complicated topic. It can be a resource for any information and links for further learning*” According to the interviewee; “*It is ideal for introduction, repetition, reflection, interaction, and information*”. Most important of all, “*it*

reduces cognitive load by focusing on solutions” And it must be easy and simple; “It is easy inaccessibility”.

Are there any strategies applied to develop the nano-learning?

“It uses flipped classroom technique.” Moreover, “It is a source of multi-information”.

How is it set up?

“It is used to produce and deliver simple information as text or video and the audiences confirm that they received the information through a reflection on what they have been introduced to..... the use of videos, images, enrichment multimedia sources of information encourage the audience to engage and participate and to evaluate the learning process.”

How do you assess the learners?

A variety of questions are delivered as; *“multi-choice questions, true or false and sometimes a level of agreement questionsto measure learners’ attitude to the introduced knowledge”.*

How would you rate the material presented in the program?

“Our company mission focuses on raising the learners’ competencies in their field so, the efficacy of the program is determined by the utilization that the beneficiary will submit.”

The interviewee adds important criteria to deliver nano-learning; “Allotment of nano learning is based on a target audience and the research behind.”

“According to the learners, it is about the kind of learners, the level of the learners, the multi-intelligence of the learners, and whether these learners are forced to learn or not, and the second one is the research behind and how this knowledge is delivered. Commonly, it is either by sending a link through emails or SMS or by a notification in an application”.

After the first stage of the online interview, data was analysed using an open coding procedure. The components of the nano-learning methodology were categorised into several codes as the **'duration of time'** needed to apply this methodology during each session and the **'stages of the**

nano-learning lesson' concerning the extent of learning theories being applied Furthermore, the '**design of the lesson**' necessitates several '**metacognition**' principles. In addition, the type and quantity of '**materials**' used or practised in the nano-lesson, as well as the appropriate method of '**evaluating**' or '**assessing**' the learner's achievement. Furthermore, the type of '**resource pack**' this lesson provides to the learning society, as well as the type of '**interaction**' between learners and learner to the instructor. One important topic to consider is how this type of methodology can influence the behaviour of the learner.

4.3 Axial Coding:

4.3.1 Semi- standardised interview findings:

Through the investigation with teacher **A**, using books and teaching is more reliable and *"it is the best method to use for further research for students, because when students start searching for a specific topic in a book that will guide them toward further exploration through the knowledge that is referred in the book"* To add with that, *"learners need reliable sources for their learning journey and that is available in the books more than being in websites."*

According to teacher **B**, "no more books"; students' preferences are different from the old generation, so there is no need to carry books to the class or pay fees for a textbook"

While teacher **C** believes in "using books in learning is not an essential tool anymore..... *In these days, learners are used to receiving information from different aspects not just books so, learning cannot be determined among books only"*.

According to teacher **D**: *" I'm old school even if I like development because books are totally more interesting for me in education than technology and e-books. But I also agree that we should upgrade ourselves and our methods."*

All teachers confirmed the use of universities platforms and digital applications helped design a digital curriculum that consists of slides and questioning links; therefore, the books are not playing essential role as years ago and most learners had already developed technological skills on how to use the technology through devices as tablets or laptops. Teacher **A**: “*Students don’t need to look for resources to do assignments since curriculum is there in the university platform.*” “*I know students won’t go through books, so I assign several trustworthy websites for my learners to look for in doing any research.*” Teacher **B**.

“*My students are required to do presentation about different topics to strengthen their language, but I don’t guide them toward any specific websites.*” Teacher **C**. However, teacher D believes learners “*... are getting spoiled*” and that is because the teacher guides the students toward specified resources to search and do assignments.

The second phase of the codes are related to the lesson designing and the materials used to support the learning method along with the appropriate metacognition sources.

Using online questions or the Internet to help learners engage with the lesson is accessible, teacher B: “*Students work individually and in groups depending on the task given*” in addition to that, teacher **A**: “*So, it will recommend adding tablet devices to the academic system instead of books*”. Teacher D adds to that: “*using gaming applications raise students’ engagement*”. All teacher agrees on preparing a lesson must include a sort of digital phase as including videos, slides supported with images, charts, illustrations or audio. “*Using electronic tools is preferable by learners*”. Teacher **B**.

The third phase of the code explains the appropriate assessment tool and the effective techniques for interactions.

Acknowledged by teacher **A** by saying; “*we are dealing with a new generation who prefer to engage with the provided information through using PowerPoint, videos, and online questions so they can engage through mobile phones during the session.*” The teacher confirmed the level of participation raises among learners while watching videos. Therefore, their concentration is at a higher level than receiving information

through verbal concepts. So " *the use of PowerPoint slides to explain and summarize the curriculum is essential to attract the new generation of learners.*" confirmed by teacher **B**; " *All of my students prefer to attend the class online and answer online questions and get immediate feedback and for some, it helps them to save transportation costs.*" moreover, teacher **C** confirmed the same view, but "*there should be a balance between the use of technology in the classroom and the teacher performance, so it won't threaten the teacher role.*" According to teacher **D**; "*the use of videos and different applications to help students engage with the topic is necessary and has become a requirement*" in addition to that " *learners prefer these new questioning applications to keep them engage in the content.*"

According to teacher **A, B** and **D**; the use of applications in teaching is likeable because it reduces the pressure on the teacher during the class, however, teacher **C** disagree with this view by claiming to prepare the slides for the lesson or the questions in an online application that require student's engagement is "*a time- consuming.*"

"Even though I am an old-fashioned style teacher, I have to confess the new generation finds it easier to deal with the curriculum through these new platforms." teacher **C**.

4.3.2 Questionnaire findings:

Through the codes being discussed in the previous section, an axial coding followed the previous interview to investigate learners' attitude toward nano-learning procedure and measure the level of students' interest to learn in this type of technology. The questionnaire asses 90 students from 18 to 34 years' old who are interested in learning English in different institution in the UAE.

The first category to be analysed is the stages required to design a nano-learning lesson in relation to the **cognitive** perspective.

- To obtain this, students asked whether they should learn from a tablet device instead of carrying several books and the result revealed that **57.8%** of learners prefer to use tablets to

study for the whole curriculum requirements instead of booklets or books and to specify this more, the majority of this response indicates students age of 18-22 and that confirm the view of a new generation need new methods of learning.

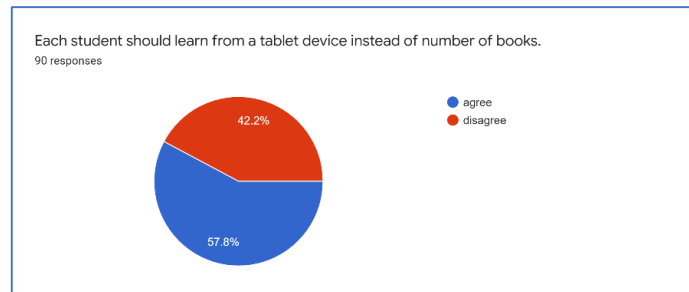


Figure 1.1: Cognitive Perspective; Result of using tablet device instead of books

- The second step in this category examine students learning through watching videos helps for better understanding and simplify the task rather than a teacher's lecture and the result confirmed the importance of using videos in receiving new content and it is better than traditional learning method of lecturing and students of different ages agreed on using videos help understanding and that indicate the teacher role as being a guide only.

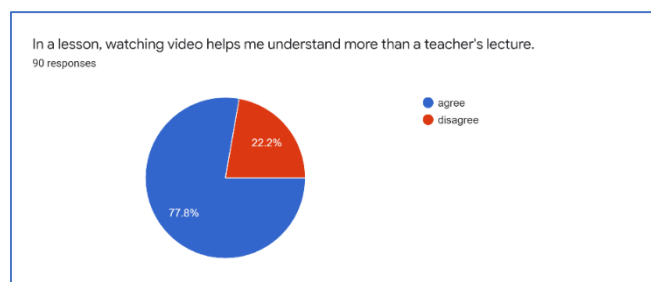


Figure 1.2: Watching video during a lesson raise students' comprehension

- The third statement is about students' preferences of using variations in learning as videos, images, and online discussions and the result raised to 93.3% to confirm students prefer classes with variety strategies and techniques to help narrow down the topic and simplify the content, as well as using multimedia tools help attract students' attention and the brain recognize the learning elements through memorizing colours, graphs, and images.

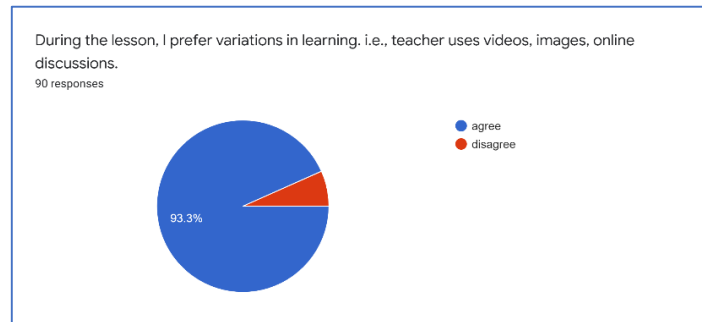


Figure 1.3: learning through variation of strategies

- To analyse students' metacognition, a fourth statement about speed questions has been issued and 85.6% of participants indicate using online questions as competitions is fun like Quizlet, Kahoot, etc. because these applications are using special characters to indicate each learner and help learners to reflect on their learning and that obtain chances to the learners to question during the discussion stage. To reflect on the brain recognition of new information being introduced, learners do learn through different multimedia that helps enhance the mental ability to attract and trace as well as link symbols, colours, or images to the knowledge learned.

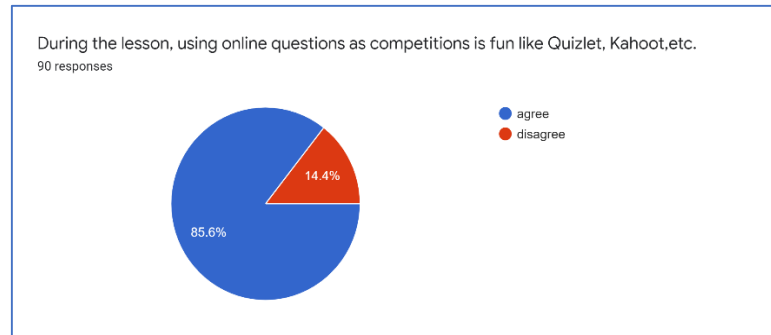


Figure 1.4: Impact of using online questioning

- The second section of the learners' questionnaire focuses on the **behaviour** perspective of the learners to assess the learner behaviour during receiving and engaging with the learning process through a device. Due to the role of technology in devices such as mobile phones, laptops, and tablets people create self-depending learning phenomenon, however, through asking learners about learners' preference to learn better individually, the result confirmed this theory with a 61.6% of learners who developed a self-learning behaviour.

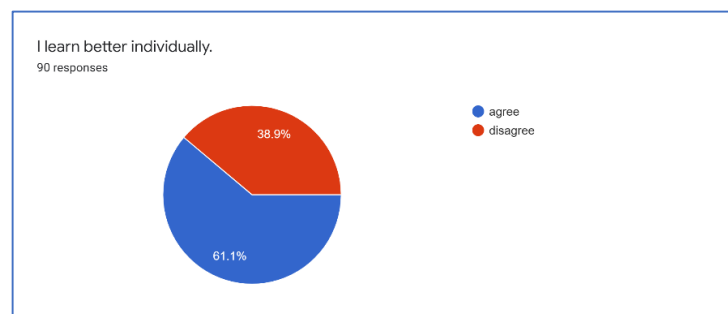


Figure 2.1: Behaviourism Perspective; Preferred learning style

- Learning system requires an engagement with the teacher or the colleagues to enhance the learning content and for some learners developing an independent learning does not require a face-to-face interaction with the teacher as it appears in below chart and that reinforcement can be achieved through the device which can reduce the lesson timing as well as ensuring all learners get a chance to participate and answer the question.

Moreover, the most important of all is, that receiving immediate feedback is consider valuable strategy in teaching to reflect on the learners' achievement.

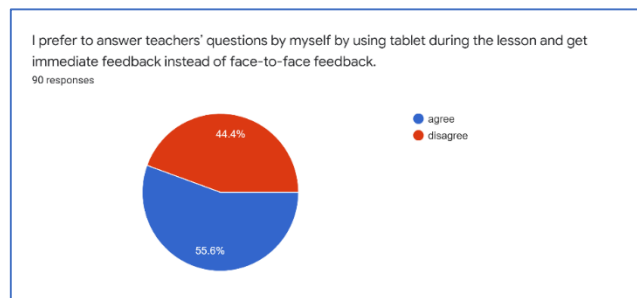


Figure 2.2: Students preferred types of questions.

- For instance, some learners value the discussion that occurs in the lesson and help reflect on their learning behaviour during the lesson, 92.2% of participants agree on the importance role of discussion as being important and help learners to understand the content and some learners prefer face to face discussion to interact with the learning material, yet some prefer having recorded online discussion to preserve as a resource to reflect on.

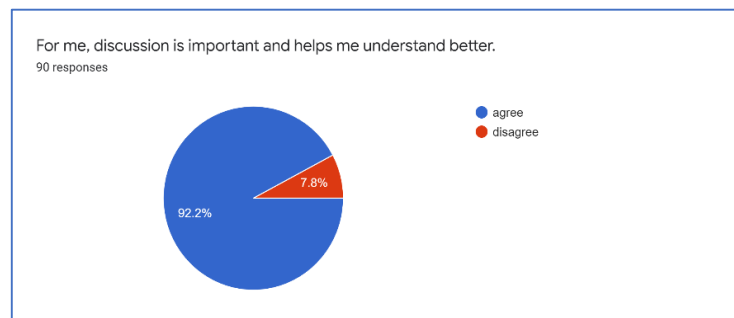


Figure 2.3: The role of discussion in learning

- Building an appropriate learning environment is important and must be suitable to the learners' preferences in the **constructive** view of learners' preference of relying on the teacher only to understand the content, participants acknowledge their understanding of the topic rely on other resources than the teacher with a result of 38.9% of learners depend on other

resources and a result of 61.1% confirmed they depend on other resources for further understanding as YouTube and Google.

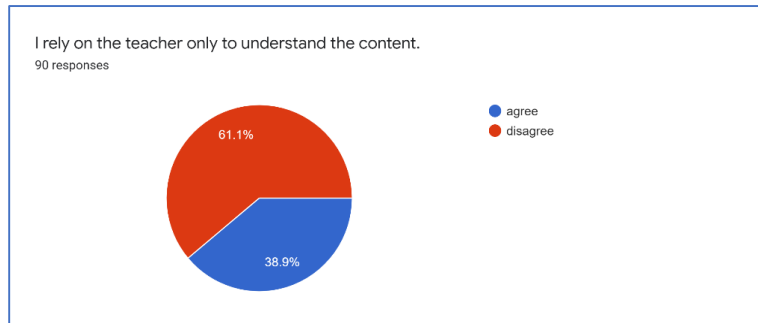


Figure 3.1: Constructivism Perspective: The role of teacher in emphasising the curriculum

- Amazingly, the majority of the learners prefer listening to repeated verbal answers from colleagues help remember the topic which indicates discussion is important.

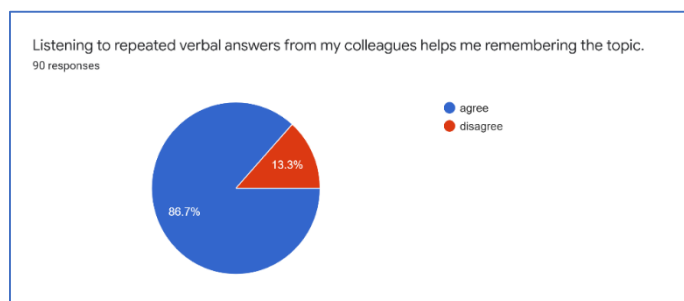


Figure 3.2: Constructivism Perspective: Construct content through colleagues

- To enhance the content, instructors tend to extend learners' knowledge through asking students to search for specific information in books, however, learners agree on searching online is easier than going through the academic book.

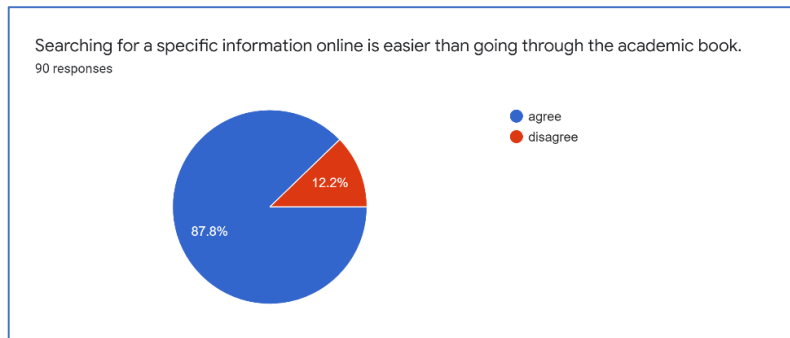


Figure 3.3: Constructivism Perspective: Construct comprehension through independent learning

- This research paper is based on the view of connectivism, which focuses on learning through applications or platforms in a short period of time and through asking students and assessing their attitudes toward learning in the view of the **Connectivism**. In measuring students' capacity of memorizing the presented knowledge from the teacher's verbal explanation only, the result was divided into half agreeing with the statement while the other half disagreed. However, this indicates the important role of the teacher being in the education process to facilitate the teaching concept.

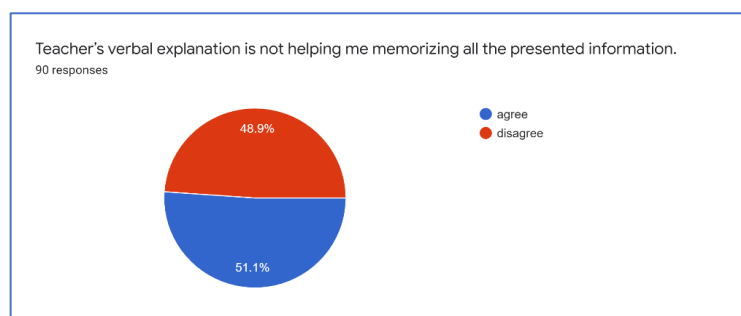


Figure 4.1: Connectivism Perspective: Memorization of content dependency

- Along with that, learners prefer to learn any topic using images, videos, and applications to raise their mental ability in memorizing the presented material.

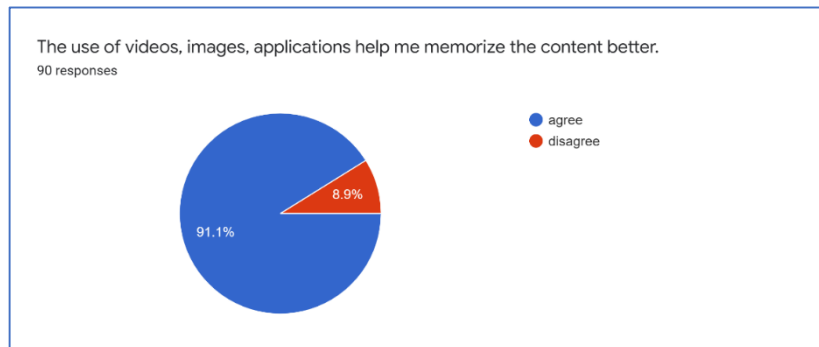


Figure 4.2: Connectivism Perspective; E-learning environment role during the learning period

- Furthermore, since learning depends on a recorded lesson and prepared slides that are supported with images, videos. Etc. the majority of the students prefer to shorten the period of learning; learning sessions should be reduced to less than one hour.

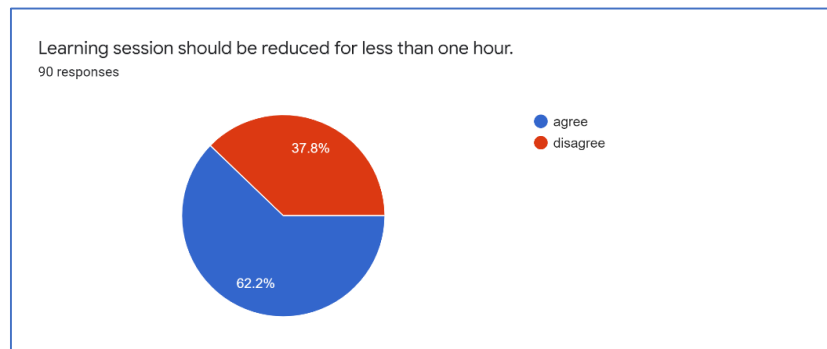


Figure 4.3: Connectivism Perspective; the duration of a learning period

- Some of the students engaging with the teachers to answer questions and getting immediate feedback through using a gaming application are better than raising hands and waiting for

permission to answer with a number 78.9% of the students agreed on getting immediate feedback then raising hands.

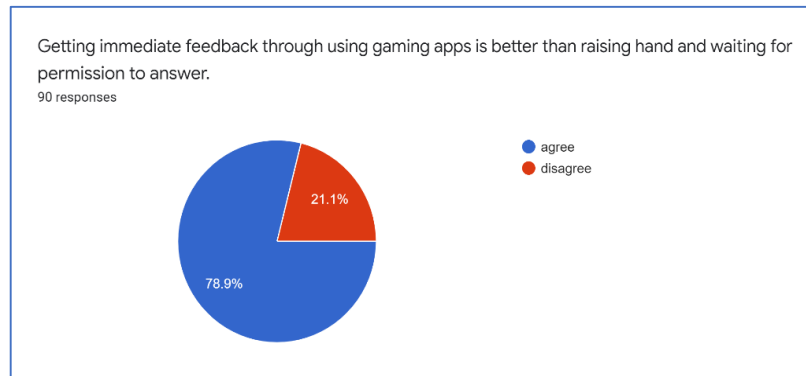


Figure 4.4: Connectivism Perspective; The accuracy of feedback during the learning session

- For some of the students learning using platforms and websites help to learn more about learning topic and extend the learning process through using other platforms as Google, YouTube and otherwise websites help students a lot to enhance their learning.

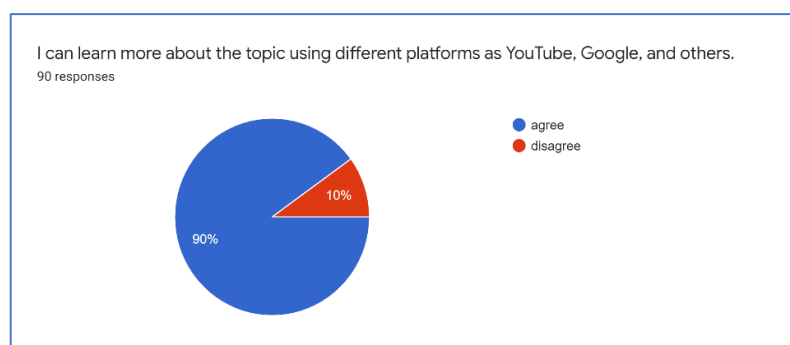


Figure 4.5: Connectivism Perspective; The importance of variation in learning platforms

- However, some of these learners agreed on not all the information represented on the previous websites are reliable. And here comes the role of nano learning, that requires building, reliable information in nano learning system.

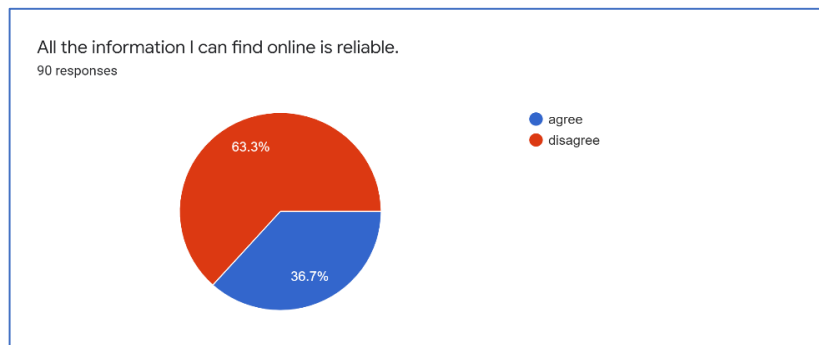


Figure 4.6: Connectivism Perspective: The reliability of online sources

4.4 Conclusion:

This chapter revealed the result of the data processed under the grounded theory concept. It discussed the result of the teachers' interview codes and the founder of the nano learning and build relations to the students' questionnaire data result to form a new learning theory which will be discuss in the next chapter.

CHAPTER 5: DISCUSSION

5.1 Introduction

This chapter starts by discussing the result of three data gathering instruments and relate the result to the literature review. The second section is trying to answer the main questions of the research and finally reveals the new learning theory that this research is aiming for.

5.2 Analyses of the data

5.2.1 Online & teacher's interview data analysis

According to the data of the teachers' interview, nano learning helps to narrow any big or wide knowledge to smaller parts or smaller chunks which can be delivered in a sort of video or image or even an online lecture in a period of two to five minutes and can be assessed by the teacher.

These chunks of learning can be used as an introduction for any new topic or can be used as repetition for the main element of learning during every class or during the whole period of learning. Also, it can be used as a reflection on the based learning and as interaction which can happen between the learners or online learners, and the most important of all is a source of information where learners can use links or videos to refer to whenever they are looking for further information or looking for prior information or prior knowledge and even pre-knowledge to support their new learning.

According to the interviewee, the learners of the nano learning should be well known by the instructor, and all the information or all the materials delivered to the learners must support the multi-intelligence theory where each learner is different from the other in learning and acquiring new knowledge and nano learning is supported by the e-learning theory.

“According to Bloom's taxonomy, there are two main dimensions that should be included in the learning process to acquire any new knowledge, and these two dimensions include the type of knowledge being presented, whether it is factual, conceptual, procedural, or metacognitive knowledge, and the cognitive process domain, which include remembering, understanding,

applying, analysing, evaluating, and creating. and if all these principles are involved in the learning there will be clear production, neither-less, all of these are easily presented in the nano-learning because learning now depends on creating an online curriculum, which involves a rich environment of multimedia that helps learners to understand, analyse, and apply the language and it can be evaluated in different ways. As mentioned before the cognitive or mental capacity of precognition used in the process of constructivism and connectivism is also related to Bloom's taxonomy (Marzano & Kendall 2007). Moreover, the designing of nano lesson is based on technological perspective which is built in neuron network that is similar to the perspective of scientist's view of humans' brain stimulations and confirms the constructivism view of linking human neurons to the computer's systems.

Referring to the technique of generating and constructing nano-learning through an online interview and combining the results with the data from the teachers' interviews to build a questionnaire for students in order to contribute to the development of a new learning theory.

5.2.2 Students' Questionnaire

Students were measured in terms of their willingness to learn through the use of a tablet as an alternative to a textbook, and the results showed that 75.8% of the students prefer the tablet, which can be analysed as being easy to carry and containing a lot of data, and it must be clarified that this percentage 93 % are between the ages of 18 and 23, and these students symbolize the new generation's eagerness to study.

In terms of comprehending, the offered material, and its ease of comprehension, 93.3 % confirmed that the content comprehension is influenced by the diversity of the material presented, which includes photos, videos, and graphics. This emphasizes the importance of having technology in the classroom as a necessary component of learning.

In order to measure the extent of students' desire to participate in quick questions and measure the extent of understanding by answering questions in a quick and individual way using previously mentioned sites and programs such as Kahoot and Quizlet, 85.6% of students prefer this type of questions and this can be analysed as they contain Attractive graphics and colours,

as well as showing the student's name and rate in answering, which exceeds the desire to compete and focus in order to reach a satisfactory result.

By measuring the behavioural perspective of students, 61.1% of students prefer learning in an individual way, and it is likely that the reason for this is the conditions of the COVID-19 pandemic, which contributed to the use of electronic devices greatly in learning, as well as improving the skill of self-reliance in research and acquisition of new learning skills. To emphasize the new addition in e-learning, 55.5% of the participants prefer to obtain feedback directly through participation in the speed questions or assignments, because the feedback plays a major role in supporting the psychological aspect of the student and confirms the extent to which the student understands the presented curriculum as well as leads the student to self-reflection.

Surprisingly, students still prefer listening to discussions between each other, and this is evidence of the importance of providing problem-solving and critical thinking skills in modern learning because it contributes to the formation of the learner's personality and contributes to raising the efficiency of educational outcomes and by referring to students, it helps them understand the content more through discussion and dialogue 92.2% assert the importance of this item.

In addition, 86.7% of students prefer to listen to other students through verbal participation because this contributes to remembering information and linking it to the participant's style while analysing the answers. This confirms the importance of verbal participation and dialogue in understanding the content, which confirms more than 61% of the students do not depend on the teacher only for understanding but on the interaction and discussions between the students and the teacher. Through research and auditing, 87.8% of students prefer to search for information through electronic search engines, and this indicates that students have become familiar with the mechanism of using search methods and verifying the information and data presented, also because searching using the Internet has become fast and does not require effort, while only 12.2% still prefer to search through books.

The last statements examine students' preferences toward the connectivism principles in relation to the type of learning and the memorizing. The result indicates 91.1% of students memorize the content through videos, audios, images and using different illustrated materials. Moreover, students believe teacher role is important and 51.1% rely on teacher verbal explanation to memorize the presented information. Furthermore, 96% of students prefer to interact with content using questioning platform and applications and that confirm the role of self-learning of Siemens view in learning can occur through videos and prepared learning platform and to support that 78.9% of learners like to get immediate feedback to reflect on their learning. However, searching for reliable information is quite difficult because not all the presented knowledge is reliable or trustworthy, therefore, 63.3% of learners cannot depend on all the online information. Finally, due to the 'click life' that the world is living and students being able to get knowledge through click and receive precise information, 62.2% believe any long learning session should be reduced because the use of videos to explain and images or charts to facilitate the content helps reduce the verbal side and the effort on the teacher and students.

5.3 Reflection on the results:

Learning through device in classroom's session becomes a necessity due to the changes this device can add to the learning environment. In a study about the changes tablets may add on high school students, "the devices provide new settings that are interactive, media-rich, and entertaining. According to the findings of this study, policymakers should consider implementing technical and pedagogical support to help instructors and students realize the full potential of this type of technology in education" (Montrieux et al. 2015). Moreover, as mentioned before the designing of multimedia is equal to the neuro system of the brain.

One of the main elements which help to simplify the learning material and indicated learning comprehension is the use of media in teaching the language as using videos, images, or illustrations that help explain the introduced content. A study conducted at Taibah University confirmed the role of videos in teaching English as a foreign language helps raise students' awareness of language use, pronunciation and improve students'

performance (Almurashi 2016). Furthermore, the use of illustrations and images can develop new learning literacy skills. Moreover, the use of images helps the brain to break down the learning content and simplify the target aim of lesson i.e; It helps to dismantle the material presented into molecules, and the brain works to install these molecules through graphics and images to link them with information. (Calderhead & Robson 1991). Introducing lesson with different multimedia, requires assessing students with a similar tool that raise students' metacognition and attract students to engage with the presented material through new evaluation applications as mentioned in the 4th questionnaire statements. Educational gaming applications increase student learning in the classroom, having the greatest impact on classroom dynamics, engagement, motivation, and overall learning experience. using educational games in the classroom might reduce distractions, hence boosting teaching and learning quality beyond what is available in traditional classrooms (Licorish et al. 2018). This increases the desire among learners to concentrate and get immediate feedback to reflect on the learning material during or at the end of the lesson. These programs allow teachers to provide feedback very instantaneously without interrupting students' participation in the activity. This is critical for language learning since students can continue working on the assignment and receiving feedback while doing so. Having learners who compete each with modern devices using the latest technology on lead to develop self-learning competency and this skill plays an important role in the learners' attitude toward learning and exploring new items and that is why some of the learners developed independent learning skill through interacting with some websites or platforms that attract the learner preferences. One main element found in this research is the importance of the discussion and verbal communication the learners need to support their learning stages "... the value of interaction in online teaching and learning supports an equilibrium model of social presence in online debate, in which participants engage more linguistic immediacy actions to support interaction among peers as affective communication channels are limited" (Swan 2010). Therefore, there is a need for offering discussion space for students during or at the end of the lesson to reflect on the content and asses their knowledge.

According to the searching of specific assignment, now with the presence of the Internet, many students prefer to access information in a quick and easy way, as well as

with high efficiency. Therefore, we find students doing their homework using multiple sites and search engines that facilitate access to the required assignment of or the project, as well as the doing a specific search. In a study that emphasized students prefer to use search engines to reach the topic rather than going to the library and searching among books or library devices. “Students turn to the Internet before the library, but a deeper investigation revealed different preferences for study versus project-related research. Specifically, using search engines or Wikipedia was a pre-stage, rather than a final destination, for project work” (Biddix, Chung & Park 2011).

Visual images combined with verbal information can assist students in remembering what they have read. There appears to be a central processor in the brain that contains multiple channels. It will receive data from you. One channel is mostly verbal, whereas the other is mostly spatial or visual (Mousavi, Low & Sweller 1995).

Feedback is very important and an essential part of the educational process and must be present during any class and in many studies discussed that show the percentage of feedback that must be provided and the appropriate timing for providing feedback. Every student has the right to participate during the class and is entitled to receive feedback that helps arrange students' concepts and reflect on what has been studied, and in a study that emphasized the appropriate timing of providing feedback to the student. 'It is important to provide learner with immediate feedback because a delay might cause “desirable difficulty” (Kehrer, Kelly & Heffernan 2013). And through nano-learning, the teacher and the student ensure that they obtain the appropriate feedback through the programs prepared and equipped with questions through which the extent of the student’s understanding of the material is measured. The student can also feel more confident through what has been learned based on the quality of the feedback provided to him and thus contributes to Raising the student's efficiency in participating in the academic content.

In a world where a teacher is using videos to support the teaching material and enhance students' capacity in learning a new language through focusing on pronunciation and the alteration of words, students tend to imitate the teacher and started to search for the same videos or similar videos that enhance their learning of the language or any presented topic, so by time students developed a concept of self-learning through using

the same materials that a teacher use or present in the classroom and develop a behaviour of independent learning.

Individual approaches to assist individual learning have led to the development of flipped classroom technique. It implies a new ideology of teacher's function by offering a virtual role of a teacher and transforming students from passive to responsible and productive members of society (Chilingaryan & Zvereva 2017). According to Abdulwahed & Ismail (2011) Bell affirmed microteaching offers students with ideal educational experiences and made them aware of the benefits and relationships between theories and practice. Furthermore, *“the stages of developing nano-learning are based on three lists that address cognitive, emotional, and psychomotor learning objectives. Most traditional education has focused on the cognitive domain list, which is widely used to build curriculum learning objectives, assessments, and activities”* (Lorin W. Anderson 2001).

The structure of building nano learning is based on the methodology of micro-teaching which requires delivering knowledge in a short period of time with a full support of multimedia, and a reflection that easily gets assessed and evaluated. With the development of mobile technology, smartphones, e-learning, and microlearning flourished (Bruck, Motiwalla & Foerster 2012). Life has become technology oriented that sometimes one is unaware of the data consumed.

Confirmed by Gabrieli et al (2006) we are dealing with today's generation, who use mobile technology and learning and receiving new information, so the most significant advantage of micro learning is that learning resources are available to all learners in their mobile devices, also help reduces recognition span.

Also confirmed Nano learning can occur in a short period of time, at any-time, anywhere, and under any circumstances. *“Nano learning can be defined as learning that occurs in less than a minute, some easily relatable examples, including asking smart speaker...”* (Corbeil, Khan & Valdés-Corbeil 2021).

Nano learning helps to change the traditional type of instructions in the classroom to a more innovative instructional design which leads to a self-directed learner by narrowing down the topics and it can be blended in the activities presented during the lesson (Santojanni et al. 2022).

The main structure of nano learning is based on the development of understanding explained by the Taxonomy of Bloom, which is based on delivering knowledge toward higher of understanding to reach the evaluation or the assessment stage. This kind of learning depends on the strategy of a flipped classroom which can help deliver a different way of knowledge to the students, helping students to be individual learners, and encourage students to be a self-learner, where learners can depend on themselves to find information and search for the best resources of learning through the provided links and texts. Finally, students can discuss and initiate new learning during the classroom discussion since the main topic or the main theory of this research is based on connectivism; the nano learning methodology has the framework of connectivism's view in regarding the use of technology in teaching or in learning. In a new learning learner are individual learners who can use different multimedia resources as videos, images, charts, and electronic books as a source of knowledge and use emails or definite platforms as a source of connection to the teachers or instructors and the community of learning. Nano-learning deliver the best e-environment for learning in which the new generation is looking for.

5.4 Summary of the findings

The designing of the nano-learning is based on previously mentioned learning theories that support the learning phenomena through the acquisition of a second language. Through the stages of the grounded theory approach. This study proposes a theory based on the necessity for a change in the educational system to keep up with technological advancements in the globe.

The thesis that emerges as a result of the facts gathered is: (Learning occurs by interacting with devices as a new learning environment that have a clear educational plan and techniques, as well as an updated educational system based on data modification that requires less physical effort).

5.5 Conclusion:

The purpose of this research was to answer the question: “What is the nature of Nano-learning and what do teachers of EFL wish to achieve through the application of educational technology in school curricula?” After conducting several interviews with teachers, and administering a questionnaire on the students, followed with using the grounded theory coding technique to analyse the data, I concluded that nano learning is an applicable learning technology that rely on students for self-learning more than being directed.

The second question of this study is to measure the extent of use of nano learning in the current curriculum and the investigation confirmed due the transformation in the digital world and adding modern technology to teaching, there is an extent use of nano learning in the field of teaching English as a second language through using interactive e-books and use of specific applications that help learners to engage, interact and get immediate feedback.

And this question investigates the benefit of nano learning would add to the education field and could be measure through the analysis of the teacher’s impact on their role before and after the new addition of technology in teaching which help reduce the effort and pressure on the teacher and provides learners with a variety of resources that can rely on. Moreover, this tool helps learners to interact and communicate with the teacher immediately at any time. Furthermore, this research paper is suggesting a general question “Does technology develop a new learning theory?” and through validity of learning theories being practised in the nano learning and the new additions of learning resources, this theory can be measured as reliable and learning through technology can produce the nano technology theory.

This research calls for the importance of designing an electronic educational program that consists of an electronic curriculum supported by a variety of videos, images, graphics, as well as audio, and a diverse library of sources that are provided by the educational institution so that they are reliable. The material provided through the digital educational materials provided with the curriculum and this program has become a necessity in light of the rapid

development that the world is witnessing in technology, as well as because of the enrichment of modern technologies in the educational process, as well as the positives that these technologies have added in the educational process.

Instead of designing a curriculum and printing it on paper, this curriculum can be used electronically without the need for printing! Instead of asking the teacher to use modern educational programs and means in learning, the application of nano-learning is an alternative to that. Through what has been proposed in this research, nano-learning consists of educational material supported by electronic educational means and a library that contains various references from audio and video, as well as reliable sites for that the student can prepare for the subject and also resort to the subject to enrich what has been learned. This strategy can also be used as a flipped classroom tool and as a source of learning. The importance of discussion and brainstorming among learners, there is a special section for each educational session where what has been learned is discussed between the students and the teacher. Thus, nano-learning is the future of learning.

5.6 Limitations to this Study and Recommendations for Future Research

Searching and questioning about a new topic related to new objectives of modesty is enjoyable and challengeable at the same time. It is quite interesting to dive into the latest discovery in technology and how to alter this new invention to serve the education field, however, finding the related knowledge and information is difficult due to the lack usage of nano learning lesson in the field.

The number of the participants of this study is challengeable due to the COVID-19 circumstances. Even though I am satisfied with the students' number, however I am not satisfied with the teachers being include in the research because teachers considered to be evidence of student's behaviour and can analyse the curriculum more through their experience.

Finally, in term of future research, I believe the subject of teaching through technology must be explore immediately and adopt all the benefit of it to be address in different schools, universities, and learning institutions because this is the future of learning.

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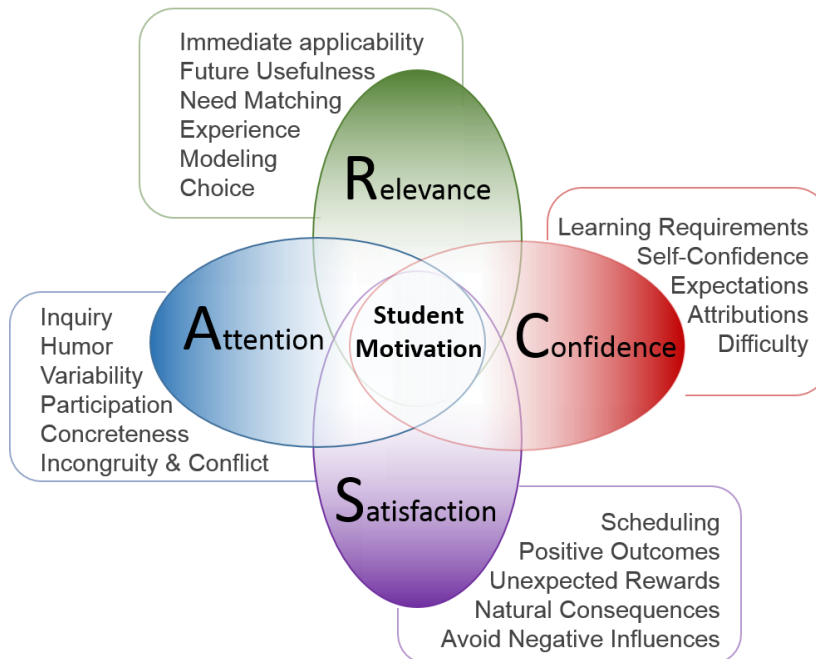
Model of Motivation: ARCS Instructional Design - Education Library. (n.d.) [online]. [Accessed 23 May 2022]. Available at: <https://educationlibrary.org/model-of-motivation-arcs-instructional-design/>.

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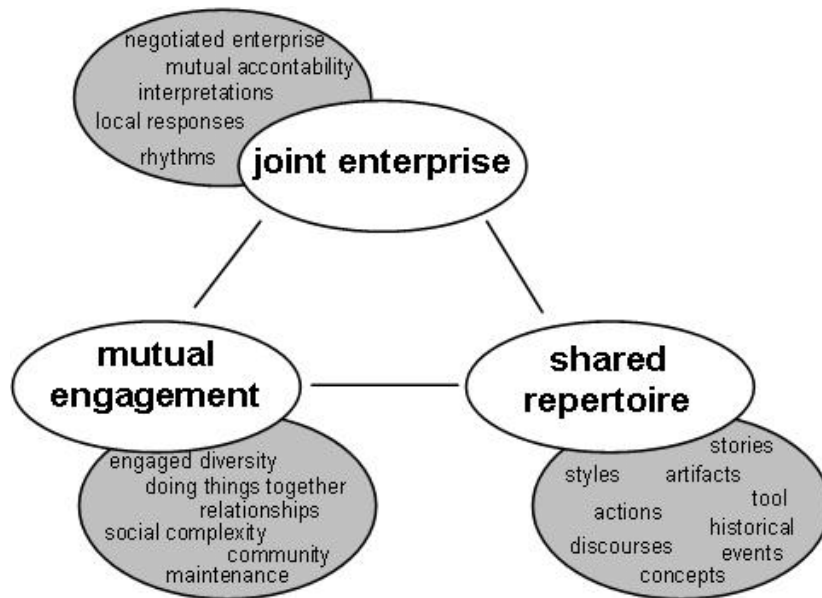
Stern, J. (n.d.). Introduction to Online Teaching and Learning [online]. [Accessed 17 April 2022]. Available at: <http://www.sloan-c.org/resources/index.asp>.

7. Appendices: Appendix A



(*Model of Motivation: ARCS Instructional Design - Education Library n.d.*) Model of Motivation: ARCS Instructional Design - Education Library

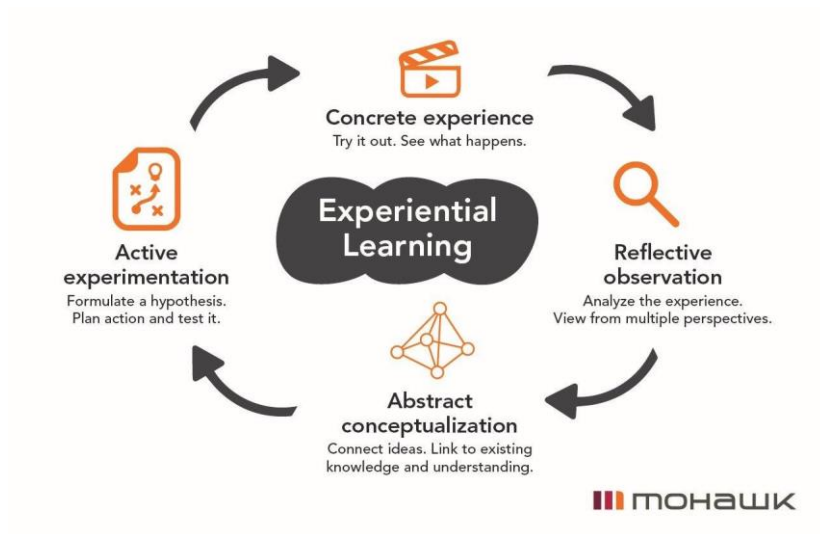
Appendix B



(My interpretation of a 'Community of Practice' – Teanne MacCallum n.d.)

My interpretation of a 'Community of Practice' – Teanne MacCallum (wordpress.com)

Appendix C

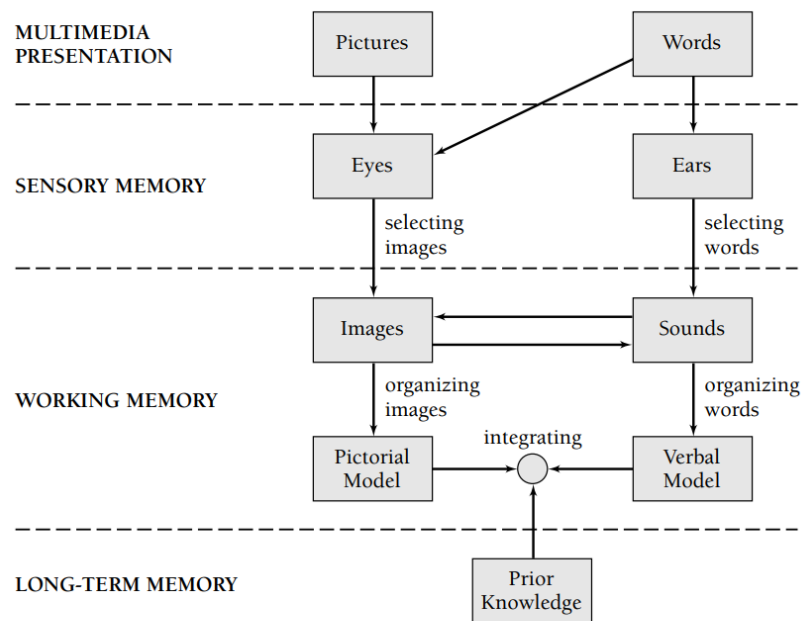


(Experiential Learning Theory | Mohawk College n.d.)

Experiential Learning Theory | Mohawk College

Appendix D

Figure 6.2. Cognitive Theory of Multimedia Learning



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([\[PDF\] Cognitive Theory and the Design of Multimedia Instruction: An Example of the Two-Way Street Between Cognition and Instruction](#) | Semantic Scholar n.d.)

[\[PDF\] Cognitive Theory and the Design of Multimedia Instruction: An Example of the Two-Way Street Between Cognition and Instruction](#) | Semantic Scholar

Appendix E

Students Questionnaire sample

Feedback Survey Questionnaire On the Nano-learning Lesson		
University:	Major:	Date:
Name (optional):		

Direction: Please indicate your answer with yes or no with each of these statements regarding the Nano-Lesson you have been practicing.



	The statement	Yes	No
Cognition Review: focuses on the appropriate in Parliament for students to get in case to help them solve problems			
1	Watching video helps me to understand more than using pictures as flash cards.		
2	Like learning using tabs or phones.		
3	I prefer to depend on myself in learning.		
4	Prefer all the lesson using the same procedure.		
5	I needed the teacher to explain again.		
6	The content was east to follow.		
7	I understand everything related to the topic.		
Behaviorism Review: learning occurs when a learner obtains new or changed behaviour as a result of the stimulus			
8	I depend on myself in learning.		
9	It was boring to interact with the tab.		
10	It was fun to learn from the tab.		
11	I prefer to learn in groups.		
12	I learn better individually		
13	It was easy to answer the questions by myself.		
14	The timing was perfect for me.		
15	It makes me feel more confident.		
16	The class was quiet during the lesson		
Constructivism Review: focuses on individuals in how to actively engage in the learning process, teacher role as facilitator to help learners construct the knowledge.			
17	The teacher guides me only.		
18	The teacher kept explaining.		
19	Getting the information from the white board is better.		
20	Hearing the answers repeated from colleagues is best way to remember.		
21	Searching for a specific information online is easier than a book.		
Connectivism Review: encouraging learners to use technology that leads to decentralization and fragmentation of information in order to form a coherent narrative and connect end point			
22	Getting immediate feedback is better than waiting in a queue.		
23	I understand better through technology.		
24	I can learn more about the topic using different platforms.		
25	I can discuss the new content with my colleagues online.		
26	All the information I can find online is reliable.		

*This Survey is used for private research assignment by Maha Alshehri -British University in Dubai

Appendix F

English Teachers interview questions

Interview Questions
of Nano- Learning
With EFL teachers

The following questions will be discussed with English teachers regarding the Nano-Lessons have been practiced.

Name of the interviewee (Optional): Prof.

Signature: _____



Questions	Note
What is your experience in the teaching field?	I have 10 years of experience in teaching English for all classes and ages. I'm also an IELTS trainer and a coordinator.
Usually, how long is the lesson or the session that you present?	I usually present 2 to 4 sessions a day, for different classes. Each session is for 3 hours having a half hour break in between.
There's a saying we are dealing with 'You-tube Generation' so do you think following the use of technology influence this generation a lot?	Yes, I totally agree with the fact of dealing with YouTube generation. Unfortunately, technology is badly affecting them because they are not using it for education, but for following what is trendy and sometimes a waste of time. Most of time they follow what is ridiculous.
Are you using videos during your session? If yes, do think your students participate more during displaying the video?	Yes, I definitely use videos in my classes but not all the time, since I have a definite English standard that I have to let my students reach it in a very short time, in order to get their British degree. I use videos when I do an English song as listening. They listen first and fill in the blank with the missing lyrics, then I put the video so they can listen and follow. This way improves a lot their listening.
Do you use written assignments with your students? or online assignments? If online? Do your students receive immediate feedback or personal feedback?	I use online assignments since we are using a platform. And when I check for them they can directly see the explanation and the correction. When I see that a certain mistake is repeated for most of students, I reexplain it in class for everyone. But also I give them written assignment to do in class and I give them my feedback directly with the correction.
Can you name the websites, applications, or specific platforms you are using among your students during and after the class?	We are using the off2class platform now as a reference, instead of the books. I always explain on my own and we practice by using the platform. Plus, the assignment also are sent.
Do you use various techniques of teaching during the lesson? Individual or group?	Yes, I have to use many techniques in my class. Sometimes individual sometimes group. And both are giving great results. I even give the chance to my students to play the role of being a teacher for half an hour,

Interview Questions
of Nano- Learning
With EFL teachers

	to give them more self confidence and responsibility. It always works and they feel excited.
Do your students use textbooks or digital curricula? as e-book, pdf, PowerPoint slides Do you think students learn better by digital curricula?	My students use a digital curriculum, depending on a platform, they have also e-books and even their placement test is online. I'm old school even if I like development, because books are totally more interesting for me in education than technology and e-books. But I also agree that we should upgrade ourselves and our methods.
Do you ask your students to go for online resources to do their assignments?	If I need yes I do, I ask them to prepare a topic that they are interested in a lot. They can present it as they want, when they play the role of a teacher. And they mostly depend on you tube and power points.
Do you think the usage of technology in the classroom, will help reduce your effort, pressure and reduce the lesson timing?	People think that depending on technology, the teacher's effort will be reduced. But I personally disagree with that, because I never depend on any platform nor books explanation to make students understand. I always depend on my own explanation and the summary that I give them, after that we move to the platform to only practice. If technology is enough to educate people, no one would go to school or even have a teacher to teach him.
Have you heard of nano-learning?	Actually, not to much but I know that it's about a tutorial program designed to permit a learner to learn a certain subject in ten-minute time frame through the use of electronic media.
With the multi resources of online learning, do you think learners will need books?	No, I don't think so, since all the global libraries and resources of the world will be available just at their hands at home.
Why would learners go for online resources?	For many reasons. First, it's faster, cheaper, easier for them and it can be printed or typed. What does the student need more than that? Second, it is international resource where they have a variety of books and writers.

Appendix G

Online Interview of Nano-learning founder

Online Interview Questions
With Nano- technique
Company.

The following questions will be discussed with a broad company regarding the Nano-Lessons have been designed.

Name of the interviewee:..... sign:...../

Questions	Note
Can you introduce yourself and your company, please?	
Where is your location?	
Is there any application or specific software you have developed?	
What was the main theory behind developing the idea or the concept of the nano tech?	
What is your main objective?	
Is there any plan for further development?	
Is it based on individual understanding or group?	
Have you applied the apps in companies or institutes?	
What are the requirement to receive or attend this lesson?	
Is it costing less?	