THAILAND EDUCATION TRANSFORMATION INTO THE NEW DIGITAL AGE

BY

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Abstract

The objectives of this dissertation were 1) to study current government policies on online education in Thailand, 2) to study leading models of free open-sources online education in Thailand and abroad, and 3) to explore Thailand transformative online education for the new digital age. The qualitative study involved document collection and analysis, 2 focus groups, and 18 in-depth interviews using purposive sampling from key stakeholders in online education entities from grade 1 to grade 12. The findings showed that 1) digital infrastructure in Thailand was ready for the digital transformation; 2) current Thai policies and plans were heading toward core competency curriculum to transform passive learning to active learning approach; 3) Thai human resources deficiency in digital skillset and literacy impeded education transformation; 4) Thai culture and structure of the educational system was an external factor that deterred the transformative education; 5) free open sources were available online for everyone, but not everyone had the ability to access and search for them; and 6) the supports from all stakeholders were crucial in creating a transformative education environment. The recommendations were dedicated to all educators, learners, families of learners, schools, private sector, non-profit organizations, and public entities to work together to execute the policy's goal into the digital transformative education that can be realized in Thailand.

(Total 145 pages)

Keywords: Digital Education, Distance Learning, Lifelong Learning

Student's Signature …… Dissertation Advisor's Signature……

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Chapter 1

Introduction

1.1 Statement of Problem

The Internet's presence is everywhere beyond time and space. Even its presence is not visible to human eyes but it embeds in everyone's life in almost every aspect of life that one can think of. The Internet redefines physical barriers, occupies virtual space, reshapes time, and holds a new kind of power of knowledge and information. According to Castells (2001, p.1), "the Internet is the technological basis for the organizational form of the Information Age." Unlike any biological and industrial revolutions, the Internet outperforms any creations of humankind. The development of the Internet brings forth a transformation of the society. Castells (2010a, pp. 386-387), calls this new society as a "network society because it is made up of networks of production, power, and experience, which construct a culture of virtuality in the global flows that transcend time and space." The Internet has continued to progress in supporting new technological inventions. Humanity has also been adapting to the technological advancement that may seem irresistible.

As in the 2000s, we have witnessed a drastically increase in an adoption of wireless communication particularly in smart devices. Mobile communication and smart phone technology allow people to connect with one another globally, share information and experiences, learn new knowledge, process data, and live their lives timeless and spaceless. As the 21st century enters a new paradigm, wireless communication and the Internet have rapidly converged to be the leading platform of communication. Life without a smart phone seems impossible at this point and before we know it the Internet and mobile devices have become a necessity that humans can

live without. The mobility, the infinite connectivity, and the capability of smart devices such as smart phones and tablets have shifted a social paradigm to a global presence of real time information and social interactions. The Internet and wireless communication technologies are very powerful tools that humanity utilize to transform the society into an informational society.

The phenomenon that we all can agree in the digital age is that the whole world has increasingly been turning into a society of digitalization. Since the adoption of the Internet and consecutively by the wireless communication, the society is transforming into a new form of information and network society. Books are available digitally and accessible through portable reading devices. Education is transitioning to an online format of which students can learn new skills through social media, educate themselves without an educator, and even earn a degree without visiting a physical campus. A new method of learning is by searching subjects or topics from search engines. Online sites, forums, and search engines augment existing information resources and return this information instantly through just one click of which searchers do not require prior knowledge or any kind of specialization to begin a new learning. The shift in how people spend their time through digitalized activities is across all ages, genders, ethnicities, and background. With a rapid and constantly changing of technology, people are required to upkeep their technological skills for the digital world. Such a disruption of technological adoption in education deems to be a great impact to the transformation, but it does not truly transform people's behaviors until a pandemic was announced in 2019. The COVID-19 pandemic has struck global citizens by surprise but this outbreak was essentially a catalyst for an adoption of digital platforms across all daily activities causing physical activities to be performed digitally and virtually. Schools that we were familiar with were suddenly become an education through electronic devices where everyone were learning virtually. A change in ways of teaching and learning was pressuring a change in behaviors in humankind to adopt technology regardless of circumstances. Before we realized that change, technology was already integrated into activities and pedagogy of teaching and learning.

Technology is permeating into every aspect of our social life. Education, likewise, migrated to an online platform abruptly substantially due to the COVID-19

outbreak. This educational transformation occurred radically leaving many educators, learners, and associated people unprepared for the transition. New technological adopters during the pandemic and beyond are changing their behaviors to accept digital form of education and ways of teaching and learning. Thailand education may have been slow to adopt changes but the past few years have proven that Thai education has been transforming from former ways of teaching and learning to a new pedagogy that utilize and maximize technological tools, applications, and devices in mediating social distancing measures that were enforced and encouraged by the government entities and the Ministry of Education. Changes in behavior, mindset, and pedagogy essentially transforms Thai education into a new digital age that an adoption of technology and new ways of learning will remain and continue to progress into digital and virtual platform beyond the post-pandemic.

Education may be the slowest sector of social change but due to the COVID-19, educational entities adopted technological usage instantaneously. We were shifting from a face-to-face model of teaching and learning to an online teaching and learning in a matter of days. Until today, it has been over three years of a prolonged social distancing measure that physical educational institutions are not safe to attend. Teaching and learning are now conducting through electronic devices as we all are transforming into citizens of the Internet. The Internet has become a prime mover of social transformation through methods of teaching and learning, knowledge exchange and transfer, and ways to obtain new skillsets. Educational transformation does not change overnight by the crisis of the pandemic and the technological disruption but continuous efforts from the government entities, schools, students, and parents are making the transformation realized. The struggle and resistance to changes from both educator and learner sectors surfaced as a rapid transition of education was implemented.

Has education really changed in the digital age in Thailand? This question resonates with the researcher as a social innovator in examining ways to integrate technology into a society particularly in the form of education. As technology is advancing very rapidly, the adoption of the Internet, wireless communication, smart phones or tablets, and computers is essential in everyday activities. Therefore, learning technology by itself is already a form of lifelong learning that never cease to

amaze users all around the world. Education is an area that offer humanity to grow personally and socially. The researcher views education as an empowerment of humankind. If technology integration allows the exponential growth in education in the new digital era, the development of digital citizens starts with education in various forms under the Internet galaxy. Even technological adoption, Thailand education has not transformed until the COVID-19 pandemic. The inevitable disruption cannot be the only way to create a transformative education in Thailand. Therefore, the study to understand the current policies, to observe phenomena of current practices of online education, and to learn from the leading models of free open-sources of education is crucial for a researcher to explore Thailand transformative education into the new digital age.

1.2 Statement of Purpose

1.2.1 To study current government policies on online education in Thailand.

1.2.2 To study leading models of free open-sources for online education in Thailand and abroad.

1.2.3 To explore Thailand transformative online education for the new digital age.

1.3 Inquiry Question

Thailand: What are the current government policies on online education and how can free open sources contribute to transformative education for the new digital age?

1.4 Benefits from the Research Study

1.4.1 To illustrate Thai digital education that are currently implementing and the effectiveness under different circumstances.

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1.4.2 To offer alternative pedagogy and methods of teaching and learning for digital education and to recommend means of technology integration into education.

1.4.3 To provide recommendations to both educator and learner sectors in creating transformative education in Thailand.

1.4.4 To provide recommendations to policy makers in implementing effective education transformation in Thailand.

1.5 Technical and Specific Terms

Active Learning. Active learning is a student-centered approach. Students are actively involving in the class session and interact with the teacher and peers to engage in learning new materials (Unangst, 2021).

Blended learning. Blended learning is a collaborative combination of live or face-to-face teaching learning experience and online or interactive virtual learning sessions regardless of circumstances (Pandit & Agrawal, 2021, p. 264). Blended learning is a synonym for hybrid learning which is another term used throughout this dissertation.

Computer literacy. Computer literacy is more than an ability to use computers well. Users require to have dynamic mixture of skills to access and manipulate digitally encoded information through computers (Tidline, 2023).

Digitalization. Digitalization is the process change in business by using digital technologies. It is the process of moving to a digital business which provide new revenue and value-producing opportunities (Information Technology Gartner Glossary, 2023).

Digital Citizen. Digital citizen is a person who develops the comprehension and knowledge to effectively navigate through the Internet and digital technology. “Digital citizenship is the ethical and responsible use of technology” (Digital Respons-Ability, 2020). Digital citizen is also referred to a person who participate responsibly in social and civic activities (Cambridge Dictionary, 2022).

Digital Immigrants. Digital immigrants are the people who adopt digital skills later in their adulthood (Prensky, 2001, p. 3). Digital immigrants are the people who learn digital language and acquire digital skills later in life.

Digital Literacy. American Library Association (2013) as cited by UNESCO-UNEVOC defines digital literacy as the ability to search, understand, assess, generate, and communicate digital information. This ability requires both cognitive and technical skills. European Union Commission (2016) as cited by UNESCO-UNEVOC specifies digital literacy as the skills required to achieve digital competency that users can critically use information and communication technology for work, leisure, learning and communication.

Digital Natives. Digital natives are the people who were born into the information age and have been exposed to Internet, mobile communication, and social media since they were young (Prensky, 2001, p. 1).

Education. Education in this dissertation refers to a process of facilitating learning, or a process of acquiring knowledge, skills, values, and habits. Education can be conducted in many forms including teaching, training, storytelling, discussion, and research. Education is often taken place under a guidance of educators; however, learners can also educate themselves. Education can be situated in formal and informal settings. Even experiences attained throughout life is also one form of education. Therefore, education is not restricted to formal setting through institutions of schools, colleges, and universities. According to Cambridge Dictionary, Merriam-Webster, and Oxford Dictionary (2023), education is a process of teaching, training and learning, especially in schools, colleges, and universities, to improve knowledge and develop skills. It is crucial that education in this dissertation does not limit to only formal teaching and learning process but all processes of facilitating learning to acquire new knowledge, skills, values, and habits.

E-learning. E-learning or electronic learning is a form of learning through a use of electronic devices connecting to the Internet. Individuals or groups are teaching and learning online or offline of which all educational activities can be either synchronous or asynchronous in time. E-learning or electronic learning is used throughout this dissertation and is interchangeable with other terms used in this dissertation such as online learning, virtual learning, Internet-based learning, and distance learning (Egielewa, Idogho, Iyalomhe, & Cirella, 2021, pp.21-22).

Information Have. Information have is referring to people who have access to the Internet and wireless communication. They own technological devices that can connect to the Internet and wireless communication. They have full access of the internet and information that is available over the Internet (Qiu, 2009, p. 235). They can afford high-end services with little to no interruptions of the network.

Information Have-Less. Information have-less is consisting of people who connect to the Internet and wireless communication through low-end electronic devices. This sector is typically comprising of users who can afford used or refurbished devices with a basic wireless communication plan (Qiu, 2009, p. 8). Some Internet users may not own any devices but can access to the information from Internet cafes or can borrow from those who own electronic devices that can be connected to the Internet. Therefore, information have-less group is a wide range of people who own low-end devices, have unstable network of Internet and wireless communication, do not own low-end devices but have limited access to the Internet and wireless communication, and have means of connecting to the Internet via Internet cafes or borrowing from other people (Qiu, 2009, p. 26).

Information Have-Not. Information have-not is referring to people who lack an access of basic necessities such as electricity and water. Consequently, they lack an access to the Internet, wireless communication, and electronic devices. (Qiu, 2009, p.114). Essentially, the absence of access is the key determinant of the information have-not.

Netiquette. Netiquette is an abbreviation of network etiquette or Internet etiquette. According to Merriam (2023b), netiquette is referring to etiquette governing communication on the Internet. It is known as guidelines for courteous communication in the online environment (Chen, 2023). It provides rules of conduct in social situations in the digital community.

Passive Learning. Passive learning is referring to traditional way of learning where the teacher is a subject matter expert (IGI Global, 2023). Students receive the information from the teacher and internalize the materials. It is a method of learning that students do not engage in a communication with the instructor or classmates (Unangst, 2021). This is a teacher-centered approach in teaching and learning.

Technology Literacy. Technology literacy is an ability to use, govern, evaluate, and comprehend technology (International Technology and Engineering Educators Association [ITEEA], 2023). To be a technological literate person, one should know what technology is, how it operates, how it influences society and how society utilizes it. It is much more than knowledge about technology, electronic devices, and their applications. Technological literate citizen holds a degree of knowledge about the nature, behavior, power, and consequences of technology from a real-world perspective (ITEEA, 2023).

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Chapter 2

Literature Review and Conceptual Theories

Thailand education transformation into the new digital age is the research study aiming to study current government policies on online education in Thailand, to study leading models of free open-sources for online education in Thailand and abroad, and to explore Thailand transformative online education for the new digital age. The research study is examining the current government policies on online education in Thailand and searching for ways to utilize free open sources into digital transformative education.

This chapter reviews literature, publications, dissertations, and theories related to online teaching and learning, online pedagogy, Internet equity, open-source education, and digital literacy. The collection of relevant literature is instrumental in examining social transformations in education. Research on online learning format is widely studied but not in a focus of the social change. This study is aiming to explore transformative education that transitions education into the new digital age.

We all are willingly, unwillingly, knowingly, and unknowingly changing our behaviors and ways of teaching and learning through an adoption of technology. In order to live and prosper in a digital world as everyone is stepping foot into an informational society, we need to examine our changed perception and interactions in better preparing and be more informed of the futuristic society with an electronic nervous system. Education may seem slow in changing but due to the COVID-19 pandemic, it shifts everyone into a digital form of teaching and learning with no resistance. The new transformations are much deeper than an adoption of digital technology, they become social changes. Acceptance of digital innovation in

education, approach to attain knowledge unconventionally, and new avenues of teaching and

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learning are the new normal realities that we are living in. The global pandemic is an unfolding event that challenge educational institutions to thrive and become savvy in the 21st century of education. This is a time of opportunity for advancing the digital agenda and exploring its potentials, capabilities, relationships, and interactions in education.

This research study is conducted to observe and understand Thailand education transformation into the new digital age. The study is intended to explore new educational forms including but not limited to traditional approach of attaining a degree of knowledge and digital means of obtaining knowledge from unstructured procedures. The literature review section is a compilation of relevant dissertations, journals, publications, literatures, and theories supporting the study from ProQuest Dissertation & Theses, Sage Journals, EBSCO Open Dissertations, Google Scholar, and ECSCOHost databases. The use of filters limited the search to recent publications dated from 2009 to present. The exception is the use of theories and theoretical frameworks relevant to the topics that dated prior to 2009. Discussions of literature reviews are in the following sequential order:

2.1 Education Theory and Lifelong Learning

2.2 Digital Literacy, Digital Natives, and Digital Immigrants

2.3 Social Transformation Through Internet and Mobile Communication

2.4 Conceptual Framework.

Since an adoption of the wireless communication and the Internet, we all are entering into a digital realm of an informational society. Along with the COVID-19 pandemic, we are changing our behaviors, perceptions, and interactions with technology. Education alike is inseparable from technology. All stakeholders in education are required to adapt and constantly learning new ways of transferring and gaining knowledge. Education through online programs is more prominent than ever before. Students no longer need to visit a physical institution to attain knowledge. A content learning or specific knowledge learning with short courses can be obtained online through various channels making traditional forms of education drastically

change. Once we step foot into a digital realm of education, we substantially transform into citizens of the digital world.

2.1 Education Theory and Lifelong Learning

Within a matter of days, schools, colleges, and universities all around the world became places that were not safe for physical co-presence to contain the rise of the COVID-19 infections. According to the United Nations Educational, Scientific, and Cultural Organization [UNESCO] (2022), up to 200 countries with 1.57 billion learners were affected by school closures both in full closures nationwide and partial closures by regions starting from February 2020 to present. 83 weeks of school closures was the longest duration as of March 2022 since the spread of the COVID-19. As of March 2022, Thailand accumulated total of 53 weeks of school closures (UNESCO report, 2022).

Digitalization of teaching and learning processes have been accelerated and adopted across continents without proper preparations and trainings. All educational institutions at all levels were severely disrupted and were forced to rush in planning new methods of teaching and learning as well as viable solutions to continue education with minimal disturbances. It has been approaching four years now at the time of this dissertation that social distancing will continue to be a prolonged temporary measure that no one knows when will this pandemic cease to exist. While many schools in Thailand resume physical attendance since May 2022, the social distancing measures are not entirely uplifted. Each respective school manages its own measures depending on situations and circumstances.

2.1.1 Education Paradigm and Definition

According to Little (2016, p.708), education is a social institution that every citizen attends to study basic academic knowledge, adopt articulated skills, and learn cultural norms. Schools can be agents of change or conformity. An agent of change occurs when individuals learn to think outside of their family or the local norms they were born into. On the other hand, an agent of conformity occurs when

students study a standardized curriculum, learn a common culture and knowledge base for their respective society. Education can create pathways for students to both either independence and obedience.

Education comprises of formal and informal forms of education. Formal education is the academic learning through attending a formal institution with certain set of curriculums. In contrast, informal education is a type of learning about cultural values, norms, and behaviors to conform in a society. Informal education can be attained from various social environments such as academic institutions, home, and local communities (Little, 2016, pp. 711-712). Universal access of education is promoted globally but unfortunately not all students worldwide have the same level of access to educational system based on many aspects on their race, class, and gender. Even in the same country, not all learners have the equal opportunity to the same education. As noted by Little (2016, p. 717), "students of low socioeconomic status are generally not afforded the same opportunities as students of higher status, no matter how great their academic ability or desire to learn." This problem exists prior to the technological integration in education. Fast forward to the 21st century, further problem keeps widening the gap for educational opportunity as the technological advancement drives future generations.

2.1.1.1 Educator Sector

1) Teachers, Professors, Instructors, and Lecturers

Teachers, professors, instructors, and lecturers are main actors that facilitate learning by passing the knowledge and resources. They are the key actors who determine what contents students should learn. Through their experience and knowledge, students are influenced by their methods of teaching. Their guidance can shape students' learning and capacity to develop skill sets in respective areas of expertise (Villegas-Ch, Palacios-Pacheco, Roman-Cañizares, & Luján-Mora, 2021, p. 3). A framework developed by Mishra and Koehler (2006, as cited in Pandit & Agrawal, 2021, p. 3) illustrated that teacher knowledge comprises of technological, pedagogical, and content knowledge. Technological proficiency is an ability to integrate technology into the teaching process and is an essence of the digital teaching. Pedagogical expertise is the know-how to teach by using specific methods or creatively executing teaching sessions in memorable and effective

manner. Content knowledge is a specific insight about the subject or topic of teaching. The content knowledge is slowly diminishing in its weight as data and information is readily available over the Internet through search engine and simply within one click away. Pedagogical knowledge is the most critical asset for instructors to successfully conduct online courses as we all are moving away from traditional practices. All teachers will have to find ways to integrate outside knowledge that is digital in its nature in teaching sessions making real world updates relevant to the content of the courses.

Four major areas of educators' responsibilities in digital teaching practices comprise of pedagogical practices, social implementations, managerial efficiency and technical know-how. A facilitation of education and an ability in passing on the knowledge fall under pedagogical role. Social impacts involve creating a welcoming, warm, and collaborative environment in teaching and learning. This social factor enhances psychological motivation in online learning. Managerial capability asks for educational planning in setting courses' agenda, pacing and timing the learning sessions, setting practical and obtainable goals for learners, as well as creating innovative rules in proctoring online study. Technical requirements become increasingly crucial credential in the digital era for instructors to be comfortable with the technology and its rapid advancement (Pandit & Agrawal, 2021, p. 264).

Not all lecturers are prepared for full online courses, and so inadequate trainings cause more burdens for lecturers to cope with additional requirements of digital teaching. According to a study performed by Coppola et al (2002, as cited in Pandit & Agrawal, 2021, p. 265), three main tasks in assessing teaching ability are cognitive, affective, and managerial tasks. Cognitive skills correspond to activities in responding to students, answering questions, critical thinking, reasoning and analyzing data and information. Affective competency includes all works in influencing students, and maintaining students' relationships with their peers. Managerial actions comprise of getting students' participation in an online class, monitoring their reactions and evaluating their learning outcomes.

Routinely involvements with posts that students make online can boost students' interests and participation in online sessions as well as

promoting attendance on screen (Pandit & Agrawal, 2021, p. 265). Psychological factors in attaining students' contribution in online sessions are central in building students' confidence and trust with online learning. Encouragement, appreciation, positive reinforcement, acknowledgement, inclusion, and support are areas of importance that greatly create a positive learning environment essential to effective virtual learning (Pandit & Agrawal, 2021, p. 265). Technological literacy is inescapable for all instructors worldwide regardless of their age, background, and access of technology. The 21st century and beyond will mandate an increasingly growth of technological adoption in education and lifelong learning of technology become an integral part of teaching aspect.

2) Institutes, Departments, Schools, Colleges, and Universities

Emergency planning in assisting both instructors and learners can alleviate tensions in transitioning into virtual teaching and learning sessions. Regular trainings of the faculty and staff to adapt to new technological advancements and new technicalities are fundamental in providing effective distance learning (Pandit & Agrawal, 2021, p. 266). All stakeholders need assistance and will be required to have just-in-time trainings for digital learning sessions. The responsibilities to create mutual understandings and acceptance of teaching and learning method fall greatly on the academic leaders and decision makers.

Periodic group meetings between faculty and staff are practical practices to allow collaborative teamwork across institutes, colleges, departments, and campuses in sharing techniques, skillsets, knowledge in offering effective teaching styles suitable for online environment.

The pandemic has shown the vulnerabilities and shortcomings of current forms of education. It is a game changer to educational institutions both in public and private sectors to rethink their approach of effective education during a true digital confinement. According to Rashid and Yadav (2020, p. 341), "the current situation has challenged deep-rooted notions about the role of higher education institutions in providing quality education, mode of delivery, accessibility, the importance of lifelong learning, and educator's perceptions about the type of learners." Technology literacy is a crucial component of education. The new normal as we all will be facing will necessitate education to be innovative and flexible

with technological integration. For institutions to stay strong and resilient, acceptance of change and ability to change are the core values to their sustainability.

2.1.1.2 Learner Sector

1) Students and Researchers

Online learning leaves many students powerless with added responsibilities in preparing their technological devices, attaining adequate Internet connection, and assessing their abilities in comprehending learning materials over virtual platform. Low level of computer literacy is adding more burdens for students to safeguard a continuity of growth in human capital.

Low degree of student involvement appears to be the most prominent problem that many instructors are facing with. The age characteristics affect the involvement and students' ability to comprehend learning at a distance format (Nesterchuk, Grishin, & Chepurnaya, 2020, p. 4). Psychological aspects of students in online sessions have become an area of interest among researchers to assist both teachers and students coping with depression, stress, anxiety, boredom, and frustration (Surahman & Sujarwanto, 2021, p. 5). Instructors play a key role in making more engaging experiences for students to excel and participate in online sessions. The teaching staffs will require to sharpen their skills to engineer assessments in creative ways to effectively evaluate students' performance while avoid having to police them (Ashour, El-Refae, & Zaitoun, 2021, p. 230).

Conducting researches during the pandemic pose a new challenge for researchers. Face-to-face interviews and participants observations are restricted due to social distancing measures. Collecting data from fieldwork is shifting to virtual activities. Even data itself is notably shifting to digital format of which the data is born digital or originated in digital platform (Grek & Landri, 2021, p. 399). For many learners, their family obligation or support play a key role determining the success of their online learning experience and outcome.

2) Family of Students

Parents' support especially on younger learners become necessary to assist them in learning and accessing learning materials. Not all kids are fortunate to have the full supports from their parents or guardians in this time of transitioning to digital learning (Grek & Landri, 2021, p. 398). Quiet spaces and free

time away from other family members are also critical factors in providing a fostering environment for learners in all ages (Neuwirth, Jović, & Mukherji, 2020, p.142). In addition, if any family members have or had contracted COVID-19, both students and teachers are facing with more difficulties emotionally, physically, and financially to sustain their essential needs and to care for loved ones. All of these have direct impact on the ability to participate in ongoing academic work (Neuwirth et al., 2020, p.145).

Socioeconomic status of student's families is a very critical element in supporting effective online learning. Their lack of adequate electricity, Internet bandwidth and connectivity, and computers or mobile devices connecting to the Internet that are fundamental components of digital infrastructure will continue to be struggles for government and agencies to provide assistance in reaching out to the disadvantaged communities. Students from families with weaker socioeconomic backgrounds are limited by their capability to enter into a digital form of education (Dimopoulos, Koutsampelas, & Tsatsaroni, 2021, p.493).

Low level of computer literacy among parents of younger children is another struggle that many households cannot attain helps. Additional responsibilities that used to be parts of schools' faculty has been passed along to the parents to assist their children in using technology. Parents' familiarity with technological devices and their usages significantly determines positive or negative experience with digital learning for both leaners and families of learners (Dimopoulos et al., 2021, p.493). Therefore, it is compelling to examine teaching and delivery methods as well as the evolvement of those models suitable for the social distancing confinements and the futuristic virtual learning.

2.1.2 Teaching and Delivery Methods

2.1.2.1 Face-to-Face or Conventional Model

Face-to-face or traditional teaching method requires that both faculty and students are physically at the same location for teaching and learning activities to happen. Digital content for education such as digital copies of textbooks and study materials, digital submissions of reports and presentations, and group chats are digital forms of technology that have already immersed in traditional approach as society is slowly transforming into a digital society (Garg, 2020, p.280).

2.1.2.2 Online Model

An online model offers an alternative approach in learning even before the COVID-19 outspread to distance learners and home schoolers who cannot visit a facility physically due to their personal constraints. Online teaching-learning model eliminates obstacles of distance and synchronous time by utilizing the technology and its extensive usage in the Internet, personal computers, laptops, tablets, mobile devices, and other smart devices (Villegas-Ch et al., 2021, p. 4).

Designing and delivering online courses require extensive planning to generate interests remotely across all learners. Constant adjustments of mixing participants' activities such as group projects and individual assignments will lead to creative learning environment and upkeep students' attentions span with digital learning. An establishment of netiquette is necessary to reach mutual understandings and agreements among educators and learners alike of acceptable online behaviors (Pandit & Agrawal, 2021, p. 265). Teaching and learning are not a one-way direction. Instructors can learn digital skills and technological skills from students who are more fluent in utilizing computers, software, tablets, smart phones, and applications.

While we all are in the midst of the prolonged pandemic, the maturation of virtual learning will soon be realized to enhance younger generations with more knowledge. The COVID-19 has been a vital factor in legitimizing online learning as a universal platform across educational provisions. Virtual learning will eventually gain a stronger footing in the future as it will definitely be the future. In the long run, distance learning will be gradually accepted by national accredited agencies and finally make Internet-based learning as a new normality (Ashour et al., 2021, p. 230).

Assessments, quizzes, tests, and examinations can be done both synchronously and asynchronously. Synchronous assessments involve real time presence of both students and instructors. The virtual space of synchronous assignments can be in various forms such as online proctored open-book

examinations, oral presentations, and real time discussions. Asynchronous assessments, on the other hand, omit the same time presence. Projects, reports, and research papers are examples of asynchronous assignments (Babbar & Gupta, 2021, p.476). While there are rising concerns of plagiarism and academic dishonesty with online learning, proper netiquette will be necessary to create Internet citizenship among students.

It will be an inappropriate recommendation to abandon a conventional model of face-to-face method of teaching completely although we are forced to utilize an online model fully at the present time during the prolonged pandemic of the COVID-19. While we can only implement an online model during the crisis, a hybrid model or a blended model is proven to be a more appropriate method of education approach.

2.1.2.3 Hybrid or Blended Model

The hybrid model will be the most prominent model used during the pandemic and beyond. This is where we all co-presence online and offline transcending place and time. E-learning is already becoming an integral part of the education system and even after the COVID-19 crisis an online learning will continue to be an essential element of teaching and learning. There are no best practices or models for education. Each institution has to customize general models applicable to their circumstances and audiences.

Combining multiple unique features of face-to-face and online instruction, blended learning is a combination of what works best. The main characteristics of e-learning is that it removes barriers of time, place, learning path, and learning pace. Even before the COVID-19 crisis, this type of model has been implemented in various institutions (Ashour et al., 2021, p. 222). Classes are to be delivered digitally and supplemented with few classes physically held on campus. Through combining digital tools with traditional teaching method, the classroom is enhanced with interactive learning that allow students accessing recorded lectures at their convenience and supplement their knowledge with outside sources that are available online.

Blended learning is not a new form of teaching-learning model. It has been adopted in many countries for different reasons particularly because of

decreasing revenues and resources to conduct a face-to-face model (Henry, 2018, p. 2). Blended learning was also introduced in response of decreasing of schools and districts funding and teacher shortages (Henry, 2018, p. 8). Regardless of its origin, all stakeholders are adopting new culture of being connected online and more activities will be performed online. Teaching and learning styles greatly tie with the culture of each respective country. As education has changed extensively through technology, connectivism is a relatively new education theory that is currently suitable and represented of the education in the digital age.

2.1.3 Connectivism Education Theory

Among many education theories such as behaviorism, cognitivism, and constructivism that were developed and recognized prior to the time of technological teaching and learning, none of the theories fit with the current situations of the 21st century of education. Since technology reshape how we live, how we communicate, and how we learn, George Siemens (2008) introduced a new theory to describe learning principles and processes reflective of current social environments. Key trend to digital teaching and learning for the 21st century is consisting of lifelong learning, informal learning has become significant aspect of learning experience, know-how knowledge is supplemented by know-where which means knowing where to find knowledge is critical to rapid changing of a digital learning. Therefore, we are forced to stay current in a fast pace of evolving information ecology. According to Siemens (2008), we all are living in a network through technology which simply be represented as connections between entities. Computer networks, electrical grids, and social networks all are comprised of the same principle that people, groups of people, systems, nodes, and entities are interconnected to create an integrated whole. Any change or alteration within the network will have ripple effects to the whole.

Main principles developed by Siemens (2008) can be summarized as followed:

1) Learning and knowledge are comprised of diversity of opinions
2) Learning is a process that connect nodes or sources of information
3) Learning may come from non-human entities through

technological advancement

4) Willingness to learn more is critical than what is currently known

5) Up keeping and maintaining connections is necessary to facilitate lifelong learning

6) Ability to recognize connections between ideas, concepts, and principles is an essential skillset

7) Regularly attaining up-to-date knowledge is a backbone to Connectivism

8) Decision making is a learning process. A right decision now may be wrong tomorrow due to circumstances in the information environments affecting the decision making.

Essentially, connectivism is simply a theory to reshape how we train to think, process, and learn. "Our ability to learn what we need for tomorrow is more important than what we know today" (Siemens, 2008). Accessibility to the required knowledge applicable to evolving digital knowledge and education is the key aspect for learners to succeed and thrive in the digital age. Connectivism provides insight of how we should change the way we learn so that learners can flourish in a digital era. Therefore, we cannot deny the fact that informational technology is a new social environment that reshape a new paradigm of learning.

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2.1.4 Paradigm Shift to Student-Centered Learning Approach

In the era of connectivity through technology, educational institutions must be creative in their delivery method toward open-source content and student-centered approach of learning. A leading path to provide exceptional learning experience with a model that is adjustable to time, place, and even in crises. Above all, academic leadership, collaborative teaching and learning style, and trainings of both faculty and students on digital technology and applications are important aspects in creating an effective and fostering ecosystem for learning (Pandit & Agrawal, 2021, p. 263). Learning regardless of the models used should be effective in creating confidence among learners of their abilities to enter the workforce. Their

employability is assessed not only from acquired knowledge but also in their critical thinking, problem solving ability, analytical skills, lifelong learning capability, and social skills (Garg, 2020, p.281).

According to Neuwirth et al. (2020, p. 142), “the real issue is: how should faculty approach maintaining rigor and delivering quality education as well as support their students’ ongoing ability to engage in meaningful, interactive education activities?” Students’ satisfaction and perception that they are treated as individuals and their communications and opinions are heard and attend to is essential to evaluate student-centered learning approach. Not all students are eagerly asking direct questions or asking for clarifications in class. Post-class discussion boards where students can openly ask questions whenever can help addressing various students’ learning style and behaviors. Briefly reviewing questions between each face-to-face or online sessions assists in closing gaps in miscommunication, misconception, misapprehension, and misunderstanding (Neuwirth et al., 2020, p.150).

Individual and group assignments can be fused together to promote student engagement and peer-to-peer interactions, relationships, and collaboration. Combining various features of online discussions boards, posts, and small groups can enrich interactive learning experience and create skillset in teamwork (Neuwirth et al., 2020, p.151). Teamwork and collaboration are fundamental essence that each student must develop in preparation of entering a workforce.

Key elements of a student-centered approach are flexibility, accessibility, and adaptability. Learning does not stop once the classroom session is over, learning is a life long journey of knowledge accumulation. According to Bayne & Gallagher (2021, p. 617), there are four main values in succeeding in student-centered approach which are experience over assessment, diversity and justice, relationships first, and participation and flexibility. Learning should not be overly stressed on assessments, tests, quizzes, and exams. A focus of employability, creativity, critical thinking, and acceptance of failures and mistakes to better themselves are parts of the value of rich experience of learning and teaching can prepare learners to be the better future generations of humanity. Diversity in education should embrace inclusion across all areas including but not limited to race, ethnicity, age, demographic, socioeconomic backgrounds, beliefs, political views,

religions, and even technological skillsets. Social responsibility should be integrated in teaching functions as values to be passed on to next generations of their roles in their respective communities, societies, and global civilization. Relationships between teachers and learners are essential to build social interactions and relationships. It provides a safe environment for information sharing and meaningful human exchange. For education to sustain and become resilient in the digital era, education must be adaptable, adjustable, flexible, accessible, and attainable along with the rapid technological advancements (Bayne & Gallagher, 2021, p. 617). Educational transformation should keep pace with technological transformation as societies at large are transitioning into virtual societies.

Khan Academy is among the leading free open sources of teaching and learning that stretch its reach worldwide. Anyone who can connect to the Internet can search for Khan Academy, learn from the resources available for free online, and gain knowledge without attending a physical classroom. For learners with language barriers, Khan Academy has been translated from English to 17 languages and additional 24 languages with less contents (Khan Academy, 2022). Non-profit in its nature, Khan Academy has proven that free education can be realized to provide opportunities for everyone in the digital age of education.

Khan pedagogy was designed to have pedagogy meet technology. Learning experience with Khan Academy is personalized of which each student progresses at his or her own pace. Students obtain instant feedback and results when taken tests or exams. They can advance to more difficult levels of subject matters at their own discretion. In addition to learners, teachers can customize assignments to each respective student's need rather than the same assignment to all students in the class (Kumar, 2022).

Khan pedagogy encourages students to believe in their potential. They must hold a mindset of "I can learn anything." For students who do not hold this mentality of learning, Khan Academy provides an environment to support students at learning so that they do not feel alone and can always seek help when they are stuck. The platform was designed to make students feel comfortable with their environment even if they do not understand the materials or topics of learning. A hint, quick summary of topic, get help button, a link to re-watch topics of learning, and more

tools are at the learners' fingertip to navigate through the learning materials with help along the way. Encouragement on both right or wrong answers and progresses throughout the course contents go a long way to foster positive learning experience that not only achievement is being rewarded but efforts in attempting also counts (Kumar, 2022). Not only Khan Academy offers help to students, educators and parents can seek help from Khan Academy. Khan Academy's success is defined by the success of both learners and educators (Kumar, 2022).

2.1.5 Lifelong Learning

Learning is a lifelong endeavor that exist in both formal and informal settings. Learning can be obtained from institutions with certification to learning from peer-to-peer without certification. Learning can also be self-taught through experiences or other mediums of knowledge provider. Lifelong learning skills provide the foundation for learning throughout one's life. These skills support one's thinking, self-management, self-development and social interaction. Lifelong learning is the pathway that learners translate their knowledge into action (McGarrah, 2015). As its name of lifelong learning, learning process can be applied to learners of all ages as well as the aging process of learners. "Adaptability and the ability to acquire new skills and competences is therefore paramount" (UNESCO – Institute for Lifelong Learning, 2023). The emphasis of self-learning and peer-based are acknowledged for lifelong learning process.

The UNESCO report, UNESCO proposed a vision of education into two key paradigms: lifelong learning and the four pillars of learning (Delors, 1996, p. 37). The four pillars of learning are 1) learning to know, 2) learning to do, 3) learning to be, and 4) learning to live together. Learning to know includes learning to learn knowledge and skills inherent to one's need. This allows individuals to recognize and take opportunities that arise throughout their lives. Learning to do emphasizes on the acquisition of skills of professional practice. Individuals need to develop the ability to adapt in continuing changing environment of workforce, situations, and circumstances. Learning to be is the ability to act and make judgement. It is a personal responsibility to self, others, communities, and society. Learning to live together is a development of citizenship. Individuals learn to appreciate interdependency and

manage to resolve conflicts in an intelligent and peaceful method (Delors, 1996, p.37; Keevy & Chakroun, 2015, p. 28). The four pillars of learning concept is in alignment with Connectivism education theory by George Siemens. Siemens (2008) stated that upkeeping and maintaining connections is essential for lifelong learning with a touch of digital adoption that reshape a paradigm of learning.

To thrive in a digital environment, literacy alone is no longer applicable to the current reality of social interactions. Digital literacy is a new skill that everyone regardless of their roles must adopt to become digital citizens. Digital literacy is not simply an ability to read, write, and count in the digital platform, it requires much more complex skillsets to be proficient in the online community.

2.2 Digital Literacy, Digital Natives, and Digital Immigrants

Literacy has been on national and international agenda for all countries and organizations worldwide to increase literacy rate among world citizens. Literacy is understood to be the ability to read, write, and count (UNESCO, 2021). Since we are in the 21st century, literacy alone is no longer applicable to the current situation of the digital age and the social distancing measures of the COVID-19.

2.2.1 Digital Literacy

Digital literacy has become a crucial requirement for world citizens to enter a digital era of information age. According to UNESCO (2021), digital literacy is "a means of identification, understanding, interpretation, creation, and communication in an increasingly digital, text-mediated, information-rich and fast-changing world." Eshet-Alkalai (2012, p.268) defines digital literacy as survival skill in the digital era. It comprises of a system of competencies and approaches used by learners in digital environments. Digital users need a substantial variety of intricate cognitive, sociological, and emotional skills to navigate effectively in digital domains (Eshet-Alkalai, 2004, p. 93). Eshet-Alkalai & Chajut (2009, p. 421) suggests that digital literacy consists of six types of skills:

1) Photovisual literacy is the capability to operate effectively in a

digital realm. It is the skill of reading visual representations and understand instructions and messages.

2) Reproduction literacy is the skill in creating genuine, purposeful

written and art work by replicating and modifying preexisting digital data and content. It is the art of creative recycling of published materials.

3) Branching literacy is the ability to establish knowledge through a nonlinear manner. It is a nonlinear way of thinking by utilizing hypermedia.

4) Information literacy is the expertise to consume information critically. It is a capability to distinguish reliable sources from false information and properly evaluate the quality and validity of information.

5) Socioemotional literacy is the technique to communicate effectively in online platforms.

6) Realtime thinking skill is the talent to process and evaluate significant amount of information in real time.

In summary, Eshet-Alkalai (2004, p. 94) shapes digital literacy framework into three aspects:

1) Technical-procedural skill refers to basic computing skills required to implement technology.

2) Cognitive skill involves pedagogy which includes comprehension, critical thinking, and creativity.

3) Emotional-social skill is concerned with communication and the

respective platforms in online communities and space.

Digital literacy is fundamental to all citizens around the globe. While not all can master technology and be comfortable with the digital world, all educators and learners must attain basic knowledge to maneuver through the network and informational society. As citizens are migrating into the Internet galaxy and become digital citizens, the migration process arranges digital citizens into digital natives and digital immigrants.

2.2.2 Digital Native and Digital Immigrants

The digitalization of education is not a new concept and has been a universal trend worldwide. For supporters of distance learning, an implementation of online learning may seem to be long overdue for a digital era. The education in the 21st century provides a space of rapid transformation that is digital in nature (Grek & Landri, 2021, p. 397). For significant population of stakeholders, this pandemic introduces the first-time online learning experience. For other digital veterans, they are facing with a full-fledged online exams and lectures for the first time (Pandit & Agrawal, 2021, p. 263). The pandemic is simply an accelerator of the digital transformation in education. The emergency e-learning protocols in many countries set a new record of the fastest adoption of digital learning systems in a history of education. The unprecedented shift to online learning has become a new normal of education. As we all are facing with challenges at present and ahead, there are incredible opportunities for educational growth and development with technological integration that can enrich educational experiences.

Students today especially generation Alpha are no longer the people that the conventional educational system was designed for. Generations Alpha, Z and Y are the generations that were born into digital platform or had been exposed to digital technology at early ages. They think, perceive, and process information fundamentally and differently from their predecessors (Prensky, 2001, p. 1). Prensky classifies people in the digital era into two major groups: Digital Natives and Digital Immigrants. Similar to a connotation of native speakers of any languages, digital natives are the native speakers of digital language of computers, Internet, mobile communication, and social media (Prensky, 2001, p. 1). The rest of populations are grouped into Digital Immigrants as they adopt and learn digital language later in life during their adulthood. Similarly, immigrants tend to have thicker accent in their speaking skills as they retain some degrees of their heritage in the past. Some immigrants can learn better than others leaving less of their digital immigrant accent to be noticed (Prensky, 2001, p. 3). Nevertheless, these groups do not think and process information like their counterparts. Therefore, instructors who fall mostly into Digital Immigrants category are speaking different digital language from students who are Digital Natives. It should not be a surprise that there are gaps between the

people who transmit the knowledge and the people who receive the knowledge. Acknowledging the gaps and finding ways to bridge these gaps can build greater success in younger generations' potential to become capable citizens.

Information at present is only one-click away through search engines provided that we are connected to the Internet. The roles of all stakeholders are drastically changing along with substantial growth of technological advancement. Digital natives are the future of humanity and that young learners will grow comprehensively very much different from their digital immigrants' counterparts. In order to ensure digital natives' successful growth, we must search for solutions to tune in two groups that speak different digital languages in order to build relationships and transform our future of digital societies.

2.3 Social Transformation Through Internet and Mobile Communication

The COVID-19 pandemic has become a catalyst in shifting education to a digital format as no history of education ever experienced. The coronavirus disease was reported to originate from Wuhan, China in December 2019. Three months after, World Health Organization (WHO) declared the coronavirus disease as a pandemic on March 11th, 2020 as cited by Rashid & Yadav (2020, p. 340). The substantial effect of the outbreak was that digital infrastructure quickly transformed almost all aspects of social activities and established itself as the main pillar for survival. Work, financial transactions, trading goods and services, leisure meetings, families and friends gathering, and education migrated abruptly and suddenly to the digital world (Grek & Landri, 2021, p. 398). The shift to digital realm was almost immediate and unexpected by both educators and learners. No one was prepared nor equipped with this kind of situation. This sudden change essentially transformed our societies to a new normality that we all learned to adapt and accept the unavoidable shifts of education.

2.3.1 Societal Changes

Technology does not determine society nor it dictates a revolution. Technology is simply a tool that humans design to be a main driving force in social changes. An adoption of such technology particularly the Internet, wireless communication, and their diverse applications is a radical change to our society. Online communities are emerged through these revolutionary inventions of which have already become a fundamental dimension of everyday life that progressively growing. Because of its pervasiveness throughout all aspects of human activity, the social processes in the making are rapidly transforming a society economically, socially, and culturally (Castells, 2010b, p. 5). We are all living in a new social paradigm as Castells calls it "Internet galaxy." Under this new realm of society, the Internet is the basis of our new communication environment (Castells, 2001, p. 275). The socio-technical transformation permeates throughout the world and the entire social processes of value creation, value exchange, and value acceptance (Castells, 2001, p. 66). It has become a new social practice. The ability to adapt and react to change with little to no penalty in effort, cost, and time is a fundamental essence of the information age.

Attaining skills and knowledge can be acquired simply by searching through online mediums from search engines or specialized websites, blogs, and social media. Do it yourself and learn it yourself have become a new motto to obtain new knowledge or skill via online contents. As institutionalized education is less attractive to learners, knowledge is readily available and accessible through a technological device that connects a person to the medium, the Internet, to gain the knowledge.

Formal and informal learning through institutions via online programs or partial online programs require some means of online access that are becoming the norm of the 21st century. Various applications are implemented in assisting online teaching and learning particularly during the COVID-19 outbreak. Educators and learners are transmitting and transferring knowledge through technology, an essential medium of knowledge transfer and exchange. Social transformation in education is obvious in many forms as we are all transitioning to the digital world. The forefront changes in the society especially with the technological advancement often are driven by business motives.

2.3.2 Business Practices and the Conversion

Technology is not simply a potent tool that humanity exploits to manipulate social reformation but it is an influential force that shifts a social paradigm through its penetrations to the core of life and mind (Castells, 2010b, p. 76). Employment and working lifestyles are the core of social structure. Under a new paradigm, flexible work hours, part time jobs, task-oriented contracts, teleworking, and telecommuting are parts of the new working processes. Online learning is a part of this transition. Educators are teleworking as they teach online. Learners can access digital copy of course materials transcending time and location granted they are connected to the Internet. Information exchange and knowledge transfer between teachers and learners are accessible 24 hours via synchronous real time sessions, asynchronous recorded video sessions, synchronous chat discussions, and asynchronous chat messages that can be left to respond at a later time. Classroom on the run is a new way of learning in the digital age as we can access digital content from portable devices.

Purchasing products and services are moving into online platforms especially in e-commerce sites and applications. Products that are traditionally acquired by visiting a physical store can be ordered online. Some products can be returned with a full refund without making a trip to a physical store. Textbooks, publications, journals, and newspapers are available digitally. They can also be purchased through online stores of which physical stores for academic related supplies are diminishing. Services can be contracted and arranged without meeting in person. Tutoring and actual classroom sessions are now conducted online through technological devices with a connection to the wireless communication and the Internet.

Mobile banking has been a lucrative method for financial institutions to reduce costs in their operations. Banking tellers and physical branches are declining in number as many financial activities can be performed digitally. Educational institutions worldwide accept all kinds of digital payments. We pay for tuition, textbooks, and essential study materials through mobile banking. The information technology has become the crucial tool for effective implementations of social

processes in developing socioeconomic domains of human activities (Castells, 2010a, pp. 372-373). Flexibility is the most prominent factor in the digital age. All activities across all dimensions of life are focusing on flexible time and space or virtual space. Personal and work lives are inseparable with this new era of information technology. Flexibility comes with reachability. Distance and space have decline in their meanings and the contents on virtual space have increased in its impact to human mind and perception. The 21st century form of education requires extensive aspects of flexibility, reachability, and adaptability.

Social transformation through technology is inevitable and impactful that generates new normal practices as we learn to accept, adapt, and adjust to changes. The new social practices and behaviors in education and ways of teaching and learning constitute new culture, values, meanings to society, and ways we perceive the term education. This implication traces back to Castells' (2001, p.1) theory that the Internet is indeed the technological pillar for the society in the digital age. The new society is a network society which construct a new culture of virtuality in the global flows that is timeless and occupies virtual space (Castells, 2010a, pp. 386-387). Castells acknowledged that his study has never focused on education, teaching, and learning. Therefore, this research study is aiming to bridge Castells' social transformation work and Qiu's digital divide concept to education.

2.3.3 Inequality of Digital Access

According to Castells (2010b, p. 71), "the penalty for being outside the network increases with the network's growth because of the declining number of opportunities in reaching other elements outside the network." The ability to connect to the Internet from a wireless device is the critical and determining factor for a new network society. This is evident in e-commerce platform, sellers and producers are utilizing online channels as their means of marketing and selling their products and services. Through its limitless boundaries, the Internet connects buyers and sellers together bypassing many middle stages of purchasing and delivering products and services. Human activities are increasingly organized around networks. Networks constitute a new social framework. In turns, diffusion of networking modifies social outcomes (Castells, 2010b, p. 500). A digital divide is inevitable because there is a

gap for those with limited access of the Internet and those without. Even for those with a full access of the Internet, not everyone is able to use the technology effectively. An ability to learn and maximize the usage of the Internet is not on a same level playing field. These are the consequences of both connection and lack of connection to the Internet (Castells, 2001, p. 269).

2.3.4 Digital Divide and Knowledge Gap

Socio-economic status of students and their families worldwide particularly in developing countries play a key role in initiating e-learning. As with the advancement of technology, the Internet, wireless communication, and their respective applications, not everyone has equal access. There are two forms of technological stratifications. The first is a digital divide of which class, race, geographic areas, and socio-economic aspects of both educators and learners impede them from accessing the fundamental technology for online learning. The first form of digital divide then leads to a second technological stratification, a knowledge gap. This is the gap in information, skills, and knowledge of those who cannot access the technology particularly the information that is readily available over the Internet (Little, 2016, p. 338). This is leaving our society very much divided into those with technological knowledge and those without. Living in the same globe, we have one end of communities without electricity, wireless communication, and the Internet access while the other end of communities with full speed of the Internet access and wireless communication of which a single learner owns a laptop, a smart phone, and a tablet with full access of digital data, information, and knowledge. Digital divide in the context of this study includes those who have no access of the electricity, the Internet, or technological devices, a group of learners that can connect to the Internet because they can potentially borrow these necessities from someone who have access or own those fundamental essences of the informational society, users who own minimum specifications of mobile devices and data plan to attend online sessions, and those who are ready and already migrated into the digital learning platform.

2.3.5 Access to the Internet and Wireless Communication

As much as inequality continues to exist in many countries worldwide, digital divide is a result of the predecessor condition of socioeconomic status that even with the technological advancement, it does not close the gap. According to Qiu (2009, pp. 8-235), the digital divide segment people into three main sections; the information have, information have-less, and information have-not. While information-have learners enjoy the luxurious learning experience even in times of social distancing and learning from home, many students around the world fall into the categories of information have-less and information have-not. The information have-less and have-nots have no access or limited access to Internet infrastructure and electricity that are the core components in enabling the online learning (Egielewa et al., 2021, p.19). Therefore, it is no surprise that they will not accept or slow to accept new technological innovations in assisting them in learning because of their lack of access to the basic necessities to enter a digital method of learning.

Access to technology comes in various forms including the availability of smart phones or tablets, the availability of laptops or desktops, the availability of operating systems that are compatible with online learning, the availability of wireless communication or Internet connection, and the speed and the bandwidth of the Internet in the areas (Surahman & Sujarwanto, 2021, p. 2). Educational policy to address the feasibility of digitalization contribute to the success in closing gaps in equity and quality in education. Nevertheless, an intensifying digital divide is magnifying a splitting of the world into a bipolar stand where the ones with no Internet access may be left behind. The challenge of the 21st century lies with the increasing integration of digitalization in education and how can we all ensure that everyone in the global society can benefit from it.

2.3.6 Artificial Intelligence Development and Its Application in Education

Beyond the Internet and the wireless communication, artificial intelligence (AI) was developed as a science and engineering intelligent machine to advance intelligent computer programs in 1956 at Dartmouth College, United States (Miao, Holmes, Ronghuai, & Hui, 2021, p. 6). According to UNESCO World Commission on the Ethics of Scientific Knowledge and Technology [COMEST],

(2019), AI are machines capable of replicating human functionalities in forms of intelligence such as learning, reasoning, problem solving, language interaction, and creating innovation work. Alexa and Siri are examples of AI that are known on smart devices. Cloud, Azure, AWS, and TensorFlow are AI as a service platform used among private entities. In the field of education, AI was adopted to support learning and assessment, teaching, and educational institutions' management (Baker, Smith, & Anissa, 2019). However, there is no substantial evidence on how AI can improve learning outcomes or create more effective learning experience (Zawacki, Marin, Bond, & Gouverneur, 2019). The rapid technological advancement of AI brings multiple challenges for all stakeholders in education. At present, the risks involved in implementing AI in education outweigh the benefits it can offer (Miao et al., 2021).

While educators may worry that AI will overpower human agency and potentially replace them in workforce, AI poses more imminent concerns on social and ethical implications. As data is the heart of AI operation, data protection, privacy, ownership, and analysis are at risks of being exposed, misused, abused, manipulated, and sold for other purposes (Jobin, Lenca, & Vayena, 2019). Therefore, the ethical issues become significant concerns that require attentive consideration. The inclusion, digital divide, and children's safety are among prominent risks of AI. As AI projects or implementation require extensive financial investment, the adoption of AI in Thailand education is not currently in the plan. Before AI is considered for Thailand education, proper assessment should be carefully analyzed and studied applicable to the current situation and teaching and learning environment. As stated by Holmes, Bektik, Whitelock, & Woolf (2018), no research on AI in education has been undertaken, no guidelines have been established, no policies have been initiated, and no regulations have been in place to address ethical and social issues raised by the implementation of AI in education. This AI potential can be further studied as the continuation of this study and results.

It is important to recognize that at present there is no distinct division of formal and informal formats of education as the Internet has made informal education gained its recognition and value. Informal education has been widely adopted by formal education as supplemental knowledge. Therefore, there are tremendous

collaborative efforts to bridge the formal and informal education in all types of learning particularly in the form of lifelong learning. Formal education is transformed mostly through the government's involvement and public policies to change the curriculum and evaluation process. Informal education, on the other hand, is initiated by private and non-profit organizations that value education and offer different approach of teaching and learning that is more current to the digital era of education. Therefore, the study does not establish the distinct division but rather finding an approach that allow both formal and informal education to coexist for the benefits to all learners in the digital era.

2.4 Conceptual Framework

Below is an illustration of the conceptual framework for the research study in a simplified form for ease of understanding. The framework attached is used to provide all relevant information pertaining to the purpose of the study, the supporting theories and concepts, and the outcomes.

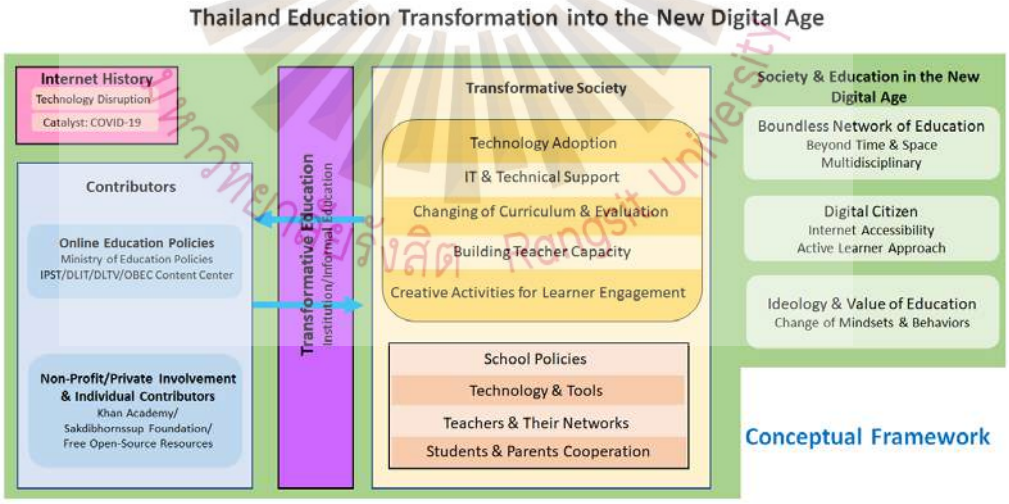

Figure 2.1 Conceptual Framework

Source: Lipipun, 2023

From the researcher's observation, education systems have not evolved in parallel with the technological advancement and adoption in business and financial

sectors. The sudden adoption of technology and rapid technological usages in online teaching and learning came upon the crisis of the COVID-19 pandemic. This is the period of actual transition to digital platforms that took place and continues to transform Thai education into digital formats of teaching and learning. The infrastructure, pedagogy, and curriculum at present do not prepare students to maximize their learning experience for the current online learning and the future of the education in the digital age (Chu, Reynolds, Tavares, Notari, & Lee, 2017, p. 8). All contributors from educator end including government policies, government entities, ministry of education, free open-source online education support groups, and schools play important roles in creating transformative online education. As described by Castells (2010, as cited in Chu et al., 2017, p. 17), the 21st century era is a period of intense transformation that greater emphasis have been on knowledge, collaboration, and mobility. Former education prior to the pandemic can no longer exist in its form and must reconstruct to integrate technology into online education. A change in curriculum, evaluation process, and pedagogy require extensive trainings among educators to successfully execute a transformation. With the collaborations from learners and their families, education can truly transform. Education should not be a stand-alone unit but rather a network of education that is boundless transcending time and space. Education will increasingly be multidisciplinary as learners can select their own paths of learning to fulfill the requirements. With the connectivity of the Internet and wireless communication, more learners are entering a digital environment of knowledge as they are trained to be active learners. Through transformative education, digital citizens embrace a new mindset and ideology of free education that is beyond the former rigid structure. The digital age of education is shifting value of education and change both educators' and learners' behaviors in teaching and learning. Therefore, transformative education is essential in preparing educators and learners to become citizens of the Internet who are global and eager for challenges in a highly mobilized and technology-dominated society (Chu et al., 2017, p. 17).

As things continue to change rapidly with uncertainties of the COVID-19 pandemic along with the advancement of digital technology, the one certainty is that we will not return to the traditional approach or the previous normal. The new normal

will definitely be very different than anything we have known or experienced. Considerations of all stakeholders' viewpoints in achieving a mutual and meaningful collaborative teaching and learning approach and effectively use of social spaces particularly digital spaces are crucial for social transformations into the new digital era. A paradigm shift to digital pedagogy presents challenges as well as opportunities for both social and educational transformations. The idea of digital literacy and digital pedagogies are still not the main stream of educational approach until the COVID-19 crisis comes upon. The lack of meaningful research in digital pedagogies and teaching and learning in Thailand necessitate purposeful research in providing insights for educators in understanding Thailand transformative education into the new digital age.

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Chapter 3

Methodology

Thailand education transformation into the new digital age is the research study aiming to study current government policies on online education in Thailand, to study leading models of free open-sources for online education in Thailand and abroad, and to explore Thailand transformative online education for the new digital age. The research study is examining the current government policies on online education in Thailand and searching for ways to utilize free open sources into digital transformative education.

The primary purpose of choosing qualitative research for the study is to gain deeper understanding of the phenomena. Education transformation is a subject area that is complex in structure with various stakeholders involved. The researcher deems a qualitative approach is the appropriate method to reflect the phenomena that has occurred, experiences that key informants were facing, sharing of struggles and accomplishments of transformation, and depiction of the situations beyond the reports or written documents related the study. Qualitative approaches provide rich interpretation of the phenomena under observation as well as allow other unobservable factors to be apparent during the study (Merriam, 2016). The design permits open-ended questions which encourage key informants to share their stories in their own context and willing to discuss their struggles and obstacles from their experiences.

The qualitative research design is utilizing primary data from conducting interviews, focus groups, and observations with participants from selected groups. The secondary data is collected from literature and publication reviews in supporting the

findings that agree and may not agree with the research study. Discussions of methodology are in the following sequential order:

3.1 Qualitative Research Design

3.2 Key Informants

3.3 Interview Questions

3.4 Method of Data Collection

3.5 Data Analysis

3.6 Ethical Consideration.

3.1 Qualitative Research Design

3.1.1 Documentary

Documentary is a collection of data and information on the context within the research study. Documentary approach includes relevant dissertations, journals, publications, literatures, and theories supporting the study from ProQuest Dissertation & Theses, Sage Journals, EBSCO Open Dissertations, Google Scholar, and ECSCOHost databases. Documents are both digital in nature and older publications that were converted into digital formats. The use of documents is integral to compile conceptual framework and theories relevant to the research study. In addition to databases, information on the Internet is also extracted to support the study from applicable public, private, and non-profit organizations.

3.1.2 Focus Group

The focus groups took place in December 2022. All of the focus groups were conducted using Google Meet or Zoom video conferencing. Prior to the beginning of the focus groups, the researcher assured the key informants' confidentiality would be protected. The number of key informants per session varied depending upon their availability. The number of key informants ranged from 3 to 6. The focus groups were arranged around key informants' availability to ensure that all key informants are present in the discussion. All focus groups lasted between 60 and 120 minutes. A snowballing approach was used at the end of every session for key

informants to refer a researcher to another key informant who can provide valuable insight to the research study.

3.1.3 In-depth Interviews

In-depth interviews took place from November 2022 to April 2023. All of the interviews were conducted via Google Meet or Zoom video conferencing. Prior to the beginning of the interview, the researcher assured the key informant' confidentiality would be protected. Interviews were organized around the key informants' schedule to allow adequate time for questions and answers and accommodate any further discussion as needed. All interviewed lasted between 60 and 150 minutes. A snowballing approach was used at the end of every session for key informants to refer a researcher to another key informant who can provide valuable insight to the research study.

3.1.4 Observations

Observations took place from November 2022 to April 2023. All of observations were recorded using Google Meet or Zoom video conferencing. Prior to the observations, all participants were informed of the researcher's observation and their confidentiality would be protected. The observations were conducted under scheduled sessions of meetings and online classrooms. Observations from online classrooms offer opportunities to observe online teaching and learning sessions and behaviors of students when attending classes online. Observations from meetings in public and non-profit organizations offer opportunities to observe trends of digital education, conflicts, and barriers to transformative education agenda. From these meetings, the researcher was able to approach attendees and ask for in-depth interviews to further understand the digital education.

3.2 Key Informants

Key informants are from 2 sessions of focus groups and 18 in-depth interviews. The study limits the key informants relevant from grade 1 to grade 12 levels of education. The first session of the focus group consists of 5 participants from the public sector of education who are government representatives responsible for polices and implementation of digital deployment. The second session of the focus group consists of 3 participants from non-profit educators and volunteers. The in-depth interviews consist of 6 teachers, 2 government representatives, 2 non-profit educators, 2 students, and 6 parents. The participants are grouped into two main sectors as followed:

3.2.1 Educator Key Stakeholders

3.2.1.1 Teachers from primary schools and high schools (grade 1 to grade 12)

3.2.1.2 Government representatives responsible for policies and implementation of digital curriculum for schools

3.2.1.3 Non-profit educators and volunteers that are successful in being forefront leaders of digital teaching and learning

3.2.2 Learners Key Stakeholders

3.2.2.1 Students from high school levels of education

3.2.2.2 Parents from both primary schools and high schools.

3.2.1 Educator Key Stakeholders

Educator key stakeholders consists of 3 main groups of key informants. Total of 6 teachers from grade 1 to grade 12 were interviewed. A focus group and 2 in-depth interviews were conducted with government representatives. Similar format of a focus group and 2 in-depth interviews were conducted with non-profit educators.

3.2.1.1 Teachers Key Informants

Teachers are the main key informants to provide insights of front-line situations and challenges with online teaching and learning especially during the COVID-19 restrictions. This group is aiming at public schools that fall under the jurisdiction of Basic Education Commission. The selection of teachers is through a referral from Basic Education Commission and a snowballing approach from participants. The researcher was able to acquire additional key informants from the educators' network that are teaching at private schools that use the guidelines from Basic Education Commission.

Key informant A is a public high school level teacher teaching subjects of technology, programming language, and computer. Key informant A is teaching at a second school of choice for students in the area and therefore tends to have students with area of study in arts, language, and areas that are not sciences, mathematics, and technology. Key informant A is an outstanding teacher in creating logics and reasoning assignments and applying projects into the real-world situations for students to visualize what they learn from textbooks and able to relate to their daily routines.

Key informant B is a public high school level teacher teaching subjects of technology, programming language, and computer. Key informant B is teaching at a first school of choice for students in the area and the majority of the students are in STEM field. Working with top performing students, key informant B embraces co-learning technique to learn with the students of new programming languages and working on projects that have never been done before. Key informant B often spends time beyond school hours mostly after normal school hours and weekend to help students who are in need and students who want to advance their learning beyond the curriculum for competition or scholarships.

Key informant C is a public middle and high school level teacher teaching Thai language at a relatively small school size with less than 400 students. The majority of students are in arts and language study. Key informant C works with students who value education as a check-off list to do and tend not to further their education beyond high school. Key informant C is a very persistent and patient teacher in making sure every student graduate and adapt with the current situation of the workforce.

Key informant D is a public high school level teacher teaching mathematics with students from all kinds of study emphasis. Key informant D teaches from algebra to calculus and has a wide range of students' performances. Key informant D is a digital native teacher who is tech savvy and proficient in English and Korean. This becomes a leverage for key informant D to build good relationships with students and in trend with social media. The smaller age gap made key informant D a promising leading teacher model for the 21st century of Thai educator. Key informant D is an exemplary teacher that supplements outside resources in a learning process and able to execute integrated assignments across multidiscipline.

Key informant E is a primary school teacher teaching technology at a non-profit school. Key informant E spends time teaching basic skills of technology and computer usage for young students. The emphasis is mostly on where is safe to browse online, how to safeguard personal information, and beware of scammers. Key informant E is very lovable among young students and builds collaborative relationships with the parents to stay current with technology.

Key informant F is a primary school teacher teaching Thai language at a non-profit school. The students are mostly from lower socio-economic background. Key informant F uses incentives to attract young learners in online formats and design assignments with parents' involvement so that parents can also evaluate and keep track of their children's learning progress. Key informant F does not leave any child behind and will schedule a house visit for students in need. Key informant F has a vision to offer education opportunity for all and helps students realize that they can progress from current socio-economic background through a pursue of higher education.

3.2.1.2 Government Representatives Key Informants

Government entities responsible for policies and implementation of digital curriculum and online teaching and learning facilitation consist of responsible entities for online platform open-sources that are under the jurisdiction of Basic Education Commission. Representatives from each division were requested through a formal interview request letter from College of Social Innovation.

Key informant G has been one of the main key contributors to Distance Learning Television (DLTV) program since the very beginning. Key informant G has a vision to help students with remoted areas and unable to access proper education. The target audiences of DLTV are the information have-not and the goal of the program is to convert the information have-not into information have-less. Key informant G is passionate in closing the digital divide and integrates the teaching and learning process through technology.

Key informant H is aiming to consolidate all resources into a centralized data and trying to propose more current curriculum applicable to the digital age. Key informant H has been involved with Distance Learning Information Technology (DLIT) and Office of the Basic Education Commission Content Center (OBEC Content Center) applications. The COVID-19 was a catalyst in many implementations to be used and rolled out during the time of social distancing. Key informant H was responsible for this roll out to resolve school closures problem with students unable to learn during the pandemic.

Key informant I, J, K, L, and M are in the focus group session. They are the team that work together in creating a visionary curriculum for STEM field particularly the Learning Space and SciMath applications. They are passionate in making changes to education and work extensively with teachers, the study teachers' key informants, in applying, integrating, and executing teaching sessions online.

3.2.1.3 Non-Profit Educators Key Informants

Non-profit educators are the forefront leaders in online teaching and learning including assisting in creating new contents as well as translating foreign contents for education suitable for Thai students. Representatives from each division were requested through a formal interview request letter from College of Social Innovation. Observation was also conducted on a meeting of discussion in planning an effort of collaboration among non-profit educators.

Key informant N is the team leader of the non-profit organization that work with online free open sources platform and will be working with the volunteer team in continuing to translate Khan Academy learning resources into Thai language. Key informant N has a profession in teaching and started the work with a non-profit organization to introduce new teaching and learning pedagogy

into education. Key informant N values education and wants to be a part of the organization that can offer free education with no hidden agenda.

Key informant O is a passionate English teacher and professor that works with the non-profit organization to offer free education, train teachers to be more effective in teaching, and teach students new approaches of learning. With the passion of teaching, key informant O wants to offer a world of education that is free for all and be a part of the organization that make differences to the world of education.

Key informant X, Y, and Z are the non-profit educators and volunteers who want to make Khan Academy free open-sources accessible by Thai learners that are not proficient in English. The works performed by X, Y, and Z were non-paid efforts that created a translation site and dubbed videos so that Thai learners can learn from international resources.

3.2.2 Learner Key Stakeholders

Students from the above jurisdiction may vary from different digital access ability to the Internet and wireless communication, age, and level of education. Interviews were conducted for older students in high school age. Younger students were mainly observed from an online teaching and learning session.

3.2.2.1 Learners Key Informants

In-depth interviews were conducted for 2 high school students to understand their learning style and approaches.

Key informant P is a high school student with top performing standing. Key informant P is also a volunteer and a part of Khan Academy translation team. Key informant P wants to pursue a career of teaching particularly in English and wants to leverage Khan Academy learning resources to all learners so that they can learn beyond their classrooms. Key informant P uses outside and international open sources to enhance the pursue of education and wants others to be able to utilize these resources to their benefits. Not only key informant P succeeds in education endeavor, this student who will eventually become an English teacher wants to create a new approach of teaching and learning that is more current and applicable to the

digital world of education. A self-taught learner who soon to become an influential educator is the leading model of the 21st century of Thai education.

Key informant Q is a high school student with top performing standing as well. Despite being offered to pursue a career in engineering, the passion in mathematics makes key informant Q wants to pursue a career of teaching as a way of giving back to the society through transferring and offering knowledge by education. The thought process and vision that this digital native key informant has is breaking free from the traditional approach of education and culture that many are used to.

3.2.2.2 Patents Key Informants

Parents of students of the above jurisdiction that participate in their students' learning and contributing to success of the online learning ecology.

Key informant R is the parent of a high school student that is on top of the student's progress. The parent is very proficient in technology and able to assist the student in leveraging technology in education.

Key informant S is the parent of a high school student and a primary school student. Key informant S treats the two children differently. The older child is very responsible and attentive in studying and so key informant S spends less time monitoring and keeping track of the child. The younger child, on the other hand, is much younger and requires a great amount of parent's involvement in studying, learning, and finishing assignments. The researcher was able to gain an insight from a parent who has two children with different ages.

Key informant T is the parent of a middle school student that relies heavily on the teacher to assist the student in education. As key informant T has lower level of education, the assistance to study material is very limited. Key informant T is also struggling with technology and so is unable to assist the child with assignments and homework.

Key informant U is the parent of a primary school student that involves extensively on the child's learning process and able to assist other parents in leaning new technology through online learning sessions.

Key informant V is the parent of a primary school student that does not live with the student. Key informant V relies on older relative to take care of the child and relies heavily on the homeroom teacher to follow up with the child, the relative, and the parent.

Key informant W is the parent of a primary school student and a middle school student. Key informant W is very responsive to the homeroom teachers in updating and tracking children's progresses. However, key informant W has lower socio-economic background that unable to make both students attend online sessions concurrently as they share a mobile device to study. The older child usually let the younger child attends a class real time and catches up with the study material through a recorded session at the later available time.

Total of 26 key informants are participants of the study. 8 key informants are from 2 sessions of focus groups with the government representatives and non-profit educators. 18 key informants are from in-depth interviews consisting of 6 teachers, 2 government representatives, 2 non-profit educators, 2 students, and 6 parents.

3.3 Interview Questions

Initial questions are arranged to understand the interviewees' understanding and their interpretations of online teaching and learning. The ice breaking questions are intended to understand the interviewees' standpoint and world view of technology, technological impacts on their lives, their changing behaviors and pedagogical skills, their perceptions of education, and their vision of education in the digital age. The questions used in the interviews are listed below.

1) What do you think of "Free Open-Source Education"?

2) What are the differences between free open-source education and formal education with tuition fees?

3) What are the motivators of starting (DLTV/DLIT/OBEC Content Center/Learning Space/SciMath/Non-profit organization)?

4) Is the education program that you offer related to an intention of offering life-long learning? What are the positive outcomes of this program?

5) Are there any gaps in current formal education that does not meet the business requirements in skillsets, critical thinking, and knowledge? Are we generating capable graduates to enter the workforce?

6) Do you see educators' roles changing as we adopt new pedagogy of online teaching prior to and during the COVID-19?

7) Do you see learners' roles changing as we adopt online education? Are they becoming active or passive learners?

8) With the data abundance over the Internet, what do you think is a learning process essential for this new type of education?

9) Would you mind sharing your experience both positive and negative experience through the program, new pedagogy style, and online teaching and learning?

10) Are there changes in our mindset and perception of education? Are we changing our behaviors as we adopt new ways (new normal) of education?

11) Are we ultimately changing as a society? What are some of the phenomena that you think contribute to social transformation as we adopt technology in education?

12) Is free open-source education a game changer to education? How is this ideology affecting us as a person, learner, educator, and society?

Not all questions are asked to every respondent. Some questions are omitted as they are selected to appropriate respondents. All interviews were conducted online via Zoom, Google Meet, and Line applications due to COVID-19 restrictions of social distancing as well as remote interviews of participants who were located in different provinces throughout Thailand.

3.4 Method of Data Collection

The research study maximizes the usage of technology and the Internet in a qualitative research approach in alignment with the concept of transformative education into the new digital age. Videoconferencing technology via Zoom, Google Meet, and Line applications is the primary tool used in conducting interviews, focus groups, and observations. During the interviews and focus groups, the researcher conducts a two-way communication of which open-ended questions are implemented. An overview of the study is explained and ice breaking session is introduced to understand and observe key informants' stand on education and technology. An observation is also conducted in digital format as all meetings and class sessions were online in their nature.

3.5 Data Analysis

After data collections, the researcher transcribes all recorded data into a printable format in order to improve analysis. Responses are organized and grouped into major common themes for interpretation. The emerging themes then rematch with theories for a systematic pairing to find correlation. The repeating evidence of data that coincide with assumptions and theories are presented to draw findings from the study. While most adult respondents and interviewees are opened to in-depth interviews, students are less inclined to respond in the same research conduction. Peer observation during online class session is mostly conducted to observe students' behavior in addition to the interviews.

Coding of Transcripts

The researcher transcribes all interviews manually. Interview transcripts are cleared and scrubbed of any confidential information. In this study, data analysis includes assigning codes to interview transcripts. Similarities and patterns are emerged from the data through key words and

phrases. Codes are then sorted into categories for recurring themes (Merriam, 2016).

3.6 Ethical Consideration

Researching a topic affiliated with education may face with diverse opinions on how education will be best taught through different styles, approaches, and pedagogies. Since there are wide range of age gaps and experts in this field, the data collected may be contrasting one another depending on the interviewees' background and demographics. Conflicting data is common due to age differences and the level of participants' digital literacy and skillsets in fully utilize various online teaching and learning platforms and applications. All real, online, and offline identities, consent forms, digital recordings, and transcribed data will be kept in a safe place of the primary researcher. The researcher and advisor will be the only person to have view the confidential material. The documents containing confidential information will be destroyed after the required period has expired.

มหาวิทยาลัยรังสิต Rangsit University

Chapter 4

Thailand Policies of Online Teaching and Learning

Thailand education transformation into the new digital age is the research study aiming to study current government policies on online education in Thailand, to study leading models of free open-sources for online education in Thailand and abroad, and to explore Thailand transformative online education for the new digital age. The research study is examining the current government policies on online education in Thailand and searching for ways to utilize free open sources into digital transformative education.

This chapter findings answer the statement of purpose to study current government policies on online education in Thailand. The study examined the documents related to the policies from the national level to the Ministry of Education level. The focus group and in-depth interviews were conducted to study the public entities responsible for open-source online education and distance learning programs. Requests for interviews and focus-groups were formally sent to entities involved and representatives from each respective program were assigned to provide information in addition to literature reviews. Discussions of Thailand policies of online teaching and learning are in the following sequential order:

4.1 Online Education Policies in Thailand

4.2 Government Entities Responsible for Online Education

4.3 Current Practice of Teaching and Learning in Thailand

4.4 Catalyst of Digital Education Adoption

4.5 Technology Usage in Online Education

4.6 Human and Technology in Digital Learning

4.7 Digital Content Development

4.8 Evaluation Process and Dilemma

4.9 Challenges that Impede Transformation

4.10 Conclusion.

4.1 Online Education Policies in Thailand

Online education plans and policies can be found in Thailand National Strategy 20-Year Plan (2018-2037), Master National Strategy Plan (2018-2037), National Reformation Plan (2021), National Economic and Social Development Plan Draft (2023-2027), Thailand National Education Plan (2017-2036), and Thailand Education Strategy Plan (2020-2022). The policies in respective plans are correlated to support digital platform essential for online education and develop applicable skillsets for educators and learners to thrive in the digital era.

4.1.1 Thailand National Strategy 20-Year Plan (2018-2037)

Education policies were included in the Strategy 3 Human Resources Development and Citizenship Advancement. The directives of the policies were intended to enhance learning skills applicable to the 21st century competency, transform teachers and facilitators into new roles of educators in the digital age, encourage lifelong learning, and build a digital platform for online education (Office of the National Economic and Social Development Council, 2018c, pp. 37-39). The government outlined goals to achieve and strategies to modify the curriculum into the competency-based curriculum, develop open-source online education with a potential of earning a credit bank for courses taken, and enhance digital platform to support online teaching and learning. The Strategy 3 emphasized on the role of teachers and technology where education through technological mediums and online contents can offer high quality of education. The government addressed the necessity to develop teachers and their pedagogical skills essential to the digital era (Office of the National Economic and Social Development Council, 2018c, p. 38).

4.1.2 Master National Strategy Plan (2018-2037)

Master National Strategy Plan was published along with the Thailand National Strategy 20-Year Plan. Section 12 Learning Development stated the intent of the government to build a digital platform of lifelong learning through a collaboration of public, private, and civil society sectors. This section particularly addressed an open-source online education to be available for all ages. Education should be easy to access anytime and anywhere. High quality of education in a new digital era should be offered through technological applications. The key focus on learning process was on self-learning that Thai citizens could be self-motivated to learn and keep up with the world and rapid changing of technology (Office of the National Economic and Social Development Council, 2018a, p. 3).

4.1.3 National Reformation Plan (2021)

Under Thai constitution article 54 dated 2018, all children in Thailand shall receive a formal education in total of 12 years starting from kindergarten to high school with a commendable quality of education at no cost (Office of the National Economic and Social Development Council, 2021, p.295). Therefore, the National Reformation Plan was drafted to strengthen education opportunities, enhance quality of education applicable to the changing of the 21st century, reduce disparity in education, and introduce the competency-based curriculum (Office of the National Economic and Social Development Council, 2021, p.305). The heart of education was the teacher (Office of the National Economic and Social Development Council, 2021, p.309). By building a strong curriculum and process of teachers' development, the more teachers will be fluent in technology, creating digital contents, designing pedagogy for teaching sessions, and adapting in ever changing of education (Office of the National Economic and Social Development Council, 2021, p.308). Digitalization of teaching and learning processes was demanding educators to become active facilitators who can create active learning environment for learners. As active learning capability was passed along to learners, active learners can learn at their own pace, be self-taught, and create their own personalized learning experience (Office of the National Economic and Social Development Council, 2021, p.307). Essentially, they will learn to apply their

knowledge into the real world. While the core courses were still focusing on sciences, technology, engineering, and mathematics (STEM) classes, the competency-based curriculum will help in expanding the knowledge that can be transferred or applied as learners progress to higher education (Office of the National Economic and Social Development Council, 2021, p.314). Lifelong learning concept was also emphasized as a credit bank can be accumulated for learners and they can earn credentials as they progress through various types of education regardless of their age and education background (Office of the National Economic and Social Development Council, 2021, p.319). Therefore, digital citizenship was addressed to ensure that Thai citizens will become digital literate in information and media, as well as learning how to learn in the digital age.

4.1.4 National Economic and Social Development Plan (2023-2027)

The draft of the upcoming release of the National Economic and Social Development Plan listed education as a part of the Mission 12 Thailand has high performance citizens with continuous learning to meet the future demand of workforce. According to the background written in the plan, Thai education ranked relatively low in quality when benchmarking worldwide. Program for International Assessment (PISA) score of Thai students declined in ranking from rank 50 in 2012 to rank 66 in 2018 (Office of the National Economic and Social Development Council, 2018b, p. 15). Thailand is facing with the problem of insufficient skilled workforce that do not meet the current demand of labor that requires a skillset that can adapt with constant changing of technological advancement. According to the plan, the study from World Economic Forum showed that Thailand ranked 61 out of 140 countries in global competitiveness index in both skillsets of graduates and digital skills for the year of 2018-2019. The ranking fell down further to 79 out of 141 in skillsets of graduates and 66 out of 141 in digital skills in the year of 2019-2020. The decline in ranking raised a concern to the government to examine possible reformations (Office of the National Economic and Social Development Council, 2018b, p. 16). An ongoing issue with inequality of education particularly among the populations who have limited to no access to technology has not yet been properly addressed. The goals of mission 12 are to develop Thai citizens across all ages with

skillsets necessary for the current demand of workforce and to support lifelong learning education. For basic education sector, the competency-based curriculum in alignment with the National Strategy Plan is developed and ready to launch in 2023. Teachers and instructors are the most critical assets in education. To heighten education, developing core human resources, educators, in both qualitatively and quantitatively is one of the key sub-strategy plans to ensure continuing innovation and creativity in teaching pedagogy as well as technological expertise. The plan mentioned a potential allocation of funding in building a basic infrastructure necessary for the electricity and Internet connection to reduce education parity (Office of the National Economic and Social Development Council, 2018b, p. 125).

4.1.5 Thailand Ministry of Digital Economy and Society Action Plan (2023-2027)

Thailand Ministry of Digital Economy and Society Action Plan (2023-2027) was written in alignment with Thailand National Strategy 20-Year Plan (2018-2037) to transform Thai citizens into the 21st century digital citizens. The plan focuses on the roles of educators that are changing to keep up with the digital transformation and lifelong learning that is essential to all citizens. (Ministry of Digital Economy and Society, 2023, p. 5). One of the main goals in the action plan is to create capable digital citizens that are able to access technology, leverage technology in daily routine, conducting business, planning future career, continuing lifelong learning, further education, self-development, and career development. Ministry of Digital Economy and Society has a strategy to provide basic infrastructure for the Internet access throughout the country particularly the remoted areas that basic infrastructure is not currently accessible (Ministry of Digital Economy and Society, 2023, pp. 59-60). Ministry of Digital Economy and Society has a strategy plan to reskill and create new skillset for younger generations starting with the schools to build a society of highly competitive digital citizens of the future. The plan extends to the initiation to upskill current workforce to be adaptable to digital disruption and able to keep up with lifelong learning (Ministry of Digital Economy and Society, 2023, pp. 69-70). This research study is aiming to find a space for an open-source learning

opportunity and such opportunity is addressed under Ministry of Digital Economy and Society Action Plan. Open learning platform is introduced in the plan to assist lifelong learning for all citizens regardless of their ages with no monetary cost to earn a certification (Ministry of Digital Economy and Society, 2023, p. 73).

4.1.6 Thailand National Education Plan (2017-2036)

Thailand national education plan was designed in alignment of the concept of education for all and inclusive education aiming to develop skillsets 3Rs8Cs necessary for the 21st century. 3Rs were represented as skills in reading, writing, and arithmetic. 8Cs were represented as skills in critical thinking and problem solving, creativity and innovation, cross-cultural understanding, collaboration, teamwork, and leadership, communication, information, and media literacy, computing and information and communication technology (ICT) literacy, career and learning skills, and compassion (Office of the Education Council, 2017, p. 16). Under strategy 3 Human Resources Development and Citizenship Advancement, in alignment with the National Strategy Plan, the National Education Plan drafted a strategy to improve self-taught ability and learning process, enhance teachers' and educators' roles, and develop digital contents and library to offer education as an open-source online format (Office of the Education Council, 2017, p. 116). Under strategy 4, Equity in Education, the plan listed a scheme to develop and expand necessary infrastructure for online teaching and learning, fund technological related expenses essential for online platform, build new recording station and add television channels dedicated for distance learning. Therefore, programs such as DLIT and DLTV are the core platforms necessary to offer education for all (Office of the Education Council, 2017, p. 123).

4.1.7 Thailand Education Strategy Plan (2020-2022)

Strategies within Thailand Education Strategy Plan focused on learners, educators, lifelong learning, and technology. Concept of active learning, STEM, credit bank process and credentials, and e-library are main points of development in Thai education (Ministry of Education, 2020b, p. 1). Under strategy 5 Digital Education and Technological Support, the plan listed very clearly the

importance of online learning. The plan was to expand basic infrastructure of Internet speed and availability in all provinces in Thailand. The plan also dictated a development of digital platform for lifelong learning and potential centralized platform that anyone can access and learn. Dedicated entities are responsible of creating teaching and learning digital contents as well as big data system to store all the necessary information and data. Current programs of DLIT and DLTV will be further enhanced to support massive open online courses that are necessary for the future of education (Ministry of Education, 2020b, pp. 47-48). In addition, the budget allocated for 2022 in education plan was to ensure the most priority to ICT where data center, big data management, e-library, e-learning and e-teaching platform, e-books, online classroom management, and Internet infrastructure are the areas of development and funding (Ministry of Education, 2020a, p. 2).

Overall, Thailand national policies are in alignment with the world's trend in progressing education into the digital era. Lifelong learning is on Thailand National Strategy 20-Year Plan which is in agreement with the UNESCO's vision to support and encourage lifelong learning. The new introducing competency-based curriculum mentioned in the 2021 National Reformation Plan is also following the global trend that UNESCO International Bureau of Education has published to advocate and build capacity to support people and institutions to develop evolutionary education (Rabinovitch, 2019). However, the enormous challenges to introduce more appropriate educational curriculum in the new digital age require extensive resources to change a deeply embedded traditional education foundation. "In fact, competency-based education is a redesign of the culture and structure of school systems to support effective instruction and learning" (Sturgis & Casey, 2018).

4.2 Government Entities Responsible for Online Education

All government programs responsible for online platform are under the Ministry of Education. There are 3 programs under Basic Education Commission. 1) Distance Learning Television (DLTV) is responsible for small sizes of schools with less than 120 students. 2) Distance Learning Information Technology (DLIT) is

responsible for medium to large sizes of schools. 3) Office of Basic Education Commission (OBEC) Content Center is the new centralized platform to provide comprehensive resources for education. Institute for the Promotion of Teaching Science and Technology (IPST) is a dedicated unit responsible for STEM study materials. All 4 programs and applications are online education platforms available that are supported by the government.

4.2.1 Distance Learning Television (DLTV) under Basic Education Commission

DLTV is not a new program, DLTV first establishment since 1996 as the King Rama IX 50th year anniversary of his accession to the throne. The king donated 50 million baht under Distance Learning Foundation to assist education in remoted areas. The model school is Wang Klai Kang Won school under the Royal Patronage has been a reputable school to showcase the initiative to solve the problem of education inequality and to offer quality education to all young learners in Thailand (Distance Learning Television, 2022). The DLTV initiative was established to solve a problem of insufficient teachers at remoted areas where basic infrastructure was not available to people who lived in the area. Most of these areas had limited access to electricity as well as connection to the Internet via wireless communication or local area network. DLTV was designed to be taught through a satellite communication. The 15,500 initial participating schools were small in size with less than 120 students per school and the teaching sessions were streaming via satellite at appointed time (Distance Learning Television, 2022). Teachers at these respective schools relied on specialized teachers through DLTV to teach respective subject of matters to students as they were mainly homeroom teachers who could only moderate students but unable to teach respective course contents. In 2017, existing satellite station was remodeled and a new satellite station was also built to support DLTV initiative (Distance Learning Television, 2022). Key informant G mentioned that DLTV launched its website in 2017 to allow asynchronous teaching and learning session taking place as more of the remoted areas had more accessibility to electricity and the Internet due to infrastructure improvement. While DLTV was designed to fit larger screen of television size, recorded teaching sessions that were uploaded on the website were

modified to be suitable for personal computers, tablets, and smart mobile devices. When asked about the current situation of the DLTV initiative, key informant G was proudly presented that

> "Thailand had managed to reduce number of schools who are enrolled in the program to 13,800 schools as less population in 2022 are no longer reside in the remoted areas" (Key Informant G, personal communication, February 8, 2023)

since their areas are developed to become small cities with adequate infrastructure. As a result, students who are attending remoted schools as a part of DLTV initiative are less in number with the smallest size between 3 and 10 students per school. As of 2022, 300 schools in Thailand still have no access to the Internet. At present, DLTV course materials are available online and through satellite channels for K-12, vocational, and college education (Distance Learning Television, 2022).

DLTV addressed the social inequality of the information have-not learners. Without the Internet, the students are able to learn via satellite communication. With limited numbers of teachers, homeroom teachers can leverage the resources available from DLTV to teach students in remoted areas on subjects that they are not proficient or familiar with. This provides an opportunity for learners to be included in the society of digital transformation. Once the respective school areas have access to the Internet infrastructure, both teachers and learners will be able to progress from information have-not to information have-less citizens. Eventually they will be exposed to the digital interface of education and get accustomed to the digital learning. Slowly, this small population of information have-not will fade away as everyone is stepping foot into the Internet galaxy.

4.2.2 Distance Learning Information Technology (DLIT) under Basic Education Commission

While DLTV initiative is aiming to solve online teaching and learning at small schools in remoted areas, DLIT was launched in 2015 to introduce a new format of information and technological integration into teaching and learning at medium and large schools. As key informant G stated that DLIT is most suitable for high school

level of education, the COVID-19 pandemic has made DLIT attractive to other levels of education. DLIT has 5 different platforms consisting of DLIT Classroom, DLIT Resources, DLIT Professional Learning Community (PLC), DLIT Assessment, and DLIT Digital Library. DLIT Classroom is a database containing recorded teaching sessions, interactive quizzes, educational animations or cartoons, and recorded experiments for K-12 that can be viewed anytime. DLIT Resources is a database similar to DLIT Classroom but contain video clips of specific topics of knowledge that can be useful for teachers to download and use to supplement their teaching in the classroom. DLIT PLC is an online community for teachers to share and learn from one another in an online space. DLIT Assessment is aiming to help teachers in creating assessment for students. DLIT Digital Library is assisting teachers with creating contents and teaching materials. Currently, DLIT is available from kindergarten to grade 12 high school. DLIT program work with Chulalongkorn University, Institute for the Promotion of Teaching Science and Technology (IPST), YouTube, Google for Education, and Microsoft to enhance the online teaching and learning experience through both content and quality of the delivery (Distance Learning Information Technology, 2019).

DLIT has made tremendous progress in introducing a new approach of teaching and learning. DLIT is the basic startup of the exposure into the digital realm of education. Students who are not familiar with this type of learning can be assisted by their teachers at school. Teachers who are not proficient in technology have assistance available in troubleshooting. Trainings are available for teachers who struggle in implementing technology into their classrooms. DLIT is an introduction to all educators and learners so that they can grow further into other platforms for digital teaching and learning.

4.2.3 Office of the Basic Education Commission (OBEC) Content Center

Key informant H mentioned that since the COVID-19 outspread, the situation necessitated Basic Education Commission to rapidly evolve to enhance online teaching and learning tools and facilitation to ensure that online experience has the least amount of disruption. OBEC Content Center was initiated in September 2020 to offer a comprehensive digital education platform where all resources are collected

and accessible online 24/7. OBEC Content Center consists of 5 main resources which are Content Center (CC), Authoring Tools (AT), Local Content Server (LCS), Content Verification System (CVS), and Content Management System (CMS). Content Center is an online library of all resources including electronic books, video clips of cartoons, multimedia, recorded sessions, pictures of content summarized in one page, sound recording through podcast and any other mediums, educational interactive gaming and applications, samples of quizzes and exams, and homework and assignment templates (Office of the Basic Education Commission, 2020). OBEC Content Center is an enhancement of DLIT platform that consists of applicable contents from kindergarten to grade 12.

OBEC Content Center is an intermediate step into the digital world of education. As students and teachers alike are accustomed to new approaches of teaching and learning as well as digital pedagogy, they can progress further to self-learning and self-teaching. By making more open-sources available to learners who have sharpen their skills in navigating through the library of abundant information, it allows limitless learning opportunities who learners who seek information and knowledge. While the online format of teaching and learning is almost mandatory during the COVID-19, OBEC Content Center is where teachers can rely on for assistance during the unplanned situation.

4.2.4 Learning Space under Institute for the Promotion of Teaching Science and Technology (IPST)

IPST Learning Space is very similar to DLIT and OBEC Content Center but the platform contains only online contents of sciences, mathematics, and technology (STEM related contents). IPST Learning Space consists of 3 parts which are Teacher Professional Development (PD) System, Online Testing System, and SciMath. Teacher PD system is the digital contents created by IPST for teachers to utilize and apply in their teaching (Institute for the Promotion of Teaching Science and Technology, 2017). Key informant K stated the contents also include pedagogical trainings for teachers to update their knowledge and skillsets annually. Online testing system is the platform used for student assessment including PISA testing. At present, key informant L informed that IPST is the creator of tests, practice problems, and

assignments that teachers can utilize. SciMath is an online library that stores all digital contents for everyone not limited to teachers and students to access. Currently, key informant I confirmed that the digital contents are available for grade 1 to grade 12 only and the courses were designed per Ministry of Education guidelines. According to key informant M, IPST learning space is available through both website and mobile applications. Under a directive of an implementation of the competency-based curriculum, coding has become a new course of emphasis for teachers teaching technology related content. Key informant J mentioned computer for teacher (C4T) which is a program that train teachers to learn how to code so that they can pass along their knowledge to their students. Project14 is another program that was recently rolled out in 2020 to cope with the COVID-19 and the new normal of education which key informant I stated that Project14 digital contents have been created to facilitate teachers and students in learning during social distancing measures.

IPST Learning Space is an advanced stage of digital learning as the target students are in STEM field. Most teachers that utilize IPST resources are in STEM field as well so they are very proficient in technology and digital teaching and learning. While not all students are proficient in navigating the Internet open-sources, they have the guidance from their respective teachers to help them find resources they need. These group of learners are the information have citizens that their ability to learn is boundless with the abundance of information and help to succeed and thrive in the digital world.

มหาวิทยาลัยรังสิต Rangsit University

4.3 Current Practice of Teaching and Learning in Thailand

According to key informant G, there are 4 main current practices of teaching and learning implemented by teachers in Thailand which are onsite, on-air, online or on-demand, and on-hand delivery methods.

4.3.1 Onsite Teaching and Learning

Onsite is commonly known as a face-to-face or a conventional model. As mentioned by Garg (2020), digital contents, materials, and forms of technology are

integrated within the teaching session but both teachers and learners must be physically present to meet at the same location for the teaching method to be considered a face-to-face model (p. 280).

4.3.2 On-Air Teaching and Learning

On-air is typically through DLTV program where students are attending an online class through technological devices at a scheduled air time specified by DLTV1 to DLTV15 channels' schedules with videos at high definition. This delivery method is common for schools at remoted areas. This delivery method is through a satellite communication where the Internet is inaccessible by the audiences. DLTV channels are also available online through www. dltv.ac.th, YouTube channels (DLTV1 Channel to DLTV12 Channel and DLTV 15 Channel), and DLTV application (Distance Learning Television, 2022).

4.3.3 Online/On-Demand Teaching and Learning

Online or on-demand is typically through streaming sessions where teachers and students participate in the virtual classroom at the same time. During the COVID-19 pandemic online sessions are not necessarily conducted synchronously. The flexibility in online delivery method allows students to participant and interact with teachers real-time, review the recorded session at the later time, and view the recorded session if they are unable to attend the class at the time. Currently, DLIT is available through www.dlit.ac.th, YouTube channels, and DLIT application (Distance Learning Information Technology, 2019). OBEC Content Center is also available through app.contentcenter.obec. go.th and OBEC Content Center application (Office of the Basic Education Commission, n.d.).

4.3.4 On-Hand Teaching and Learning

On-hand is the last delivery method available to students and teachers who cannot meet onsite due to the COVID-19 social distancing measures and to fill the gap for those students who have no access to the Internet or any learning devices

to study, do homework, submit assignments, or even take any assessments. On-hand option is conducted as needed depending on the students' circumstances. Participant H did not suggest the best method among the 4 current practices. The best suitable model is the proper usage of each model or a mixture of different models to match the situations of each circumstance of respective teachers and students.

4.4 Catalyst of Digital Education Adoption

Technology has been a very powerful tool in every matter of life, and education is no exception. A traditional approach of teaching and learning as we are all familiar with has the teachers as the primary source of information where learners passively absorb the information told. Technology, on the other hand, changes the role of teachers to become facilitators and enables learners to actively search for information and knowledge online. The process of gathering information and access to the tremendous amount of data available at a fingertip through a connection of the Internet making online education seemingly attractive. Much of efforts were performed by the government, schools, and teachers to transform education into the digital era, nevertheless the rollout of online teaching and learning were not successful all across the country and did not reach the momentum for massive transformation.

The unexpected COVID-19 pandemic paused education worldwide to a stand-still mode for an extended period of time as government entities, private sectors, and everyone were not prepared for this kind of situation. Social distancing measures and a prolonged shut down of schools suddenly made online education an only way for education to continue and survive through many uncertainties of the pandemic. The COVID-19 pandemic is a catalyst that truly transform education into a new normal without no question asked. Thai education has to adapt and change accordingly to ensure that education can still be offered to all learners regardless of circumstances. Online education that seemed to be an outcast model to many Thai educators and learners has become the new normal of digital education that everyone is now

comfortable with the technology and ways of new learning processes.

4.5 Technology Usage in Online Education

To be fully successful with online education, basic infrastructure such as electricity, personal computer, laptop, tablet, and mobile device must be available to both teachers and learners. Most teachers did not have any problems in accessing the basic infrastructure as they can go to school during the shutdown and able to teach using the schools' facilities. Students, on the contrary, were struggling and some are struggling now to attend classes as their socioeconomic status may not allow them to even enter a realm of online education. While the government has allocated a funding to help with a technology access support, key informants G and H confirmed that there is inadequate funding to help every student in Thailand. From DLTV program alone,

> "300 schools in Thailand still have no access to the Internet at present" (Key Informant G, personal communication, February 8, 2023).

That simply means online education is available for all but not all have an access to online education.

4.6 Human and Technology in Digital Learning

Prensky (2001, p. 1) divided people in the digital age into 2 main groups, digital native and digital immigrant. Therefore, their interactions with technology are distinct. Key informant M distinguished teachers into 2 main groups similar to Prensky. Teachers who learn technology later in their adulthood tend to struggle with

new styles of teaching model particularly during the COVID-19 in which online sessions have been conducted in alignment of social distancing measures and policies. Even with the training offering by IPST, this group of teachers require more technical supports from the team of IPST. Young teachers who recently graduated, on the other hand, are much more proficient in utilizing and integrating Learning Space platform and other applications into their teaching sessions online. Essentially, IPST has a dedicated technical team to support teachers nationwide and annual trainings for teachers. While DLTV, DLIT, OBEC Content Center, and Learning Space are more suitable to access on website via computer, having mobile application available through both iOS and android applications significantly increase reachability by number as stated by key informants G, H, I and M. Technology simply is a tool for education to reach anyone, anywhere, and anytime. Despite technological disruption and advancement, it requires a massive momentum to transform Thai education into the digital age. According to key informants I and K,

> "the COVID-19 pandemic is an influential force to move an inertia of Thai education that coerced educators and learners alike to adopt technology in teaching and learning" (Key Informant I & K, personal communication, December 14, 2022).

The new normal of online education has now been a common model of learning as people are familiar with and accept the new condition of education. It is unfortunate to say that COVID-19 is the most influential factor that truly transforms Thai education into the new normal of the digital age.

4.7 Digital Content Development

While Office of the Basic Education Commission and IPST create most of the online contents, teachers also create their own teaching materials in addition to what the government entities have available. Therefore, on the creator side of technology there are dedicated studios and team of experts in designing and creating digital contents available on DLTV, DLIT, OBEC Content Center, and IPST. As key informant K explained that creating digital content require extensive involvement of

public and external entities through a collaboration of national and international experts in digital content, education, and technology design. The digital contents were also compared and benchmarked with the United States, England, Japan, Malaysia, and Singapore curriculums. The activities designed for the curriculum also corresponds to Thailand National Education Plan to develop skillsets 3Rs8Cs necessary for the 21st century. Before each annual curriculum is approved and implemented in regions, public hearing of proposed change in the curriculum must be conducted. Feedback from the hearing is also included to modify the curriculum accordingly.

4.8 Evaluation Process and Dilemma

IPST focus group mentioned unplug teaching method to help teachers teach students who are unprepared in using technology due to the lack of access to computer, mobile devices, Internet, wireless communication, and all basic necessities in order to study online. The concept of unplug method is technically means that teachers should be able to teach the 21st century skillsets in accordance to the Ministry of Education without the need to use any technological devices.

> "Ultimately, students should be able to attain 3Rs8Cs skills without touching any devices and able to apply their knowledge and skills to technology when needed to" (Key Informant I, personal communication, December 14, 2022).

This method of unplug teaching coincide with the connectivism education theory that learners must have the ability to recognize connections between ideas, concepts, and principles (Siemens, 2008). According to all key informants from government entities, it is still unclear how the evaluation process is actually collected and feedback is being implemented. As evaluation roles are heavily relied on schools and teachers to evaluate the curriculum, no key informants have mentioned that evaluation is performed diligently on learners' side of education including their families and parents. The 360-degree feedback has not yet been performed on all online platforms thus far. Quantitative increase of number of users on the platforms alone do not

provide an overview of the current standing of digital contents, online teaching and learning platform, and online experience from both educators and learners. There still remain missing pieces of information that can truly enhance and transform Thai education.

4.9 Challenges that Impede Transformation

4.9.1 Unprepared Plan of Teaching Staffs in Online Teaching

No one was prepared for the pandemic and the social distancing measurements and so initial phase of online teaching had been a struggle for all parties involved. Key informant K addressed that

> "the schools, teachers, students, parents alike were not prepared for an abrupt adoption of online teaching and learning model" (Key Informant K, personal communication, December 14, 2022).

For online education to be successful, all participants must be involved to modify teaching and learning method that is most suitable to both educators and learners.

4.9.2 Passive to Active Learning

Thailand and the culture of conservatism is a major obstacle that impede a transformation of Thai education into a digital age. Thai culture is prone to resist to change making acceptance of newness and creativity less favorable. Key informant G even stated that

> "it requires extensive training to introduce technological mindset into teaching and learning so that teachers can become active learners through annual trainings and continuing education of life-long learning of consistently changing of curriculum and technology. Once teachers themselves become active learners and teachers, they can then pass along the active learning trait to students who are the learners of the education process" (Key Informant G, personal communication, February 8, 2023).

In agreement with the connectivism education theory that learning and knowledge are consisting of diversity of opinions (Siemens, 2008), teachers who can accept and embrace diversity will thrive in active learning environment and so pass along the inclusion process to their students. To be able to thrive as an active learner, Siemens (2008) stated that the willingness to learn more is critical than what is already known. In the process of transitioning, it requires persistency and dedication to slowly transform the traditional approach of teaching and learning. Therefore, active learning approach must be carefully implemented under circumstances to generate the active teaching and learning environment for both educators and learners.

4.9.3 Learning Environment

Participant G mentioned a struggle of teachers to teach netiquette so that students know to participate in class or at least turn on their cameras while attending a virtual online session. The problem that seems to be recurring and mentioned by all participants is that the ability to make sure students turn on their cameras while attending an online class. Participant H encouraged

> "a redesign of classroom once the new normal continues to have face-to-face teaching and learning session or any hybrid of delivery methods
> to enhance learning experience" (Key Informant H, personal communication, February 3, 2023).

Student concentric approach will allow positioning of whiteboard, students' desks, and teacher's desk, and other technological devices using the classroom to create a fostering environment for education.

Personalized learning experience is important as online learning may not necessary be synchronized or real time. Key informant I mentioned that the digital contents and platforms created by IPST has been designed with personalized learning experience in mind. The ease of use, browse information, and search data should be

relatively simple for everyone regardless of their roles, ages, and ability to use technology.

4.9.4 Teacher Mindset

As IPST focus group mentioned that 9 out of 10 teachers who went through trainings were attentive in learning new knowledge that they can apply in their teaching. However, a smaller number of teachers passed the assessments to earn a certificate with high scores.

> "Taking courses or trainings to only meet mandatory requirements of certificate can substantially degrade the intent of a digital transformation
> of education" (Key Informant L & M, personal communication, December 14, 2022).

Therefore, the digital contents and platforms are available and accessible are only good as the users who know how to use them and apply them for their benefits. Siemens (2008) pointed out that learning is a process that learner needs to connect sources of information and know where and how to find them. As long as the person has the mindset to continue lifelong learning, the ability to adapt with everchanging of technology is a critical aspect of education.

4.10 Conclusion

Government entities responsible for digital platforms, online contents, trainings of teachers, and designing curriculums, carry their mission in accordance to the plan directed by the central government and the Ministry of Education. Experts and technical teams are available 24 hours to assist all users in a new model of online teaching and learning. These platforms even though are under the public sector, they are considered open-source online platforms that are ready to help transform Thai education into the digital age. The barrier to change the behaviors of both educators and learners are still heavily tied to Thai culture and value of education. As online teaching and learning model has been widely accepted, the mindset to have people

understand that an open-source digital education is also an alternative to traditional approach that we are all familiar with.

DLTV, DLIT, OBEC Content Center, and IPST address the concerns that the study was attempting to match the educators' and learners' groups of Internet access to the theory. DLTV addressed the information have-not population, although small in number, but crucial to make sure education is available and accessible to everyone. As learners progress into the digital world of learning, DLIT is made available for information have-less to assist in digital learning, self-learning, and technological adoption in education. As the pandemic put education on hold for an extended period of time, OBEC Content Center came into the picture to enhance DLIT to information have-less and information have groups of educators and learners. IPST is an advanced stage of digital learning that STEM students and teachers can utilize to integrate technology into their teaching and learning. Public efforts in creating open-sources of education have been crucial implementations that made progress to Thai education into the digital era of education. Although the mass population are not utilizing public resources extensively, the advancement of the resources that are reflective of current application of technology should be considered to make the resources attractive to both educators and learners.

Studying online does not mean just simply turn on electronic devices, attend a session, and become a typical passive learner to only wait for instructors to pass along the knowledge. Studying in the digital age requires skillsets of connectivism education theory to transform self to be an active and lifelong learner. Knowing where to find information, how to obtain knowledge, and adapt to situations regardless of the circumstances are necessary for online learning experience to be fulfilling with true learning. Education then can truly become borderless and timeless. Successful education in the digital age is not limited by the technology but the users who know how to apply the knowledge they gain through technology will thrive in online education.

Chapter 5

Free Open-Source Online Education in Thailand and Abroad

Thailand education transformation into the new digital age is the research study aiming to study current government policies on online education in Thailand, to study leading models of free open-sources for online education in Thailand and abroad, and to explore Thailand transformative online education for the new digital age. The research study is examining the current government policies on online education in Thailand and searching for ways to utilize free open sources into digital transformative education.

This chapter findings answer the statement of purpose to study a leading model of a free open-source online education in Thailand and abroad. The in-depth interviews were conducted to obtain insights of non-profit organizations that offer open-source online education at no cost. Requests for interviews were formally sent to a non-profit organization and representatives were assigned to provide information on their roles and intent to offer free online education. The study also reviewed Khan Academy, a leading platform of a free open-source online education. Sakdibhornssup Foundation is a non-profit organization in Thailand that follows similar model as Khan Academy in offering a free online open-source education. Discussions of free open-source online education in Thailand and abroad are in the following sequential order:

5.1 Non-Profit Organization - Institution Abroad

5.2 Non-Profit Organization - Thailand Network of Free Education

5.3 Individual Contributors as Knowledge Resources

5.4 Free Education for All

5.5 Know How to Connect to Sources of Information

5.6 Knowledge Resources

5.7 Digital Literacy

5.8 Online Learning Styles

5.9 Conclusion.

5.1 Non-Profit Organization – Institution Abroad

Khan Academy is an American non-profit organization started in 2008 by Salman Khan. His goal was to create a set of online tools that help educate students by recording his teaching sessions and upload these videos online. Salman Khan started with his initial intent to tutor his cousin in 2004. As his tutoring flourished to teach many cousins and friends of cousins, the organization has now grown to more than 150 employees. The employees include developers, teachers, designers, strategists, scientists, and content specialists who inspire to provide a free world-class education for anyone, anywhere, and anytime (Khan Academy, 2022). Khan published his contents on YouTube to make them available and accessible online as the demand of his tutoring session grew significantly. In addition to the videos hosted on YouTube, Khan Academy's website provides supplement videos, tutorials, and practice problems to all learners. The website offers features such as progress tracking, practice exercises, and teaching tools. The website www.khanacademy.org offers a personalized learning resource with practice problems, instructional video clips, and dashboard that empower learners to study at their own pace. In the beginning, Khan focused mainly on mathematics to help his cousin through her classes. He believes that skill mastery to build a strong foundation of subject matter will establish a learning process that helps any learners to move further along more complicated materials at ease. The subjects of coverage expanded from mathematics to sciences, computing, computer programming, history, and economics that help students from kindergarten to grade 12 level. Standardized exams such as SAT, LSAT, Praxis, and MCAT tutorials and practice exams are also available at Khan Academy (Khan Academy, 2022).

In the United States, Khan Academy is the leading online learning resource used and trusted by teachers and students. Khan Academy website offers dedicated sections for learners, teachers, and parents. Learners will have a personalized learning

experience through a variety of classes and materials that cater to their own eagerness to learn or subjects that they struggle with and want to improve on. Teachers will have the guide to help in their teaching sessions. According to Khan Academy (2022), “We believe that teachers are critical to student success. A "teacher" on Khan Academy can be a classroom teacher, a parent, a mentor, or even a peer.” Therefore, anyone can be a teacher for Khan Academy and does not limit to only teachers at school to use Khan Academy tools for teachers. Parents can also take a role of teachers who can help their children through distance learning particularly during social distancing measures in the midst of the COVID-19 pandemic. “At every moment, we are both students and teachers; we learn by studying, but also learn by helping others, by sharing and explaining what we know” (Khan, 2012, p.12). Khan Academy defies roles of educators and learners because we all can be educators who pass along the knowledge and learners who seek to learn new things and keep up with the forever changing of information, data, technology, and skills. In 2018, mobile application Khan Academy Kids has become available for young learners age 2 to 7. To become a true world class free online resource, Khan Academy has been translated from English to 17 languages with full sites of which most of the contents were translated, 24 languages with demo sites of which partial of contents were translated, and 12 languages with light sites of which small number of contents were translated (Khan Academy, 2022).

According to Khan (2012, p.1), “the old classroom model simply doesn’t fit our changing needs. It’s a fundamentally passive way of learning, while the world requires more and more active processing of information.” Personalized learning through free open-source online contents triggers active learning behavior in learners where they can explore the materials and gain their knowledge at their own pace. Traditional method of teaching and learning fosters passive learning environment that encourages students to be fed with information and take in what is taught passively. Education is never about graduation rates or test scores but many people tend to focus success based on those numbers. Formal education should change and need to be in alignment with the current world situation of the digital age where younger generations can actually learn and thrive. Technology along with the Internet and wireless communication should be integrated in education so that it can free everyone

from limitations and make education accessible, flexible, portable, and personal (Khan, 2012, pp. 11-12). "…that when it comes to education, technology is not to be feared, but embraced; used wisely and sensitively, computer-based lessons actually allow teachers to do more teaching, and the classroom to become a workshop of mutual helping, rather than passive sitting" (Khan, 2012, p. 36).

Since the technology is changing rapidly, what we know today may be obsoleted in a decade from now. Therefore, what we teach and learn today is less important than the ability to learn by ourselves. To be self-motivated and active learners will allow us to thrive in the digital era and the future of digital technology. Then, the most crucial task of education is to teach young generations how to learn, lead them to be self-motivated learners, nurture their curiosity to seek newness, encourage their eager to explore knowledge, instill confidence in active learning so that they can learn by themselves even beyond graduation (Khan, 2012, p. 180). According to Khan, "I passionately believe that the Khan Academy is a tool that can empower at least an approximate model of what the future of education should look like – a way of combining the art of teaching with the science of presenting information and analyzing data, of delivering the clearest, most comprehensive, and most relevant curriculum at the lowest possible cost." (2012, p. 10). Education has to be continually improved and adapted to circumstances. Khan Academy by no means has an intent to replace the current education system. Khan Academy is here to help education better for everyone. As of 2020, Khan Academy has partnered with more than 100 school districts in 38 states in the United States. Khan Academy is not only a supplement method of teaching and learning but a leading model to integrate with current education system to improve learning capacity, capability, and environment (Khan Academy, 2020). The traditional education that we used to know is slowly diminishing. Khan Academy has proven that education does not require the formality for teaching and learning in the digital age. In Thailand, there is an organization that shares the same mission as Khan Academy to offer free education for all. Sakdibhornssup Foundation was the first organization that started translating Khan Academy into Thai language and make the video clips available online.

5.2 Non-Profit Organization – Thailand Network of Free Education

Sakdibhornssup Foundation was established in 2006 as a non-profit organization aiming to build a sustainable development in education and healthcare. The mission for the organization is to advance Thai education and reduce disparity in education opportunity (Sakdibhornssup, 2017). The foundation initially focused on training teachers to become more effective in teaching and build their capabilities. In 2010, Katanyu program also known as Katanyudemy was launched to expand the education development further to students (Katanyudemy, 2022). According to key informant N, at present, the foundation consists of two programs to help train teachers and to offer learning and tutoring sessions for students for free. The courses offered for students include Thai, English, mathematics, sciences (biology, chemistry, and physics), social studies, and O-NET exams. The materials cover from grade 1 to grade 12. In additions to offering courses for students for free, the foundation also grants scholarships for scholars who intend to pursue degrees in education nationwide and nursing program at Praboromarajchanok Institute.

Sakdibhornssup foundation has a motto that education provides a strong and stable foundation, teachers are the leading model, teachers' spirits are the driving force, and students are the future of the nation (Sakdibhornssup, 2017). In all, the founders believe that education builds the nation and its future. In alignment with the motto, the foundation has set 5 goals to fulfill as followed:

1) to develop teachers and educators to advance their skillsets,

2) to develop principals, staffs, and administration to manage education effectively,

3) to provide knowledge center essential for education particularly in e-learning,

4) to grant scholarships to scholars who rank first in pursuing degree of education in all provinces (each candidate is selected from each province), and

5) to grant scholarships to scholars who rank first in pursuing a nursing

program at Praboromarajchanok Institute (each candidate is selected from each province).

Sakdibhornssup foundation was the first organization that started Khan Academy Thailand by translating Khan Academy videos into Thai language and has made these videos available on the website https://www.sakdibhornssup.org/khanacademythailand/. Key informant N mentioned that Khan Academy translation project was partnered with Kasetsart University in its initial phase. Later, the translation was made through a group of volunteers. The group consists of Chulalongkorn University and Kamnoetvidya Science Academy (KVIS). Recently in December 2021, there is a new initiative that Sakdibhornssup foundation is restoring the effort in expanding and continuing a translation of Khan Academy into Thai which key informant N will be the leader in such project. Khan Academy is the leading model in education that shares similarities in beliefs with the Sakdibhornssup foundation. Both organizations focus on education and emphasize that education should be free to all. Online contents are available as an open-source platform for learners. Teachers are offered with tools and guides to become more effective in their pedagogy.

Prior to the COVID-19, the foundation has already started an effort in creating and uploading contents online via website and YouTube. These online contents dissemination is intended to make education available and accessible to everyone since not everyone can travel to Bangkok to attend the training sessions or learn onsite. All contents are made available similar to DLTV, DLIT, OBEC Content Center, and Learning Space. Live streaming of teaching sessions or trainings are also available. Recorded videos are uploaded and can be viewed at a later time.

Key points of Khan Academy and Sakdibhornssup Foundation are making education free for all without any hidden agenda. Key Informant X, Y, and Z confirmed that

> “Khan Academy Thailand are a group of enthusiastic volunteers who believe in free open-source and want to be the part of the team that are making a difference to the world of education” (Key Informant X, personal communication, December 20, 2022).

With the world of education heading toward digital format from free open-sources, these institutions are the leaders to transform Thai education into a digital age in alignment with UNESCO's commitment to advocate free education for all.

5.3 Individual Contributors as Knowledge Resources

Aside from the efforts from the government entities, private sector, and non-profit organizations, individuals can also be the contributors to knowledge resources. As the Internet, wireless communication, smart devices, and infrastructure are equipped to offer a basic foundation for all of us to be connected, individual knowledge source can be made available online via various platforms. Some are recorded video clips uploaded on YouTube, some are live streaming on the website or social media platform, and some are blogs on the sites or social media. Regardless of their digital platforms, they all are digital contents that are available for free as knowledge resources. People can learn about anything through free online resources that are overly abundant via the Internet. This makes education become broader than what we are used to as an institutionalized network. This new sector created by the society of individuals with the intent to share experience and knowledge, raise awareness, or simply educate others.

To examine the model of push-pull approach, push factors that push individuals from original positions to the new alternative can be from various reasons (Kang, Wang, Chen, & Su, 2021). The transition of traditional education into digital education in Thailand can be proposed in accordance to Bozkurt and Sharma (2020, p. 1) that the COVID-19 pandemic is the main push factor that affect education. Thus, the online approach is necessary to implement when there is no other alternative during the confinement and social distancing. With the government support and directive, the push factors transition everyone in the education into the digital format of teaching and learning. The exploration of the push factors has been extensively discussed in previous chapters and it is intuitive to observe push forces during the pandemic to resolve issues of continuing education. As adopters of the Internet, wireless communication, and e-learning are comfortable with the new environment, the pull factors surface to create a momentum of change into the digital age.

According to Kasch et al. (2021), availability of the study materials, free resources for selection, and course arrangement and navigation made adoption of the online learning grows significantly. With free resources made available by private and non-profit organizations, their roles are in between the pull and push factors to bridge the gap of the implementation of online learning. However, more and more individual contributors become pull factors to offer sharing of knowledge and experience as a first-hand approach. Online channel such as GinDaiAroiDuay offers a cooking recipe and teach people how to cook and choose ingredients through YouTube and Facebook. Chef Bo also work with different platforms in teaching how to cook, select ingredients, describe benefits of the ingredients, and even teach vocabulary of ingredients and cooking in English. Cheflix, Eng24, Thai PBS are some of the channels that chef Bo appeared online via Masterclass, Facebook, YouTube, and traditional media channels allowing people to learn from her at no cost. She even works with Ministry of Education to teach cooking through Eng24 channel. With abundance of information available online, the most essential skill for all digital citizens is know how to look for information they are looking for. Google, YouTube, Facebook are among top searching sites and applications used to find information. Active learners then can explore endless opportunities via the connection of the Internet to the network that are interconnecting the digital contents and knowledge.

5.4 Free Education for All

The right to free education was documented in article 26 written in the Universal Declaration of Human Rights and proclaimed by the United Nations General Assembly in Paris in 1948. The article stated that “Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit” (United Nations). Education for all (EFA) movement is a global effort led by UNESCO aiming to improve learning supports for all children, youth, and adults. The movement started in 1990 in Jomtien, Thailand but not much has been

implemented. It took a decade later at the world economic forum in Dakar, Senegal in 2000 that the participants agreed to re-affirm their commitment in achieving education for all. The framework included six goals which were: (1) expand early childhood care and education, (2) provide free and compulsory primary education for all, (3) promote learning and life skills for young people and adults, (4) increase adult literacy, (5) achieve gender parity and gender equality, and (6) improve the quality of education (IBE-UNESCO, 2022).

All children in Thailand shall receive a formal basic education in total of 12 years at no cost per article 54 under Thai constitution (Office of the National Economic and Social Development Council, 2021, p.295). Thai government and Ministry of Education have made a progressively effort to develop free massive open online courses for basic education. The development of free MOOCs made online education possible through a technological advancement of the Internet and wireless communication. Educators worldwide from public, private, and non-profit entities have developed tremendous online libraries of educational resources that are free and open for all to use. Khan Academy and Sakdibhornssup foundation are the non-government actors who are active in creating online courses and resources in alignment to free education for all. DLTV, DLIT, OBEC Content Center, and Learning Space are the public actors who are also in alignment of offering free educational resources online. While on the educator side education is readily available as an open source of access, not all learners are able to access those contents. The limitation lies with the ability to connect to the Internet from an electronic device or via wireless communication through a portable device. Therefore, the digital divide distinguishes people who have access from those who have not. In reality, the majority of the people fall in between the two polarities as Qiu categorizes this group as information have-less group (2009, p. 26). They can access free education typically through a mobile device with smaller screen and less stable connection to the wireless communication. While information is at their finger tip, connection to the Internet and their technological devices become their barriers to acquire knowledge. According to Castells, even with the information have group, not all have the same ability to optimize their usage of technology (2001, p.269). Therefore, not all learners are on a

same level of access, ability to attain knowledge, and explore the world of free education online.

The pandemic of COVID-19 offers an opportunity for free MOOCs to make people realize that education not only for free but education can be offered free via online platform. A new acceptance of online education has transformed the traditional approach of teaching and learning. The technological advancement alone did not transform Thai education. The greater force of momentum of an external factor such as the pandemic is the key prime mover to initiate changes in Thai education. The reason is simply because there is no other alternative possible when social distancing is mandatory.

Access to technology, the Internet, and wireless communication, allow education for free to reach even wider audiences of which teachers and students do not have to commute to Bangkok to attend a course offered by the foundation. Physical location at the foundation has a limitation to number of occupancies making free education space become limited to those who can physically attend. Extra expenses are also incurred by the attendees if travel far from Bangkok. While courses are offered for free, transportation and overnight stays are not covered by the organization. Attendees who travel from other regions must pay for their own expenses if they want to attend courses for free. Even before the pandemic, key informant N stated that

> "online sessions are offered to overcome the physical space limitation and additional costs for traveling" (Key Informant N, personal communication, November 23, 2022).

As online education has become mandatory to abide by the social distancing measures, online sessions have grown significantly and everyone has to adapt to these changes entirely.

The first category of digital divide from class, race, geographic areas, and socio-economic aspects of both educators and learners become less of an impeding factor from accessing online learning. The second technological stratification, a knowledge gap, on the other hand become a critical factor that education is not attained equally for all learners (Little, 2016, p. 338). The skill to know where and

what to search for to attain a knowledge is very critical for both educators and learners in the digital age. Connectivism education theory best describe the situation of online education at present.

5.5 Know How to Connect to Sources of Information

Technological advancement is progressively changing how we perform tasks through smart devices and applications with growing connectivity of the Internet and wireless communication. Education has finally found its technological space where open-source education is readily available for all to learn. Due to a fast pace of technological growth, the knowledge and skillsets we currently hold can be obsolete by next year. Therefore, the skill to know where to look for updated information and ability to adapt and learn new knowledge will become more essential for us to thrive in the 21st century education. As knowledge continues to evolve, the ability to learn what we need for the near future is more important than the current knowledge we possess. Lifelong learning is not a new concept but yet is fundamental for all humanity to keep up with the technology. Informal ways of learning through online open resources that are available 24 hours have become an attractive method of learning. As Siemens (2008) has stated that "know-how and know-what is being supplemented with know-where," makes the ability to know where to find the knowledge is necessary for all citizens of the Internet. "Knowledge that resides in a database needs to be connected with the right people in the right context in order to be classified as learning" (Siemens, 2008). Connectivism education theory introduced by Siemens is providing insight of learning skills for educators and learners to flourish in a digital era.

The field of education has been slow to adapt to technology to acknowledge the impact of new learning tools and the learning environmental changes. As learners, we all will learn from a wide range of different and unrelated fields over the course of

our lifetime. Lifelong learning is a continual process from childhood through adulthood. Continual learning is growing in an informal learning format particularly through online resources. As many resources are free and available online, people are accepting a new approach of education through informal learning. Formal education, however, is still necessary while informal learning has significantly grown to supplement the traditional approach of education. Technology is altering the way we think, we process, and we learn. Therefore, online learning shapes the new way we learn and reshape our thinking. Siemens' theory is in agreement with Castells that we are living in a network society. Networks build a new social framework where all human activities are organized around these networks (Castells, 2010b, p. 500). If one is not connected to the network through the Internet or wireless communication, there is less opportunity to grow and thrive in the digital era as all activities are within the network. Consequently, as the networks keep growing, the more we all are required to be connected to the networks and cannot live without being connected (Castells, 2010b, p. 71). Siemens identified that people, groups, systems, nodes, and entities must be connected to build an integrated whole. Therefore, social networks work similarly to computer networks and power grids. Any modification or amendment to the network will in turn generate ramifications to the connection and the whole (Siemens, 2008). Connectivism theory is driven by an ever changing of technology and information. New data and information are being acquired and added to the network making old data obsolete rapidly. When new information alters the social landscape, new skillset or knowledge is needed to be updated to stay current with the information and technology. And so, learning and knowledge is acquired through a collection of opinions which some may contradict one other. Learning is impossible without connecting to the network and therefore a connection within a fingertip is unavoidable. Learners must attain an ability to maintain their connections to the networks and to recognize and make connections between ideas and concepts. Stay current with learning is vital in the digital era. The important factor as Siemens pointed out that decision making is also a learning process. While certain information is right at present, it may be wrong tomorrow due to alterations in the information climate. This in turns affect the decision-making process. The right answer now may be wrong in the next few days. On the other hand, the wrong answer in the past may

be right in a decade from now (Siemens, 2008). To stay being an active learner is not only from an individual, the content and interactive media from creators plays a key role in generating interests in online education.

5.6 Knowledge Resources

Creating a content for online education is not an easy task. It requires a group of experts not only in the subject matter but also in content creator, multimedia developer, and content designer. Key informants that were involved in content creations mentioned that they have a team of experts assisting in creating each multimedia prior to its demo. DLTV, DLIT, OBEC Content Center, Learning Space, and Sakdibhornssup foundation all have a dedicated production studio for recording and creating life streaming teaching session. These production studios are on par with entertainment production studios. There is a team of production and a team of IT specialist to assist teachers, viewers, students, and all learners with technical issues.

Streaming an uninterrupted session of online learning requires a minimum of at least 600 kbps of the Internet speed. In Thailand, two main applications are used for online teaching and learning sessions. All key informants stated that they used Zoom and Google Meet for conducting a session online. For Zoom, one-on-one session requires a minimum of 600 kbps of the Internet speed. For group video conference, a minimum of 1.0 Mbps is ideal (Zoom, 2022). If learners are connected via wireless communication, a minimum of 3G is required. Windows 7 or above is necessary for using computer devices. For smartphones and tablets, iOS 8.0 or above and Android 5.0 or later are supported by Zoom. A device must be 1Ghz single core processor or better (Zoom, 2022). Since Zoom is not free, most teachers tend to use Google Meet as a free option for teaching sessions. Google Meet requires Android 5.0 and iOS 12.0 and up for smart devices. Ideally, a dual core processor and 2GB memory would be compatible with Google Meet (Google Meet, 2022).

DLTV, DLIT, OBEC Content Center, Learning Space, and Sakdibhornssup foundation uploaded their videos on YouTube in addition to their respective websites. YouTube video viewing for the poorest resolution of SD 360P requires at least 0.7

Mbps of the Internet speed. To view 4K resolution, a recommended sustained speed is at 20 Mbps (YouTube, 2022). If students are using personal computers, the operating system should be Windows 7 or above. The latest version of a browser must be used whether they be Google Chrome, Firefox, MS Edge, and Safari. For Android devices, Android version 4.4 or above is needed. For iPhone or iPad, the devices should run iOS 7 or above (YouTube, 2022). Therefore, not everyone will experience good quality of education due to the lack of access or poor access. For the Internet speed lower than the minimum requirements, learners will not experience a smooth streaming of video or live session. For lower specification of smart devices, learners will be interrupted during their learning sessions. While the resources are readily available online, good quality of learning experience may be interrupted by technological barriers.

Even with students who are equipped with high-speed Internet, personal computer, tablet, and smart phone, not all learners succeed in the digital realm of education. Key informant N pointed out that

> "Thai students still lack the ability to properly use search engine to find information, filter information for authenticity and trustworthy sources, and correctly cite online references" (Key Informant N, personal communication, November 23, 2022).

This mainly due to the way we teach in Thailand, most teachers do not teach them the skill they need to handle the abundance of raw data and information that are available online. Core competency curriculum that the Ministry of Education is planning to rollout to all public schools has a purpose to teach students to properly assess information online, use reliable sources of data, and be attentive for potential fraud and scam.

5.7 Digital Literacy

Literacy alone generally refers to ability to read and write. When placing digital in front of literacy, digital literacy means much more than just being a digital literate. The American Library Associations offers the definition of digital literacy as

“the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills” (Loewus, 2016). According to Hiller Spires, as cited by Loewus (2016), digital literacy consists of 3 parts: “1) finding and consuming digital content; 2) creating digital content; and 3) communication or sharing it.” The term digital literacy may also refer as new literacy, literacy and technology, or 21st century literacy. Due to evolving technology, digital skillsets require a constant update of knowledge and skills. And so, digital literacy as described and understood today may be changing its definition in the future or even a new term may be necessary to explain the skill and knowledge needed for digital transformation in the future. Knowing that people are not on the same playing field on their background and adaptation to technology, Prensky categorizes the users and creators of technology into two groups: digital immigrants and digital natives. Digital immigrants similar to term immigrants as we are familiar with, this group of people are the ones who adopt digital technology later in their life particularly during their adulthood (Prensky, 2001, p. 3). And so, they are not naturally speaking digital language making them less savvy to search for information online, produce digital content, and upload or share their contents digitally. Translating this into education arena, learners and educators who are digital immigrants will require more support from IT team to troubleshoot even small tasks. They tend to revert back to their preferred method of teaching and learning where face-to-face model is often preferred. As we are going back to normal school sessions, they will most likely go back to their routine even after full online sessions were introduced and implemented for the last 3 years during the COVID-19 pandemic. Digital natives, on the other hand, are naturally born as digital citizens. They were introduced to technology and smart devices since young. Without instructions, they will figure out how to navigate through the digital world through technological devices. They perceive, process, search, and think very differently from digital immigrants (Prensky, 2001, p. 1). Understanding the gaps in behavior and digital skills is essential for educators and learners to bridge the gap of knowledge and digital skillsets. As most instructors, teachers, and professors are most likely digital immigrants and a majority of learners and students are digital natives. The clash between the two different thought process may need to be evaluated further in order to

ensure learning experience more engaging. Understanding the differences can make teaching and learning experience interactive which in turns foster active learning environment. Being active learners also come from the experience and environments that learners are exposed to.

Aside from digital literacy, digital etiquette also known as netiquette is essential for all teachers. Based from both key informant N and O, students are prone to turn off their cameras when attending online sessions and nonresponsive when asked. Teaching appropriate behaviors for online sessions particularly a live session should be added to the curriculum so that both students and parents know what is expected from them. Behavioral change is necessary for both teachers and learners to collaborate in creating an active online learning experience. Key informant O recognized that

> "change is not easy as it is a nature of human to revert back to their routine or comfort zone" (Key Informant O, personal communication, November 30, 2022).

This is a matter of time as such the pandemic caused a major change in teaching and learning behavior. Moving forward beyond post COVID, we need to really change to truly transform education.

5.8 Online Teaching Styles

Online learning had little to no appeal for mainstream teachers and students. The opportunity for online learning to proves its position rose as the COVID-19 pandemic has put physical school in a stall position. Online learning suddenly became the only way of learning and it was no longer an alternative for both teachers and students. It took approximately 3 years for educators and learners to get accustomed to online method and people feel more comfortable with learning in a virtual experience. Physical location is slowly diminishing in its meaning and importance. "The classic image of a teacher at the chalkboard, overhead projector, or electronic white board delivering … is inappropriate as the norm" (Horn & Staker, 2015, p.

171). Teachers are no longer lecturers but rather are facilitators for discussions and answering any questions. A productive learning experience only occurs when there is an engagement of both the students and teachers. Therefore, teachers' roles transform into mentors for students (Horn & Staker, 2015, p. 175). Digital technology creates an opportunity for great teachers to reach students beyond the physical limitation. Sal Khan is the world most prominent mentor. His lessons through online videos reach students worldwide with no boundaries and barriers for those who want to learn (Horn & Staker, 2015, p. 179).

Learners come into online courses with different level of readiness. A sense of belonging greatly relates to the degree of interaction. If they feel isolated and disconnected, they will less likely stay active in the online session. The positive climate of teaching and learning is essential to encourage participation and foster active learning experience (Simmons, 2021, pp. 33-34). By making learners feel comfortable in online classes, instructors themselves have to be motivated to continue providing a fostering learning environment. Teachers' attitudes play a key role in creating a fun, engaging, and constructive learning climate. A session of effective online learning allows students to share their ideas, makes learners feel valued, nurtures an environment for making mistakes, embraces questions and answers, and cultivates open discussions and interactions. Therefore, teachers' roles are very important in building a successful learning experience. Teachers are not just facilitators. They are the online tools and contents in creating cohesion of online learning and culture of active learning.

While key informant N mentioned that online learning is not so successful among Thai students, students who are eager to learn will perform well regardless of their learning environments. This simply translates to active learning environment, as long as learners are eager to learn they will thrive in any environment they are exposed to. Therefore, it is crucial to generate active learning experience for learners to actively participate in an online course. That leads to proper trainings for educators and facilitators. Not all instructors are tech-savvy, in the matter of fact only a few are really technological proficient. While the majority of teachers require a variation of assistance, the tech team that support all educators play a key role in making online courses attractive and effective. Similar to public sector, nonprofit organization also

has a dedicated technical support team for online learning. Key informant N proudly presented that the studio used for recording live sessions and generating digital contents are on a par as the modern entertainment production. Key informant O suggested that tutoring is a popular culture in Thailand. By leveraging tutoring style of teaching using techniques of combining tools and applications can make online learning experience more fun and attractive. If the norm of tutoring still remains as a main culture of learning, we need to find ways to integrate tutoring to online learning. This way online teaching and learning will expand in its value and acceptance as not only an alternative method but as a preferred method. While key informant O still suggest that hybrid method with a combination of face-to-face and online sessions is ideal for learning, time spend face-to-face can be more effective to allow open discussion of subject matter rather then teachers lecture the materials making students become passive learners. Online sessions, as well, should be the space for collaboration, questions and answers, and opinion sharing and debating. This way turning off their cameras are unavoidable and making students know that they need to participate and should be active in all discussions.

5.9 Conclusion

It is very astonishing to discover genuine nonprofit organizations that value free education. Not only they offer free education for all, they make sure everyone can access their materials digitally. The online platform launched by these organizations is aiming to provide free education to anyone as long as they have access to the Internet. While Khan Academy is not well known in Thailand as many teachers have a language barrier to leverage Khan Academy for their teaching, it offers an outstanding model of free education that other entities in Thailand can use to create similar useful platforms. Similar to Khan Academy, Sakdibhornssup foundation is not advertising the good deed. People come to know the foundation through the word of mouth only. With this model, we are losing an opportunity to reach larger audience of learners in all provinces in Thailand as they are not aware of such free resources. An affiliation with any sector within the Ministry of Education

can be more beneficial for us all to benefit from such free resources. Outreach to teachers may be helpful as they can use the foundation resources in addition from their trainings and any assistance from the public sector. Staying vigilant and resilient has made the foundation a role model for sustainable growth in education. Therefore, the Sakdibhornssup foundation should be known in Thailand regardless of their publicity to reach everyone in every province so that they will benefit from free education resources.

We could not neglect individual contributors that slowly becoming the resources of free knowledge online. As education is limitless and boundless, knowledge outside of the institutionalized educations and organizations are readily available within a fingertip. Active learners can sharpen their digital skills in searching for knowledges that meet their needs and endeavor. Self-development, self-learning, self-teaching, and lifelong learning are essentially a part of everyday learning that we all adapt and utilize technology as the tool for education. Abundance of resources available online is a galaxy of information that is readily accessible by everyone and that education is further with the appropriate digital skillset to build a new era of education.

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Chapter 6

Phenomena of Transformative Education in Thailand

Thailand education transformation into the new digital age is the research study aiming to study current government policies on online education in Thailand, to study leading models of free open-sources for online education in Thailand and abroad, and to explore Thailand transformative online education for the new digital age. The research study is examining the current government policies on online education in Thailand and searching for ways to utilize free open sources into digital transformative education.

This chapter findings answer the statement of purpose to explore Thailand transformative online education for the new digital age. The in-depth interviews and focus groups were conducted to collect data on users of open-source online education including both from teaching and learning ends of the online education. Key informants from teaching sector ranges from primary school to high school. The school samples range from small to large in school sizes and number of students. The average number students per each class ranges from 20 to 60 students. Some informants are proficient in technology and some have acquired only basic knowledge for online education. The informants have different background in subjects of expertise including sciences, mathematics, technology, and Thai. The researcher used a snowballing approach to attain the key informants from the network of schools that are involved with government entities and non-profit organization. The informants are voluntarily sharing their experiences from their roles as teachers, students, and parents.

Discussions of phenomena of online transformative education in Thailand are in the following sequential order:

6.1 Trends in Education and Policies

6.2 Implementations of Digital Education and Roles of Stakeholders

6.3 Digital Teaching and Learning Approaches and Management

6.4 Obstacles to the Digital Transformation

6.5 Leading Models for Transformative Education

6.6 Conclusion.

6.1 Trends in Education and Policies

Through a process of globalization, the world has been more connected than ever before. With the globalization, came along the creation of the Internet. Since the widespread of the Internet and wireless communication, people are connected across geographical boundaries making the abundance of data and information readily accessible by anyone as long as they are connected to the network. Literacy that used to be commonly known as the ability to read and write is no longer a skill applicable to the 21st century. Digital literacy, on the other hand, has become a new requirement for all citizens to become digital citizens of the Internet galaxy. Digital literacy means more than just the ability to use the technology but rather the ability to thrive in the digital world of information and progressively advancement of the technology (Eshet-Alkalai, 2012, p. 268). The more proficient of the person becomes, the more the person can optimize the knowledge gaining from the technology. This eventually leads to self-learning, self-teaching, and lifelong learning habit that change how we learn and become active learners who know where to seek information and attain new knowledge or skillsets.

Distance learning then become online learning that many educators are starting to be more comfortable with the environment as the COVID-19 pandemic challenged educational institutions through the prolonged period of social distancing. The pandemic has been instrumental in pushing changes through education that has been slow in integrating technology in the processes. A sudden closure of schools

with restrictions on a physical co-presence tested educators with new approaches of teaching and learning that require great deals of technological integration. The curriculum and former ways of institutionalized education have been established prior to the digital era of which it is the time for the transformative digital implementation to build more current curriculum that is applicable to the 21st century.

School policies in Thailand currently are in alignment with the direction guided by the government policies of which allowing education to advance in a direction of the 21st century skillsets. Adjustment to curriculum and assessment methods are in accordance to the goals of the Ministry of Education as well as the goals set by each respective school. Sufficient training for staffs, administrators, and faculty members are essential to ensure success in an online pedagogy. Necessary financial support and investment in technology to ensure adequate infrastructure is ready for both educators and learners is crucial to close the gap in technology access (no access to the internet, wireless communication, technological devices, and electricity). Regardless of the circumstances, commitments to an online learning and the future of education should be taken very seriously in order to transform in a direction that create quality human resources that will eventually join the workforce in the near future. Currently, there is a push to implement competency curriculum to improve critical thinking and problem-solving abilities among students. Digital knowledge is now embedded in core courses of sciences and mathematics

6.1.1 Curriculum Change and Approval Process

As mentioned by Childrose (2019, p. 8), the literature exploring connections between transformative education and socially responsible leadership through innovative practices indicated that collaborations among all stakeholders including administrators, teachers, and students themselves greatly expand student success and opportunities. Integrated assignment is an exemplary model of a change to a school curriculum. Key informant B was able to assign an integrated assignment partnering with other teachers from different classes and share their assessments in evaluating the students. One such assignment was an infographic project that asked students to apply their graphic knowledge and foreign language into one project. Key

informant B and the colleague worked together to evaluate knowledge retention and knowledge application.

Key informant D also worked with other teachers to integrate a project for students' evaluation. Mathematics and English courses combine two separate assignments into one large project. Not only students apply their knowledge and search for outside resources to complete their tasks, they learn to think outside the box and being creative in their projects.

6.2 Implementations of Digital Education and Roles of Stakeholders

The real challenges lie with the implementation of technology in actual teaching and learning sessions. Teaching in an online setting requires a different approach of teaching that educators may need to prepare prior the teaching sessions extensively. The design and teaching technique used in online settings must be creative to engage learners when educators are unable to detect physical interaction and attention. The engagement in such active learning process requires trials and errors that may be successful in certain age range, group of students, or particular subjects. The key stakeholders in the implementation process are teachers, students, and their parents. Co-learning among key stakeholders allow everyone to grow in endless education opportunity.

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6.2.1 Teachers' Roles

All instructors are familiar with traditional classroom teaching but not many are familiar or even feel comfortable with teaching in the virtual environment. And so, it disables educators to capitalize on the potentials of technology and online resources and tools for online teaching (Whitfield, 2015, p. 15).

6.2.1.1 Traditional Teachers

1) Mindset: Mobile Devices Are Not Allowed in Classroom

According to Chu et al. (2017, p. 112), "Teachers' beliefs in IT and confidence in their own IT skills are two prime attitudinal obstacles

toward effective technology integration in their teaching." Not only teachers in some ways are required to let go of their absolute authoritative knowledge source in a course, they need to adopt student-centered approach of teaching to meet the digital learners who are digital natives by nature (Chu et al., 2017, p. 196). Key informant A called this group of teachers as the resistant. They tend to be a group of teachers who are not familiar with technology and are afraid of changes. They see technology as a threat therefore will not permit any usage of electronic devices in classroom. This group struggled the most during the COVID-19 pandemic of which becoming a backlash to education as it was interrupted from the teaching end. Key informant A proposed a

> "change in teachers' mindset is crucial to transform Thai education into
> an effective online education" (Key Informant A, personal
> communication, December 28, 2022).

Supporting key informant A's stand, key informant B stressed that the COVID-19 was a great opportunity to transform education through a change of behavior among teachers. They were left with no choice but to adopt online teaching skillsets during the pandemic. These past few years strengthen younger teachers whom are more technological proficient to maximize their potentials and integrate technology into their teaching.

2) Teach Digital Natives How to Use Technology

Students at present are digital natives. The younger they are the more tech-savvy they become. They are exposed to computers, smart phones, tablets, the internet, wireless communication, social media, and all online applications all their lives. Educators must change their mindset to fit with the reality of the 21st century in the digital age. They have to transition from their legacy systems to the next generation digital learning environments (Childrose, 2019, pp. 19-20). Teachers progress through various stages of technology adoption and many do not break free from the first and tend to struggle with the adoption mentality. The initial stage is when teachers are aware of the possibilities that an implementation of technology can be beneficial for both their personal usage and their students. Then, teachers lead students to acquire IT literacy in their everyday learning and integrate those skills into

an online learning. Eventually, the routine exposure of technology, applications, search engine, and information over the internet will bring forth the proficiency in utilization of technology. For teachers who still struggle with online format will require appropriate training and support so that they do not become regular passive users. Teachers should advance into an active and creative user of technology in their teaching and learning (Chu et al., 2017, p. 111).

Digital literacy is now becoming a mandatory and important skillset for all internet citizens to have. Teachers who are digital immigrants should seek supports from their peers to adapt into a digital world of teaching and learning. Regardless of being digital natives or digital immigrants, all teachers have to be trained to properly use and apply technology into their teaching styles. IPST and Sakdibhornssup foundation offer annual trainings for teachers to thrive in the digital pedagogy. As a result, successful digital literate students have tremendous supports from their teachers and families. The environment that fosters active learning for digital natives to advance their knowledge and skillsets beyond the regular meeting time for school.

3) Culture of Conservatism Fosters Passive Learning Style

Key informant A confirmed that a number of teachers are falling under this group of passive learners. Teachers themselves may attempt to integrate IPST resources and other online resources in their online teaching and may be unsuccessful in certain aspects. Therefore, they will revert back to what they are accustomed to and foster passive learning style within themselves of which they pass along passive learning habit to their respective students.

Peer support and teacher communities are essential to increase an engagement of professional development among teachers. This virtual and non-virtual communities will be a great platform for teachers to share ideas and experiences as well as exchange practices and assist one another in their teaching techniques. New and creative ways of teaching can be observed, developed and shared to change the culture of passive learning to active learning (Chu et al., 2017, p. 120).

Grooming teachers' abilities to critically think and reflect on education of the digital era requires appropriate support to help them

cultivate new culture of teaching and learning. Digital literacy including information literacy, media literacy, and information and communication technology literacy are essential for online teaching. Deliberate attention and support for teachers particularly on senior faculty members who may tend to struggle in acquiring new IT skills are necessary to develop and improve learning pedagogies (Chu et al., 2017, p. 198)

Key informant A recommended a proposed

> "change in teachers' mindset is absolutely necessary to transform ways of teaching and generate a new environment of teaching and learning for the 21st century" (Key informant A, personal communication, December 28, 2022).

At present, study materials, course contents, tools, and applications are well equipped and available in creating successful online education but the human resources in Thailand are still falling behind due to a lack of readiness and inadequate training. Teachers need to change to become active learners first before they can be successful in teaching in the new digital era of active learning environment. Key informant A addressed that the impeding factor of online education lies within the human resources of educators. Key informant C addressed the comparable suggestion. New requirements of teachers' qualifications of digital literacy are absolutely necessary for the 21st century of education. Through this approach breaking free from passive learning style can be attainable regardless of circumstances. Key informant D added to the same stand that teachers need to change to transform education in the path that will lead Thai education into the digital era. The change is not easy and it may require an event to trigger the transformation. The COVID-19 was one such event that challenged Thai education to ramp up and be ready for online pedagogy that not many teachers were prepared for. With that sudden impact, a true transformation can be realized.

6.2.1.2 Creative Teachers

1) Mindset: Mobile Devices Are allowed to Use as a Main Tool for Searching Information

Instructors who utilize open-sourced resources available online can optimize the benefit from the technology of which can motivate self-learning in students. Successful teachers in online teaching environment are

successful from their inner selves through their attitude toward online teaching and technology, and their willingness to learn, self-learn, and seek help when need assistance (Chu et al., 2017, p.110). Key informant B admitted that continuing education and staying current to technological advancement is crucial to become a successful teacher in the 21st century. Self-learning and attending trainings allow key informant B to stay up-to-date with technology which in turns passing along the active learning trait to the students. However,

> "a lack of financial support from schools and the government to assist teachers with life-long learning expense greatly impact teachers' decision in continuing their education" (Key Informant B, personal communication, November 1, 2022).

Teacher like key informant B paid out of pocket to stay current with the technology. Therefore, life-long learning is inevitable for all of us in the digital era. Passion in teaching is one of the core elements of being a teacher. Without a passion in teaching, teachers are less likely to change and keep up with technology and a rapid transformation of the digital age.

Key informant C stated that

> "there is no right or wrong approach to pedagogy but rather a flexibility to adapt different approaches of teaching that vary in different situations even with the same students on the same subject" (Key Informant C, personal communication, January 13, 2023).

Continuing to improve and adjust the styles accordingly will enrich teaching and learning experience.

2) Teach Digital Natives How to Apply Their Technological Knowledge into Skillset as well as Learning from Them

Childrose's study showed that a professor who is not a digital native can thrive in online course and has a wonderful experience by creating assignments that are approachable. The mentality of willing to learn and master the technical components will make technology a useful tool rather than a barrier (2019, p. 108). Even digital natives are proficient in technology, not all are experts in extracting information that are necessary to complete their assignments. Key information A mentioned that

> “teachers’ roles are needed in guiding students how to filter useful data,
> extract related information, and proper usage of the information available online” (Key Informant A, personal communication, December 28, 2022).

In addition, teachers’ role to explain the benefits of education to students is imperative. According to key informant B, students need to see benefits in what they are learning. Students are far more active participants in a classroom when they can relate to the subjects or topics of learning.

Hand-on projects and assignments can bridge the gap in knowledge between digital natives and digital immigrants. Key informant B gave an example of an irrigation system design at home as one of the assignments. Students were instructed to apply their knowledge in programming into a design to increase the productivity of their small gardens. Some used sensors to monitor soil humidity, some used sensors to monitor the area temperature, some designed a dripping system, and some used a greenhouse concept in designing their gardens. This project then tied to a real world of smart farming for students to visualize what they had done in comparable to the real-world scenario in a larger scale.

While digital natives are active users of technology, they still need guidance from teachers to properly use search engine, find credible resources for knowledge, filter information, safe-guard their personal information, aware of potential scams, and become responsible citizens of the internet. According to key informant C,

> “digital literacy still needs to be properly taught to students who are digital natives to ensure they understand the benefits of the internet, how to maximize the abundance of data and information available online, and the harms that are surrounding them in an online community” (Key Informant C, personal communication, January 13, 2023).

Teachers who are innovative do not necessarily have to have the knowledge in the topic that their students are interested in. They guide students and learn along with them to enrich education experience. By helping students know where to search for

appropriate resources outside of the textbooks and curriculum will allow students to grow and sharpen their skillsets. Key informant D stated that active learners are fostered through this type of learning process.

3) Break Free from Culture of Conservatism Leading to Active Learning Style

The change of culture will require a cultural unlearning of passive teaching and learning that is engrained in the education system and personnel today. According to Grose (2014, p. 105), unlearning culturally will be extensive with intellectual, emotional, and social support from all stakeholders to transform relearning that can lead to behavioral changes for next-generation educational practices.

Collaborative learning culture starts with the main key educator to generate positive, supportive, and welcoming experience in technology-rich environment. The learning process is essential for all stakeholders and should be recognized and valued to achieve a collaborative learning climate (Grose, 2014, p. 122). The power of positive climate by allowing students to make mistakes and learn from them demonstrates that learners develop cognitive abilities to be confident in acquiring new knowledge and can flourish within the conditions (Grose, 2014, p. 122).

The development of teachers should become a top priority in education. In order to effectively enhance students' development of the 21st century skills, teachers themselves must become proficient in those skills which can pass along the skills required to their respective students (Chu et al., 2017, p.109). According to key informant A,

> "once students learn to apply their knowledge and make connections of the materials taught to real life situations, they will perform better in school and become effective human workforce in the future" (Key Informant A, personal communication, December 28, 2022).

A little incentive can foster active learning environment. Key informant B used a reward system to encourage students to become active learners. The more they participate in an online session, rewards such as awards, certificate, and social media recognition are given out to top performers. Key informant E pointed out that

> “a reward system to students who think different and were not afraid to share their opinions also foster positive learning experience” (Key Informant E, personal communication, January 7, 2023).

Essentially, active learning behavior was encouraged and rewarded. Key informant F also used a reward system to transform students to become active learners. Small rewards such as stationary items can go a long way for students to participate in class and become active participants. Timely submittal of assignments also received reward as a positive reinforcement of responsible behavior.

6.2.2 Students’ Roles

6.2.2.1 Lack of Ability to Analyze Information

Key informant B believed that more time spent with students in need will assist them in their learning.

> “As they feel more comfortable with their instructors, they will become more active and start to participate in a classroom” (Key Informant B, personal communication, January 11, 2023).

By guiding students to think out of the box and allow their creativity to realized, they will see their potential and career opportunities. Key informant E stated that

> “it is an art of teaching to lure students to think and learn to analyze information on their own" (Key Informant E, personal communication, January 7, 2023).

By asking students for help to complete certain tasks or asking them to guide the teacher through certain processes would generate participation in class.

Key informant E emphasized that teaching students to safeguard their information is crucial in the digital age. Youth are more vulnerable to scams and fake news. Therefore, they needed to be taught to extract information, to

distinguish reliable sources from unreliable ones, to detect potential fraud or scams, to be aware of the suspicious activities, to be alert on their online presence, and to protect their sensitive information.

6.2.2.2 Culture of Passive Learning and the Influence from Parents

We keep saying Thai students are passive learners and we should change this culture. In reality, students do not want to learn because they are placed as passive receivers of knowledge through existing traditional school structures and culture making learning experience not attractive to them (Grose, 2014, p. 5). Students' participation cannot be assumed to happen naturally in an online session. Many different ways of engagement comprise of a variety of diverse activities that the teacher creates to help spur and motivate learners' engagement (Simmons, 2021, p. 34). Learners have varied levels of readiness for online teaching and learning. For those who lack the learning styles and skilled required to be active and participate in online classes, they will need extensive help from educators to develop their skills for e-learning. The support from school, faculty, and administrators is crucial for students' readiness (Simmons, 2021, p. 33).

Key informant A stated that students have access to the internet and have means to learn online fully but choose not to attend class.

> "Technology is not impeding them from attending a classroom online but rather their choice of not attending lies with other contributing factors" (Key Informant A, personal communication, December 28, 2022).

Key informant B mentioned that parents, teachers, and the society greatly influence students' behaviors. To unchanged habits are difficult to do than learning new things. Therefore, students can only change if only there is a massive force that can create a change.

Students also should have the opportunity to choose what they want to learn. While mandatory classes are still necessary as they are fundamental to the national curriculum, elective classes should be offered in various forms. Student may want to take an elective class in language with a different teacher from other school online. If the student can take such a course and earn a credit to fulfill their completion, learning experience can be maximized and concept of boundless

education can be a beneficial education experience for all. Key informant P and Q both agreed if they were given an opportunity to take elective classes outside of their school system, they would definitely explore the new potential class offering. Key informant P utilized Khan Academy extensively outside of the class and even volunteered to be the part of Khan Academy Thailand in helping the translation into Thai. Key informant P intended to pursue a career of English teaching, but stressed the free online resources such as Khan Academy was an essential assistive tool in helping in teaching. Key informant P upon graduation intended to use outside resources supplemental to the core curriculum and resources. Key informant Q has a passion to both Mathematics and Language. In Thai curriculum, sciences and mathematics students are focusing on core courses of these materials and often neglect the other subjects of study. Key informant Q's passion to pursue a third language was out of personal motivation and the teacher's support that was beyond the traditional curriculum can offer. The opportunity to explore the knowledge and learning become boundless as both key informants turn to free online resources to fulfill their passion and goals.

6.2.3 Parents' Roles and Family Support

6.2.3.1 Technology Accessibility

Regardless of the groups that students and parents are in (Informant Have, Information Have-Less, or Informant Have-Not), the internet is the fundamental infrastructure for everyone to enter a realm of online education. Key informant A suggested that

> "by making the internet available to all students in all areas will create a network of knowledge that offer an opportunity for anyone to access education for free regardless of their background" (Key Informant A, personal communication, December 28, 2022).

Therefore, a government intervention and adequate funding is crucial in providing the basic infrastructure in facilitating an online education of the new digital era.

At school, internet and computers should be made available for all students and accessible after school hours and weekends. Key informant B stated

that this strategy was beneficial to students who do not own any electronic devices and/or do not have data plan. School library should be a central location accessible to students when they need to be connected for an online learning. Homeroom teachers at key informant B's school also assisted students by lending school's laptops as needed-basis. Since there are numbers of students who share smart phones with their family members making them unable to attend online classes, school library can be a central location that provide helps of access to technology. Key informant C's school also faced similar problem in accessing the internet and electronic devices. Some students can only afford sufficient specification of smart phones to use for online learning. Often with the relatively lower price devices, the batteries did not last long and was heated within an hour of usage. This in turns making students unable to attend online sessions that were consecutively conducted throughout the day. Key informant C mentioned that tablets were more suitable for online learning but most students cannot afford them. Their devices then limit students from effective online learning experience.

For younger students particularly in kindergarten and primary school, students who fell behind during the COVID-19 were required to rotate to physically go to school to meet their teachers to finish their homework and assignments. At key informant E's school, about 5% of the students were unable to attend online sessions. This small group of students were asked to physically be presence at school to ensure they were on track. Key informant F also faced similar challenge that many students fell behind as they were using lower specification of electronic devices making online learning less effective due to internet connectivity and quality of streaming. Students who shared mobile devices between their siblings fell behind even further as they were unable to attend an online class at the moment it was conducted. Some students later watched the recorded sessions and submitted their assignment, while some did not attend the class nor follow up on their assignments. In some cases, students did not live with their parents. When key informant F followed up with their parents, they were unaware of their children's progress and unable to ensure that their children will attend a class. Students who were left under elderly relatives' care tend not to attend online classes. When teachers

called them and tracked down progresses, they were nonresponsive to the calls and did not answer back.

6.2.3.2 Mindset

Parents' involvement in their children education is essential to successful learning experience. Students who are younger in age rely heavily on their parents to study, do homework, and finish an assignment. As a result, younger students particularly primary school have higher attendance rate on an online session than older students. Key informant A stated that due to a lack of parents' involvement in high school students making them showed up less to online session. They have less parental oversight to enforce a learning etiquette when at home.

For young children, key informant E and F found that parents tended to complete homework for their children. Because parents did not have sufficient time to spend with their children to assist them in finishing their assignments, they chose a convenient option that harm their children's education. Consequently, students' reading and writing skills were declining due to lack of support and lack of practice.

Key informant Q stressed that without the support of the family members, key informant Q will not be able to pursue a career of teaching. Key informant Q may perform well in Sciences and Mathematics of which most students will follow the path of medicine or engineering practice, key informant Q chose to pursue the career of teaching in order to make a difference in a society and to create a better nation by teaching students the right mindset to pursue their careers.

6.2.3.3 Culture of Passive Learning and the Influence from Parents

If parents' roles and responsibilities are essential to online learning environments, educators need to build strong relationships and provide substantial supports to all parents at varied extend of assistance they need to make online learning successful (Simmons, 2021, p. 36). Online education requires an extensive parents' involvement than ever before as teachers are unable to be with their children physically. Parents who were prepared coped with the sudden shift to full online learning better and able to support their children through an adoption of online learning. At key informant C's school, most parents were not prepared and sometimes

neglected the new responsibilities that they had to monitor their children's progress. As a result, students were not attending classes online as no one was monitoring, guiding, and control them. Parents' outreach from school staff members is then important to ensure a smooth transition and provide necessary support to the families who are in need. Key informant C and F made a remark that a physical visit to a student's home is required if the teacher deemed a child needs help.

> "A physical visit would allow a full assessment of the child's situation at home and possibly find the root causes of the problem that the child had" (Key Informant F, personal communication, January 22, 2023).

Key informant V admitted that due to work, key informant V did not spend adequate time with the child during the pandemic. The child was behind in several classes and did not submit assignments on time. The homeroom teacher had reached out to key informant V but a lack of free time to respond and being attentive to the child was also a potential factor that impede the child development and learning. Since then, the child was asked to physically attend a school to spend time with the homeroom teacher to catch up on course materials. One-on-one session was made possible to lead the child on track and continue the study. As circumstances varied from each household, education require extensive involvement and perseverance in understanding, analyzing, critical thinking, and problem solving.

According to key informant E, the initial phase of online transition, parents were extensively involved in assisting their children with technical issues and academic reports. After 4 months of full online learning, parents started to phase out their supports which caused students to fall behind in their classes. Key informant E grouped parents into 3 categories. Attentive parents always supported their children in every process of transitioning to online learning and monitored the progresses. Students with this type of parents were performing well in class. The second group was referred as responsible parents as they responded to the teachers when asked to follow up on students' submittals if they did not turn in their assignments. Eventually, teachers were able to receive the submittals even if they were past due. Neglect parents were the people that teachers could not get in touch or unable to communicate effectively. Some parents did not value education and did not see the importance of their students' education. Some parents were willing to drop

their students off at school so that students could learn face-to-face with the teachers. Some parents sent their children to live with their relatives in other provinces since they had to work and unable to take care of their children. Most often their relatives tend to be elderly citizens which made tracking students' progress more difficult.

Passive learning can be passed along through family members. Parents who do not value education will teach their students their way of lives. Resistance to change can be a very rigid culture that students were exposed to. Key informant D mentioned that

> "without parents' consent and willingness to change, teachers can only help students as far as they are seeking out for help" (Key Informant D, personal communication, January 20, 2023).

For most teachers, no child will be left behind, but this requires that parents are involved in their education and support them through changes. Key informant P added that self-motivation plays a key role in self-learning of which active learning style is fostered through family members.

6.3 Digital Teaching and Learning Approaches and Management

Almost all key informant responses among teachers are struggling with a low sense of connectedness among learners, a lack of reciprocal interaction from them, and a low level of participation or nonresponsive behavior. Key informant A stated that low attendance rate for an online session is prominent across all subjects. Students who are top performers are the only students who show up online and participate in class. On the other hand, students who are average performers and below average performers avoid attending online sessions. Some of them appeared online on their social networks but chose not to attend classes. According to the survey collected from the school that key informant A was teaching, more than 90% of all students reported that they are fully equipped with internet access, electronic devices, and electricity essential for online learning. But only 6-8 students out of 40 per class showed up in their online classes.

Collaborations between the educator and students are essential for an online climate. To advance in teaching and learning management, collaborations between the instructor and students are essential to increase interaction, participation, and engagement in online session and improve the overall teaching and learning quality (Ouyang, 2018, p. 1). By creating a fun and positive environment for learning, students will enjoy the class and participate more. Both key informant B and E stressed that fun and positive environment could generate active learning ability in students. Key informant F added that

> "by creating a learning environment that were safe and comfortable for students, honesty and participatory increase among attendees" (Key Informant F, personal communication, January 22, 2023).

The success of online courses lies in extensive training in course design, building instructors confidence in their technological and teaching skills, and tools to online resources. Instructors who excel in those areas will transfer the richness of teaching and learning experience to any types of medium whether they teach face-to-face or online (Stern, 2015, as cited in Childrose, 2019, p. 57). An incentive to teachers to excel in this teaching style cannot be neglected by the schools. The more support and incentives provided to teachers, the more benefits that everyone can earn from a quality, fun, and supportive environment.

Striking a balance between being an instructor and a facilitator is no easy task. At times, educators are advised to become a facilitator who allow learners to contemplate, inquire, formulate, and share ideas. At other times, educators should intervene to enrich the knowledge learning process. It is after all an art of pedagogy that has no right or wrong answer. Often times educators may require to co-learn with their students as technology advances at a rapid pace (Chu et al., 2017, p. 197). A drive in their abilities to adapt under various circumstances will be a role model and good example for students to follow. A culture of top-down instruction and teacher as a sole knowledge source will eventually transform into a student-centered approach of co-learning environment. Key informant Q mentioned that

> "an ability for teachers to be supportive of learning without the knowledge of the subject matter truly creates a student-centered

approach of co-learning environment" (Key Informant Q, personal communication, February 26, 2023).

6.3.1 Design & Teaching Styles

According to Palloff & Pratt (2007, as cited in Ouyang, 2018), the development of an e-learning community most likely goes through three stages. At the initial phase, a group of learners may express some level of interaction and communication. Most learners, on the other hand, tend to observe and decide not to participate in online class. The instructor plays a key role in this stage to trigger participation among students. As learners feel more comfortable with online interaction and communication, they will actively involve in class discussion. As learners evolve from a personal level to a community level, they begin to collaborate with others and commit to a new online community through continuous participation. At this second stage of a community involvement, the instructor changes the role to become a facilitator. The teacher, then provide guidance and support to generate interests in an online session. The last stage is when learners proactively become the key participants in all sessions. The instructor at this stage often acts as a mentor where leaners are allowed to have their freedom to share opinions and start an open-discussion. Learners gain more independence and autonomy through this stage (Ouyang, 2018, pp. 11-12). Learners' interaction and participation is a developmental process of which requires an instructor's facilitation. Therefore, a teacher remains the most important role in creating an engaging online experience. Educators also change their social participatory roles according to the circumstances throughout the courses to ensure an active engagement among students. Key informant Q mentioned that

> "the teachers' support plays an important role to key informant Q's performance at school" (Key Informant Q, personal communication, April 26, 2023).

Key informant Q's teachers are committed to help their students beyond school hours and go beyond the requirements to ensure the students understand materials and earn their expertise.

A new culture of teaching and learning relies heavily on a constant connectivity of the internet of which unlimited data is accessed and utilized digitally

(McKee & Tew, 2013, p. 5). By compiling useful data and information with current and real-world examples, teachers can create their unique online courses (Childrose, 2019, p. 11). According to Childrose's study, an environment for 21st century learning is where all of students feel comfortable to express themselves, ask questions, and are free to take a leap and learn (2019, p. 105).

Key informant A designed activities and assignments that tie to the real-world situation and indirectly taught students a concept of reasoning and logics through a process of programing language. One example that key informant A mentioned was about tasks involved in completing 1000 pieces puzzle. Key informant A asked students to illustrate the process of completing 1000 pieces puzzle through brainstorming and find correlation, repeating patterns, borders, conditions, and predecessors. In turns, these logics were translated into a programming assignment that students were required to complete. Critical thinking and problem solving are essentially key underlying technique that key informant A was introducing and guiding students.

Another example that the key informant A used in a photo editing assignment was asking students to perform a touch up of the picture taken. Students were allowed to use any application to complete their tasks. Key informant A then illustrated that there were many different methods in reaching the same goal and educated students how to use proper applications for their appropriate tasks. Thought process in problem solving, abstraction, and algorithm were integrated into assignments and course design to ensure an effectiveness in the lesson.

Most important of all, getting feedback from students will transform teachers' ability to succeed in their teaching skills so that the session can be adjusted and adapted accordingly. Allowing students to participate in course content and design heighten students' participation. Key informant B conducted a survey in all of classes to seek feedback from students and opportunities for improvement. Rather than being an instructor who only passed along knowledge, key informant B learned to adapt into different roles of facilitator and mentor as required depending on each session. Key informant D also collected feedback anonymously to continue improving the pedagogy in both online and in-person courses. Social media and online survey were used to gain more responses from students.

Key informant D loved to assign open-ended homework which allow the students to apply their knowledge and force them to use outside resources to complete their tasks. Students were often paired or grouped to encourage teamwork and offer an environment of exchanging information. Students can both becoming learners from peers and teachers to peers. As key informant D changed the participatory roles depending on the situations allowed key informant D to keep the class online and in-person attractive. Students then would prefer to consult with key informant D of potential career path and opportunities or even for asking advice and guidance on unrelated academic and non-academic topics. Building a trust and relationship with students to feel comfortable with the teacher is a proven to be a successful environment of learning experience.

6.3.2 Course Content

Key informant A used IPST resources extensively as main tools in teaching. Key informant A claimed that IPST resources are useful in assisting teachers in their teaching. Through IPST resources teachers have a community that they can reach out to each other and exchange in ideas and teaching styles. These resources create an online community that foster learning environment among teachers who may struggle with online teaching. IPST resources has proven the success among key informant A's students to pass ONET exams with relatively higher than average score when comparing to students of the same school who did not utilize IPST resources for exam preparation. The process of approval from all sectors of ministry of education has been notorious as a lengthy process. This often led to a curriculum change that was less flexible and often fell behind the current technological advancement.

While OBEC content center tries to consolidate all the resources in one repository, a link to other resources is not yet available. Resources that may be in foreign languages are also not yet included on the website. Key informant C was proposing a central repository that may not necessarily contain all the resources but should hold adequate number of resources and a pathway to other beneficial and relevant resources for both educators and learners.

Entertainment such as movies, TV shows, and drama series can be used as mediums of learning particularly in language, culture, and specific topics of learning. Key informant D utilized these outside resources to integrate into the course and assignments to make them more attractive to learners. One such example was on probability in mathematics. Instead of using typical example to demonstrate a scenario to evaluate the probability of the outcome, key informant D used cards as a demonstration. What were the chances of winning card games? If one was to bet on the game on winning, what was likely the chance of winning? By losing that much of money, what else can the student spend to buy something? By relating probability to a real-world scenario can directly teach them to critical think about decision making and indirectly teach them to understand the concept of probability in mathematics. Key informant W preferred to have real world scenarios taught at school then simply from textbooks. Key informant W's children are taught at home to apply their knowledge from school to the household. Then they are encouraged further to explore online to widen their knowledge and grow further from the attained knowledge or skills that they have learned from school.

6.4 Obstacles to the Digital Transformation

6.4.1 Evaluation Process

Current evaluation process dictated by Ministry of Education often focus on quantitative evaluation such as PISA and ONET. Most key informants agreed that while quantitative evaluation is necessary but the evaluation practice and mindset are in need of change. There is mismatch of evaluation processes that are not applicable to ever changing of teaching and learning environment particularly in the digital era where integration of subjects and real-world situations must be applied to the learning. It is imperative that to evaluate course content, classroom management, level of student's engagement, dynamics of the learning environment, and practicality of assignments to actually reflective the teaching and learning process. Key informant A mentioned that

> “a change in an evaluation process is absolutely necessary to transform Thai education” (Key Informant A, personal communication, December 28, 2022).

Open-ended tests and examinations generate a process of critical thinking, creative thinking, and idea exploration. Memorization through multiple choices exams should be an obsolete method of determining how well each student performs. Ultimately, teachers will have to change the way they teach as active learning style so that students can perform well in open-ended type of evaluation process. Key informant D used tests and exams that are opened-ended to offer students to exercise their creativity and at the same time prevent any potential academic dishonesty. Having 38 students in a class would simply mean having 38 unique exams given to students. While this approach took more time from the teacher to create and design such test or exam, it proved that students can learn to break free from memorization and be able to think outside the box. Teachers then can properly evaluate the students’ knowledge retention and understanding as well as their ability to apply their knowledge.

Toxic environment should be avoided at all cost per key informant D’s recommendation. As a society defines the custom and culture in a community, it also become a limitation to child development. For Thai society, non-conformity is not welcomed and bound to a punishment, harassment, and a subject of bullying. Thinking outside the box can be difficult to achieve. Thinking different can be challenged and deterred and so students nevertheless are bound to a controlled environment to conform. As key informant D explained

> “a change in a curriculum was a change of education in a positive direction, but a change dictated by the ministry of education is often a change into another conformity. Therefore, learners cannot break free from a cycle of conformity” (Key Informant D, personal communication, January 20, 2023).

Key informant R and S stated that they did not take their children to cram schools or tutoring school as they feel they are not necessary.

> “The child development is better spent through other resources where they can learn from self-learning through technology” (Key Informant R, personal communication, February 16, 2023).

Both key informant R and S embrace digital learning and self-learning which in turns creates active learning behaviors in the family making their children feel comfortable with technology and learning in the new style of the digital age.

Key informant E used a very creative way to evaluate young students’ reading and writing skills. To evaluate a writing skill, students must turn in handwritten homework by taking pictures or scanned the handwritten homework as a submittal. The handwriting showed that respective students wrote the homework themselves. Reading skill was evaluated through a recorded video submittal. A sound recording was an acceptable format but a video recording was preferred. Key informant E utilized this technique to increase parents’ involvement in students’ assignments. One such example was when the assignment was involving Mother’s Day of which the students were assigned to write a poem to their mothers. The submittals consist of 2 parts; one with the hand written poem through digital format submittal, and another with a video recording that the students have read the poem to their mothers. Then the parents are involved in grading their own children and provided feedback to their skillsets. This such involvement generates co-learning for all. As a parent, key informant T mentioned that

> “having assignments where co-learning exists for parents, teachers, and students help them cope with the social distancing measures and assist their abilities to assist students with their education” (Key Informant T, personal communication, January 26, 2023).

Assessments should not be valued only as success or failure. Key informant U mentioned that each child has different ways of learning. Having 2 children, key informant U must apply different parental role in assisting them. The older child who is currently in high school required less assistance with school. Key informant U’s role has become of a mentor and provide insights of the potential career path. The younger child who is in middle school is in need of progress tracking and supervisory role to ensure the online attendance is realized. If classes are of the

child's interest, less supervisory role is needed. Therefore, parents' involvements and assessments from parents also help teachers in fostering digital education.

> "A make it happen attitude is critical to advance education into a digital era" (Key Informant U, personal communication, February 20, 2023).

Assessments should be viewed as opportunities for improvement and advancement as well as sustainable growth of an online education.

6.4.1 Lack of Incentives for Teaching Career

In Thai culture, teachers are valued as a good profession and a good career path but with low monetary compensation and benefits. Teaching at public schools takes more than passion in teaching to overcome barriers in transformative education. Younger teachers who are digital natives in their nature tend to struggle with traditional approach of teaching and learning. They know what was like to be students who were treated as passive learners and wanted to make differences in truly transforming education. Key informant D mentioned that

> "to ask for any change at school is nearly impossible as not only the principal is making the process harder to make changes, other teachers who feel that new changes will bring more work or responsibilities will do anything they can to impede such transformation" (Key Informant D, personal communication, January 20, 2023).

When attempting to voice their opinions with the intention to make the differences failed after repeating requests, most teachers will give up trying and eventually may end up not trying at all.

Key informant F went above and beyond in providing students' incentives in learning with out-of-pocket expenses. Schools should be allocating financial resources for miscellaneous spending that can assist students with learning. Key informant B was able to use the connection with the university to sponsor science projects for STEM students to be able to learn and demonstrate their ability first hand.

Because the school has limited financial resources, key informant B has to choose other options in providing assistance the students need for growth and development. But not all teachers have this kind of resources to provide greater learning experience for students. Key informant B stated that

> "the school has been a great support in allowing teachers similar to key informant B utilizing school resources such as space and classroom to have students spending more time on learning materials after hours and weekends. The accommodation beyond regular school hours is very important for students to spend good quality time with what they need to catch up or expand their knowledge beyond the classroom session" (Key Informant B, personal communication, November 11, 2022).

From several key informants' feedback on incentives, the study found that inadequate accommodation and resources are available for teachers. When facing with this challenge, teachers who have connection or who to ask for those resources can leverage their connections to get sponsorship for projects. However, not all teachers will have this opportunity and support leaving many educators being unable to receive support and resources to advance better education experience.

With low salary and benefit, teaching career may not be the first career choice for many students with high performance. For those who choose to pursue teaching career path, some may become professors teaching undergraduate and graduate levels instead of kindergarten to high school. Regardless of the level of education that educators decide to pursue and choose as their career, the study has discovered the leading models that could set an example for transformative education in Thailand.

6.5 Leading Models for Transformative Education

The study is aiming to search for the potential leading models of digital era teachers who may not necessarily have to be digital natives. The study found a marvelous digital immigrant teacher who embraces self-learning, self-teaching,

lifelong learning, co-learning, technology, and digital education. This teacher is at nearly a retirement age. The teacher initially did not have a teaching credential but graduated with computer science degree. Upon relocation to hometown, the teacher decided to pursue a career in teaching and eventually earned a teaching credential. The teacher then ended up teaching high school levels in subjects of programming, technology, and computer. At the time of technological adoption, the teacher admitted that

> "learning new technology is not a hard task to undertake but rather changing mindset of people to accept such change is a real hard task" (Key Informant B, personal communication, November 11, 2022).

To keep up with the technological change and advancement, this teacher spent great deal of efforts in searching for resources online to continue lifelong learning. Most of time is through the process of self-teaching and self-learning through abundance of online resources that are available and readily searchable. With the personality of being open-mindedness, the teacher is willing take new challenges through a process of co-learning that the teacher will learn along with the students. Often times, this teacher will have opportunities to learn new programming languages through co-learning by working with students on new projects of their choices. Not knowing Python programming language, but able to assist students with designing and programing controllers require a different level of dedication, commitment, and perseverance. Therefore, this teacher is the exemplary teaching that is the model for digital immigrant educators. With great personality and active learning habit, this teacher is one the crucial people that made the next digital leading model teacher successful.

The teacher that the study found to be the most astonishing digital native teacher is a former student of the digital immigrant leading model teacher. This teacher was a former STEM high school student who had the intent to pursue a career in engineering. With the passion in mathematics but not so much in physics, made this teacher changed the career path to pursue mathematics entirely. This teacher saw the good role model of teaching career and that made this teacher made a decision to give back to the school that provided tremendous support in high school. Upon returning as a teacher, the teacher felt fulfilling that the school is able to embrace the diversity in

thinking at a certain level and allow the teacher to initiate new curriculum and teaching style. In creating a participatory session of teaching and learning, the teacher utilizes great deal of resources including IPST, Khan Academy, YouTube, Facebook and other mathematics materials in creating an engaging learning experience. To properly evaluate students, this teacher designs an examination with an open-ended format with no multiple choices. Each respective student will receive an examination that is unique and there are no repetitions of examinations. Not only the teacher can eliminate academic dishonestly, the teacher can evaluate how well the student learn from the class and how well they can apply their knowledge to other applications or scenarios. Students are well aware of the unique sets of examinations and have no problems with such format. Knowing their evaluation process may also trigger students to engage in classrooms and actually learn the study material attentively.

In creating a useful and informative homework and assignment, this teacher also implemented an integrated assignment with collaboration from other teachers in other departments such as English, Thai, Other Language, Sciences, Social Study, and Sports where the big assignment is assigned to students with multi-disciplinary aspects to complete the assignment. Then, each respective teacher will evaluate their part of the assignment. Not only the assignment is designed to give students an overview picture of how each subject is interconnected, critical thinking is integrated in the assignment to allow students to grow and self-develop the interconnection and application of knowledge into real world scenarios. Teaching mathematics does not have to a boring session of chalkboard, whiteboard, or online virtual blackboard, it can be fun through gaming. The teacher also uses gaming in teaching session in teaching probability, statistics, data collection, and evaluation. By using gaming or card games to illustrate mathematics concept, student can relate to what they already know to the academic concepts and theories that the teacher is attempting to explain. Therefore, to become a transformative digital teacher takes creativity, knowledge, technological skills, dedication, commitment, perseverance, and passion. Although the qualities mentioned maybe innate in the person who regardless of the circumstances will perform great in times of struggles and obstacles, the external environments play key roles in supporting the success of the learners themselves. The teacher admitted that

> “without the parents’ support to allow myself to grow my own way and the guidance from the teacher to allow myself to self-develop, I would not have come this far” (Key Informant D, personal communication, January 20, 2023).

The study also discovered an outstanding leading model for digital native student that very well painted a potential of Thailand education future. This student is a top performing student at high school level who chooses to pursue a career in teaching language particularly English. This is the student who studied English from a public school without attending a private or international school throughout the primary and secondary school levels of education. The student learned the basics from school and decided to follow the passion in learning English through a self-taught process. The Internet brought the student the opportunity to learn beyond the classroom. Upon many discoveries of educational resources in Thailand and International locations online, the student was impressed with Khan Academy resources the most. The student found Khan Academy resources useful applicable to the students’ need and want to be a part of Khan Academy team. The student then volunteered as a translator from English to Thai as the Khan Academy Thailand team is working on translating digital contents into Thai for ease of learning for Thai students. With the barrier of language, the student felt that translating the useful resources into Thai can make the contents available and accessible by Thai learners who are not proficient in English. This student demonstrated a connectivism education theory very well as the student learned through the diversity of opinions and is willing to learn beyond the curriculum. As Siemens mentioned that the ability to learn what is needed for tomorrow is more essential than what is needed for today (Siemens, 2008), is highly reflective in this student’s character.

6.6 Conclusion

Efforts in creating a fostering environment include active opened discussions, build cohesive classroom community, give challenging assignments that are related to their daily lives, attractive course contents, allow mistakes and embrace them,

supportive learning climate, routine communication, provoke critical thinking and problem solving, promote self-learning and lifelong learning.

The results of this study demonstrated that to implement effective strategies in online courses, schools must have meaningful assessment of teachers and students that can be reflective to faculty training to enhance communication and collaboration. Essentially, all faculty will receive empowerment to actively implement strategies for online teaching to improve both instructors' and learners' experience. In turns, all stakeholders benefit through collaboration and proper feedback for implementation improvement. All started with a right mindset and an affirmative stand to change. Successful transformation occurs when people involved are in alignment in their mindset to change and eager to transition into a world of digital teaching and learning.

Successful education comprises of a teamwork and a support system. Everyone plays an important role in generating an active and positive learning experience. School policies, school administrators, staffs, teachers, students, and parents are stakeholders that contribute to the transformation of education into a digital age. No child shall not be left behind. Technology is a tool that shall be maximized to offer more opportunities for learning and attain education.

Educators particularly teachers' roles are not diminishing as digital education is emerged. On the contrary, learners need more guidance than ever before to stay vigilant, active, and competitive in the new learning environment. The endless efforts and time spent observed from the key informants' interviews illustrated that teaching is beyond a passion of teaching. Teachers are the creators of the future generations of which they lay a foundation of the skillsets and knowledge for the digital citizens of the future. Their dedication and vision are contributing to the transformation of education in Thailand and the implementation that takes everyone along the journey to the new era of continuing teaching and learning.

Chapter 7

Analytics, Conclusion, Discussions, and Recommendations

Thailand education transformation into the new digital age is the research study aiming to study current government policies on online education in Thailand, to study leading models of free open-sources for online education in Thailand and abroad, and to explore Thailand transformative online education for the new digital age. The research study is examining the current government policies on online education in Thailand and searching for ways to utilize free open sources into digital transformative education.

This chapter summarizes the analytics, conclusion, discussions, and recommendations for the study. According to World Economic Forum and UNESCO (as cited in Grose, 2014, p. 1), "education is recognized as one of the critical of social and economic change." Continuous improving education policies and implementation should be a priority for every nation. Therefore, the question that should be asking is how can we shape education systems to become more responsive and reflective of the new digital realities? The COVID-19 pandemic granted us the opportunity to explore new methods of digital teaching and learning of which introduced everyone into the digital realm of online education. While many digital natives, young learners, and tech savvy digital immigrants thrive in the online teaching and learning format, the majority of Thai population are still behind in adopting online technology of teaching and learning. Discussions of analytics, conclusion, discussions, and recommendations are in the following sequential order:

7.1 Conceptual Framework Summary

7.2 Current Government Policies in Thailand for Education

7.3 Leading Open-sources for Online Education

7.4 Theories Discussion Related to the Study

7.5 Becoming Digital Educators for the New Digital Age

7.6 Conclusion

7.7 Recommendations.

7.1 Conceptual Framework Summary

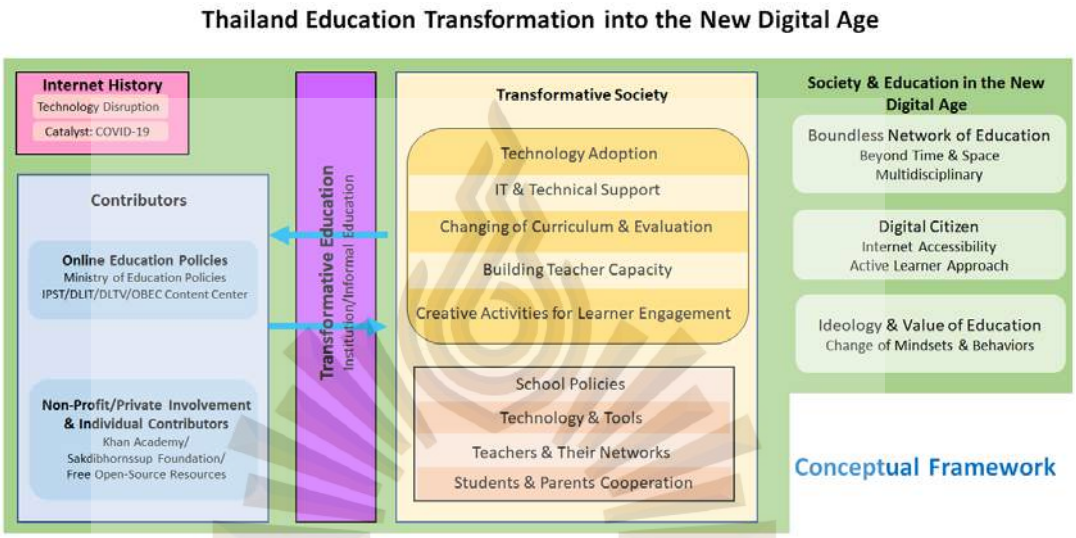

Figure 7.1 Conceptual Framework

Source: Lipipun, 2023

The conceptual framework illustrates a summary of the research study on Thailand education transformation into the new digital age. From the push-pull model, the push from public sector from the policy level to Ministry of Education plan and execution bring forth a transformation of education into digital format. The online resources are made available through 4 main entities (IPST, DLIT, DLTV, and OBEC Content Center). The implementation is then directed further down to schools and teachers where the new set of curriculums are enforced and introduced to students. On the other hand, the pull from non-profit organizations and individual contributors are contributing to the change of education in a digital format of free open-sources that are made available for everyone. A transformation of education requires all key stakeholders to be agents of change and active participants of changing. The traditional education system was designed prior to the internet era. Therefore, an embedded foundation of Thai education must be examined to evaluate

the mindset and behavior change so that it can facilitate a change into digital education. Through transformative education, digital citizens will embrace a new mindset and ideology of free education that is beyond the former rigid structure. The active learning behavior that is integrated with technology adoption will allow personalized learning that can be effective lifelong learning. The boundless and endless connectivity of the internet and wireless communication shape a new kind of digital education that educators and learners alike are required to sharpen their technological skills constantly as technology evolve rapidly.

7.2 Current Government Policies in Thailand for Education

7.2.1 Laggard Crisis Delaying Thai Transformative Education

7.2.1.1 Technological Adoption Is Mandatory Not an Option

It is hard to imagine living without an electronic device such as smartphone in this new digital era. Upon waking up in the morning, one of the first thing many Thai citizens would do is checking their smartphones. As technology permeates into our lives in almost every aspect of living conditions, we cannot deny that technology has become an essential element of life and a necessary basic need that everyone must have to become digital citizens. According to Mongkhonvanit & Dipendra (2021), 99% of schools in Thailand have access to electricity, computer, and the internet. Small in number but around 300 schools in Thailand still have no access to the internet as mentioned by key informant G. Examining this number the technology deployment by the government has been executed efficiently to reach all students. Only 75% of households have connected to the internet of which the connection is mainly through a mobile device (Mongkhonvanit & Dipendra, 2021). Bridging the digital divide between school and home must be addressed to ensure that students have access to good quality of online learning regardless of their circumstances. Schools should be the places of accommodation that allow after hours and weekends for students in need to fulfill the gap and provide learning opportunity in a new digital way of learning. With 99% statistics, Thai students should fall into

information have or have-less societies, and the 1% of information have-not group should be diminishing by the next decade.

7.2.1.2 Human Resources Deficiency

Darling-Hammond (2010, as cited in Grose, 2014, p. 4) affirmed that the skills required for the 21st century global market cannot be learned from traditional educational systems which have been established before the industrial revolution. Dede and Prensky (2010, as cited in Grose, 2014, p. 4) added that the digitalized world that young generations are growing up in today is far different from the world in which their digital immigrants' counterpart were raised. Jukes (2006, as cited in Grose, 2014, p. 4) explained that students in the digital age do not have short attention spans because of education. "They just have short attention spans for old ways of learning" (Jukes, 2006, p.26). While Thai government has been the main actor in directing the future of Thai education through 2018-2037 Thailand National Strategy 20-Year Plan, 2021 National Reformation Plan, 2023-2027 National Economic and Social Development Plan, 2017-2036 Thailand National Education Plan, and 2020-2022 Thailand Education Strategy Plan, the entities responsible for online teaching and learning platforms are not integrated and operated under their respective division direction. Therefore, the execution and implementation of DLTV, DLIT, OBEC Content Center, and IPST are only used by those who are aware of their existence. Since the utilizations are only among those who were trained to use the resources, not all resources are searchable through keywords on search engine. With language limitation among teachers, the ability to utilize foreign open-source of information is even more impossible. Only young teachers who are proficient in English can navigate through the digital world in searching for supplemental resources for teaching and learning. As a result, new ways of teaching and learning was never properly trained among teachers and students to transform education into a digital era. The implementation ineffectiveness can be mitigated through collaboration and integration of all system and resources in a centralized location where it can be a one stop library that links to many resources for education. In addition, extensive trainings that are already available may be limited to the budget allocation of which the government may need to evaluate and provide additional funding in increasing

numbers of training sessions and supports. Even the technology availability in Thailand of 99% in school, the lack of the proper trainings and investment in human resources, a transformative education can never be realized in Thailand.

7.2.1.3 Where Are We on Competitive Competency?

The National Economic and Social Development Plan clearly stated the crisis of education that Thai students' PISA score significantly declined in ranking from 50 in 2012 to 66 in 2018 (Office of the National Economic and Social Development Council, 2018b, p. 15). World Economic forum ranked Thailand 61 out of 140 countries in global competitiveness index in graduates' comprehensive skills including digital skills in the fiscal year of 2018-2019. Only a fiscal year of 2019-2020 after, Thai graduates ranked 79 in overall skillsets and 66 in digital skills (Office of the National Economic and Social Development Council, 2018b, p. 16). The study by United Nations Thailand confirmed further that 54% of 16-19 years of age do not have computing skills (Mongkhonvanit & Dipendra, 2021). This simply translated into technological adoption and skills are not properly taught at school. This laggard crisis is prominent with the government's acknowledgement of the problem. This raises a concern to truly make amendments to the implementation of policies in building an appropriate trainings and execution teams. Investment in human resources in education for both knowledge providers and recipients are the investment of the nation in transformative education that bring every Thai citizen into the new era of digital education.

7.3 Leading Open-sources for Online Education

The push-pull model is best described the transition of Thai education into the digital era. The push factors are mainly driven by the government to direct changes in the curriculum, methods of teaching and learning, and adoption of technology. Ministry of education and all the responsible entities launched multiples platforms, programs, and trainings on DLTV, DLIT, OBEC Content Center, IPST, and etc. to initiate a digital education through online resources and distancing learning. The transition then is implemented at schools and students. While this strategy has been

crucial in making a transformation in education, many adopters among teachers and students may feel the pressure of coercion into the adoption rather viewing the benefits of the adoption outcome. As a result, the usage of the internet for learning activities is significantly low with only 20% of the school aged internet users pursue online courses. 11%, 19%, 20% of student age 6-9 years, 10-14 years, 15-19 years are spending their time on acquire new knowledge through online courses. The remaining 80% spend time on social media (Mongkhonvanit & Dipendra, 2021). While the push factor has made 100% adoption among students possible due to the COVID-19 pandemic and social distancing measures, digital teaching and learning became an acceptable means of learning because there is no other option.

The key success cannot rely on the push factors but rather a collaboration from the other driving forces. The pull factors are driven by the individuals and/or society to make digital education possible in the new era of the internet galaxy. Non-profit organizations such as Khan Academy and Sakdibhornssup are the leading models of digital era of education that is far beyond the current rigid structure and curriculum of education. Personalized education that is student-centered approach with self-pacing learning allows far more comprehensive understanding of study materials, optimize the growth in knowledge and learning ability, and develop self-teaching habit which in turns creates a sustainable lifelong learning ability and skill. When education is stretched beyond its rigid and traditional structure, endless possibilities of knowledge learning is possible through the digital realm of reality. The education and knowledge hold the value even without accredited credentials or institutionalized certification. Individual contributor such as chef Bo then can be the knowledge provider through digital content in the form of digital medium for knowledge. Once the users of the internet learn to develop and share their knowledge or contents via an online platform, the passive user then has been converted into active users of the internet. The collaboration between Khan Academy and school districts is the prime example that allow the push factors meet the pull factors and create a greater benefit to the digital transformation of education. Collaborations among government entities such as all responsible entities under Ministry of Education or partnership with Ministry of Digital Economy and Society can strengthen the push factors in developing better platforms for online teaching and learning. At the same time, working with other

private or non-profit sectors that have proven more breaking ground concept of education and learning should be encouraged and supportive. The unlearning of the culture of self-focus to be the society-focus should be put as the priority of the program and all the curriculums. Then, the learning of the new approach of digital teaching and learning will be relatively easier to adopt.

7.4 Theories Discussion Related to the Study

Although Castells has an extensive career in academic, he has no work related to digital education. It is a researcher's intent to connect Castells' theory to the realm of education to further his concept into education that is transformative in the digital era. Under Castells' realm of digital age, the world has been transformed fully into the modernized and developed nation, while Thailand is still at its intermediary stage of developing nation that many of impeding factors are prominent. We all can agree with Castells (2001, p.1) that the internet has become the fundamental pillar for the technological society in the digital era. Under the new internet galaxy paradigm, the internet is the basis of our new environment (Castells, 2001, p. 275). Evidently, digital education requires the internet as the backbone of the network which connects everyone in the virtual space for teaching and learning. While the new value creation and value acceptance has been created through online education, the new social practice according to Castells (2001, p. 66) has not fully realized in Thai education. The impeding factor that disagrees to the theory lies with the passive learning culture that is hard to break free from the social value of learning through memorization and the mindset of seniority and conformity making new social practice in Thailand after adopting technology different from Castells' digital world. According to Qiu, similar to the Chinese society, Thai population remain at large in the information have-less group. While the access to the internet is possible, they are not entirely active users with full capacity of which Thai online education must adapt to the situations and circumstances of information have-less learners.

Siemens (2008) emphasized that new ways of learning through connectivism theory is simply the willingness to learn more as learning never stops. Life-long

learning is unavoidable and necessary to thrive in the digital world. Therefore, traditional approach of passive teaching and learning is no longer appliable to the current education of the 21st century. Student-centered learning approach is essential to create a self-motivated learning environment to nurture curiosity, embrace newness, encourage exploration, instill confidence, empower learning from doing and through making mistakes (Khan, 2012), and so the transformative education can then be developed properly for Thai education. However, the mindset and social value of education in Thailand restricted such transformation. While there are attempts from the government to push for changes, a few key informants still feel that the change is merely a shift from one conformity of curriculum to another without a real change in education. The study is aiming to provide a guideline for any future research to examine further into the culture of conformity and culture of passive learning that impede Thai transformative education into the new digital era.

7.5 Becoming Digital Educators for the New Digital Age

7.5.1 Where Do We Stand on Digital Education?

All key informants categorized Thai learners regardless of their age into 3 categories. The active learner is the first and forefront group that will thrive in any kinds of learning environment. They are eager to learn new things and willing to challenge themselves. Even they may not be tech savvy, they are not afraid to seek help and have a high tendency to self-learning. This group of people are not limited to digital natives. Digital immigrants who are active learners can self-taught in learning and adopt technology faster than the digital natives' counterpart. The second group is the mass population of adopters. If they are not coerced into adopting new things, they will rather stay with the former ways of education. They are not entirely resistant to change but they are not willing to change unless the situations are pressuring for a change. This group of people adopt technology in education during the COVID-19 where no other options are not available to them. Once they feel more comfortable with the new environment, they start to adopt new teaching and learning styles given the proper guidance. However, some of this group may return to the traditional

approach post COVID-19. For those who feel more comfortable with online learning will have no problem to continue and further digital skillsets. The last group is no doubt the laggard who refuse to adopt the new era of digital learning. There are multiple reasons to the resistance of which one could be the lack of access to electricity, the internet, and mobile devices, while others view education as less priority to their lives. Regardless of their reasons, these people still exist and are in need from schools to explain the significance of education in addressing that the online world will grant an opportunity to limitless of knowledge acquisition. All key informants confirmed that Thai digital education is necessary and all key stakeholders recognized the importance of such transformation. They all agreed that we will eventually become the digital citizen of teaching and learning. However, the rate of such transition may be slow in Thailand largely due to inequality of opportunities within the social structure of family background and schools' support. The digital divide that rooted in socio-economic background become the barrier to digital education transformation.

7.5.2 Passive Teaching and Learning Curriculum

Affirming Juke's statement that students are not attentive of education because of the old method of teaching and learning (2006, p.26), if we cannot change the way we teach and learn nothing will be transformative even through an adoption of technology. Unachievable curriculum change is mainly due to changing one passive way of teaching to another means of passive teaching. Therefore, without the right mindset for the digital era of education, active learning can never be introduced and succeed in the learning environment. Competency-based curriculum is the new curriculum change that is currently a piloting phase and soon to be implemented through the directives from the Ministry of Education. Conceptual plan of competency-based is promising in writing but yet still incompatible with the readiness of human resources in Thailand. A variety of concepts including active learning, learning by doing, integrated learning, and personalized learning must be implemented under competency-based curriculum (Reigeluth & Karnopp, 2020). Different teaching and learnings styles must be adaptable and flexible at various learning paces even on the same student (Levine & Patrick, 2019). The mindset of

transformative education requires extensive collaboration among teachers to work together as a whole for the greater benefits to the students. An integrated curriculum is proposed by several key informants as they have implemented the open-ended examinations that are unique sets per each student. This translated into 23 examinations for 23 students. By doing so, key informants can explore creativity and critical thinking in students. In addition, integrated project assignment that allow students to work on one assignment by integrating multiple courses together. The respective teachers for such integrated assignment provide their grades according to their pertaining subjects. This has been achievable among several of the key informants but still not implemented by most schools at large. According to Thummaphan, Sripa, & Prakobthong (2022, p. 200), administrators, teachers, and stakeholders are not comfortable with the competency-based curriculum concept and lack skills in assessment practices that is appliable to active learning. Therefore, to break free from passive ways of teaching and learning, extensive trainings and changing of mindset of all stakeholders are very crucial in making a transformative education possible.

7.5.3 Loss of Social Value of Being Teachers

Teaching career is considered not the top attractive careers among Thai population due to the pay that is relatively lower than other career opportunity. The reward of being a good teacher is not promoted or even recognized by the school and the community. Key informants among the training staffs for teachers agreed that the majority of teachers lack passion in teaching or had lost their passion in teaching due to the requirements and responsibilities they must undertake in addition to the teaching responsibility. Many teachers will fulfill their minimum requirements of the trainings and such they then become less of devoted teachers to offer greater opportunity to themselves and their students. When teaching at a public school become inferior to private school counterpart, occupation recognition also being undervalued. With limited resources in funding, technology access, school support, and the students' family support, the obstacles of becoming transformative teachers of the digital era are more discouraging. Having the passion to teaching is innate for those teachers who are above and beyond in their career and devotion to build the

future generations of the new digital workforce. From the study, teachers with success in their career and most loved by their students receive tremendous supports from students' parents, schools, public entities, and their network. As a result, they have more freedom to make changes to the curriculum and evaluations.

External environments of supportive culture and technology availability that connect to information foster self-teaching and self-learning teachers in the digital age. The dilemma of Thai human resources lies within the cultural norm of passive teaching and learning style that is engrained in the educational system since it was established. Learning through memorization has been embedded in Thai education. To produce new waves of digital age teachers, require an unlearning process of learning through memorization before self-learning can be introduced as a new approach of learning. Then self-learning can be further to self-teaching to fully transform digital age teachers.

7.5.4 Breaking the Habit in Digital Teaching and Learning

Breaking passive learning cycle is no easy task. Passive learning culture is intertwined with seniority culture in Thailand. The social value of conformity at school and work fosters passive learning style. Even with the intention of transformative education into active learning style, the social value of conformity impedes such transition. Teachers that inhabit passive learning style are inevitable passing along this trait to their students. How can we break free? Younger generations of teachers and students are ready to break the norm and the cycle of passive learning. It requires the acceptance and open-mindedness of older generations of teachers and teaching staffs to unlearn their passive learning culture. Tremendous trainings have been put forth for technological adoption and usage, unfortunately the human factor of unlearning passive culture has not yet been examined. This is a further recommendation for future research to examine psychological component of unlearning process to break free from the passive learning culture that is very much engrained in Thai culture.

7.5.5 Evaluation Inefficiency

Evaluation process is only useful when the feedback is properly evaluated and comments are being implemented to make adjustments to the policy, curriculum, and process. Sadly, feedback loop among Ministry of Education and the schools stops at the feedbacks step. The comments themselves do not travel further along to make any adjustments of any kind. Changes that are driven by the policy only made possible through the top-down approach. Feedback process is only for statistical display with no deep meaning and usage to make a real transformative agenda. Conformity mindset in Thai culture added to the complexity of the evaluation process. Providing feedbacks are encouraged but yet not open-minded culture is introduced within the process. The feedback that may be negative but productive then are not treated as constructive comments for improvement but being viewed as threats. With such mindset rooted in Thai culture, an evaluation is meaningful is considered useless. Therefore, it is no surprise to see current Thai education unreflective of the plan to transform into digital education. The declining in students' competency in education is a result of digital age mindset crash. Confirming Juke's stand on students in the digital age have short attention spans because they lack interest of old ways of learning (2006, p.26). The competency curriculum that soon to be introduced in every school district should introduce integrated evaluation process. With this change comes with the training to unlearn the old methods of evaluation process and the conformity mindset. Transformative education can never be realized without unlearning the habit that we attempt to change before introducing the new one. This aspect of unlearning is crucial in transitioning Thai education beyond the COVID-19.

7.6 Conclusion

All stakeholders are well aware of the digital education and the necessary requirements to make the transition possible. The impeding factor is subtle in the culture that everyone has the intention to make changes but probably not knowing how to make the changes sustainable and adaptable under the circumstances. When facing with barriers and obstacles, the unsupportive environment from seniority

culture can make changes even harder. Unlearning the ingrained culture of passive learning is also a major barrier to all key informants. It is not easy to unlearn things that already have become our habits. Unlearning the habit is probably harder to walk out of the comfort zone and try new things. As such Thai education is facing a dilemma of unlearning old habits and learning new ways of things. Adoption of technology can be easily introduced but is difficult to sustain if the adopters feel more comfortable with the learning environments prior to the online education. While many young learners feel more comfortable with technology and online interactions, they can get easily bored from traditional method of teaching and learning that is being translated into digital platform. The change in teaching styles in an online format requires extensive trainings to the teachers and personnel in creating an interactive learning environment.

In alignment with the government's policies, Thai citizens are well aware of the change but may not be ready for the change. Therefore, comprehensive understanding of what it takes to make transformative education change is necessary to move the large population into the digital realm of education. The implementation of education change requires a leading model and a model teacher to guide the way for many. As the study has discovered tremendous efforts being invested in role models among teachers and students, not all schools have the support systems as those who thrive in the digital world.

To drive a sustainable transformational change in education, all stakeholders must partake in their roles whether the individuals, communities, entities, and organizations stand on the push or pull sector of the education change. Siemens (2008) described the new connectivism education theory as the integrated whole which are comprised of all key stakeholders and technology. To stay current in the a very rapid evolving information ecology, the collaboration that prioritize the benefits of education to younger generations must be taken very seriously. As key informant from the government entity was proudly presented that DLIT and OBEC Content Center have great collaboration with their alliances but unable to collaborate with Ministry of Digital Economy and Society thus far. This could potentially be an opportunity for the Office of the Basic Education Commission to further develop online teaching and learning tools, applications, and experiences through

collaboration of two government entities. Essentially, education build the nation through human resources that starts from the basic education where young learners will soon become the main workforces of the nation in the future. Then, the alliance can grow in to the work with non-profit organizations and individual contributors to offer greater opportunities for all.

Ongoing supports for teachers also require the attention from ministry of education and the schools to offer opportunities for growth and transformation into the digital age of education. There are no set guidelines of what is the right model for education in the new digital age. The study has found that each circumstance vary in its intrinsic and extrinsic elements of which technology usage should be integrated at a different level of readiness. At the same time, whether the class is conducted onsite, online, or a hybrid of the two, we cannot avoid using technology in education in the forms of assignment submittals, communication, grading, evaluation, and consultation. Even a student may be an expert in one subject matter, the same principle of learning does not pertain consistently with the other coursework. Therefore, an ability to adapt under different circumstance, flexibility, and open-mindedness will build an active learning environment for all. The learning process itself does not emphasize only on students who are obtaining knowledge, adults including parents are all learners in various forms as a part of the integrated knowledge of education. The unceasing advancement of knowledge is a life long journey that digital education as we stand today may differ a month from now. The COVID-19 pandemic has illustrated such transformation of knowledge and the transition of education that we could never imagine prior to 2019. Taken this opportunity of social distancing measure as a reminder for us in time of transition, we all can agree that digital education is our new reality, social practice, and the future of the teaching and learning approach.

7.7 Recommendations

7.7.1 Recommendations from the Research Study

7.7.1.1 Recommendations to Educators

The redesign toward student-centered approach is no easy task with active learning design, integrated curriculum and assignment, and digital proficiency. The right mix of mindset and skills are required to thrive in the new digital era. Ongoing efforts of training and keep up with lifelong learning is necessary for educators to flourish in education. There is no right or wrong method of pedagogy as it varies under circumstances which is subjective under the judgement of the educators to foster such learning environment. The ability to take risks upon making mistakes, learn new things along with students, and challenge the digital skills that continue to advance rapidly are the keys to success.

7.7.1.2 Recommendations to Students

The traditional system of education was never designed to have all students succeed. Understanding the strengths and weakness in the system and create personalized learning that fit our approach and style can optimize our learning experience. Resources are always available as long as the learners are seeking for help. Owning the responsibility of education that leads to the path of personal endeavor will always create success that are not comparable by numbers, test scores, and grades. Achievements through self-acknowledgement will provide opportunities for learning
that are readily available online.

7.7.1.3 Recommendations to Parents

Learning is never a one size fits all type of education. For those who have multiple children, each child is unique in his or her own style and personality trait. Therefore, attentions required for each child is different under various circumstances. The sense of belonging and support is the most crucial environment from family to allow learners to grow and develop as active learners and become self-
taught learners.

7.7.1.4 Recommendations to Schools

Schools are the first exposure of institutionalized learning experience for most people. Regardless of how much education has changed to keep current situation of digital adoption and continue to create human resources for workforce, schools still play a critical role in creating learning opportunities,

mentoring students' growth, and coaching learners to succeed in their endeavor. When a culture of active learning and inclusivity are established, all key stakeholders are empowered to maximize education utilizing technology as the tools to transformation. Belonging and inclusion are built through trust and relationship. When optimal conditions are met, both educators and learners can grow and be ready to construct new knowledge. Feedback from teachers, students, and parents should also be taken as productive feedback to make amendments for action. An action that eventually transform

education into the digital education of the 21st century.

7.7.1.5 Recommendations to Non-profit Organizations for Education

Partnership with public entities or private organizations that are willing to be a part of the transformation can make a greater impact to Thai transformative education. This is a social responsibility for common goals to provide free education for all realized in the digital realm of education. Boundless opportunities can be generated through collaboration between non-profit organizations with the Ministry of Education.

7.7.1.6 Recommendations to Public Entities Responsible for Free Open-Source Education

Evaluation process and feedback are crucial in improving the applications, platforms, and resources that are currently available. New additions to other online resources should be a part of the depository. Resources should not be restricted to only Thai language. Other languages such as English, Chinese, Japanese, German, Spanish, etc. can be made available for learners. While each respective entity is responsible for schools under their jurisdiction, a network of information sharing and knowledge sharing can be helpful to integrate all entities under the Ministry of Education so that all entities are in alignment of each other.

7.7.2 Policy Recommendations

Without the government's involvement, education cannot be transformed. The directive of Thai education still follows the plans written to build the nation of the future. While the government recognizes the changes of teaching and learning are required and necessary for digital education, opportunities to allow other

entities including private sector, non-profit organizations, and individual contributors become a part of the transformation should be encouraged. A collaboration from both push and pull sides of the education change can propose policy changes that are reflective of current digital world. Even when education is moving to core-competency curriculum and integrated assignments of which personalized approach that students are the center of the focus, we cannot ignore the fact that evaluation and assessments are mainly quantitative statistics. Qualitative evaluation and assessments are less of the emphasis that the government may consider as a part of policy consideration. This is the opportunity for Ministry of Education to work with Ministry of Digital Economy and Society to integrate education into lifelong learning and assist in human resources development from the childhood to the adulthood.

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