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# Teachers' Use of Technology in Lesson Planning and Presentation in Palau

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College of Education

This is to certify that the doctoral study by

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Walden University
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Abstract

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Project Study Submitted in Partial Fulfillment

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## Abstract

School leaders must balance strong public demand for technology in schools, scarce and increasingly strained public financial resources, lack of research with clear relevance to the local context, and having to respond to real-time demands to make immediate and prudent decisions that affect long-term strategy. In recent years, the Palau Ministry of Education (PMOE) invested heavily in an expensive 1:1 tablet program but had not determined if the program produced the expected positive changes in elementary teachers' instructional delivery. Guided by experiential learning theory, the purpose of this quantitative, causal-comparative study was to determine if the 1:1 tablet program resulted in positive changes to the level of elementary teachers' use of technology in their lesson planning and presentation. Pre and postimplementation lesson planning and delivery data, collected from 63 elementary teachers participating in the 1:1 tablet program, were analyzed using a repeated measures *t* test. Results showed teachers' use of technology in lesson planning and in lesson presentation significantly increased after the implementation of the 1:1 tablet program. These findings suggest that the 1:1 tablet program created an environment that positively supports technology-driven instruction in the classroom and should be continued. Implications include providing the PMOE stakeholders with the evidence necessary to make a sound policy decision regarding the continuation of the expenditures needed to support the 1:1 tablet program in the long term. In light of this evidence, the PMOE has an opportunity to create positive social change for the students it serves by facilitating technology-driven instruction that is aligned to the demands of a first-class, 21st-century education.

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# Dedication

I want to dedicate this project study to my wife, Sally T. Soalablai, for the love and support throughout this doctoral journey. To my son, Junichi, and daughter, Antoni, you are the sole reason I keep doing what I do. I would also like to dedicate this study to all the children of Palau.

Acknowledgments

I want to express my sincere gratitude to my committee chair, Dr. Andrea M. Wilson, for invaluable support, guidance, and encouragement throughout this project study. I would also want to thank my committee members, Dr. Howard J. Moskowitz and Dr. Beate Baltes, for the revisions and editing. Both made my hard work and perseverance worth doing. Finally, I would like to thank the Palau Ministry of Education for allowing me to conduct my study.

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Section 1: The Problem

## The Local Problem

The Palau Ministry of Education (PMOE) has spent $750,000 on a 1:1 tablet program at the elementary school level that is poised to become the PMOE's primary technology effort over the upcoming years. The problem investigated in this study, which has not been studied at the PMOE, was whether the level of teachers' use of technology for lesson planning and lesson presentation has increased following the rollout of the 1:1 tablet program. The PMOE's general management concern was whether evidence could be developed to inform decision-making because the PMOE (2017b) leadership seeks to implement an ambitious 10-year Master Plan whose major priorities compete for limited financial resources. This study provides evidence related to technology expenditures by investigating the problem.

This problem is critical because immediate and effective prioritizing of funds is necessary if the PMOE (2017b) is to achieve the performance milestones of its 10-year Master Plan. According to internal financial records, of the key priorities that are unfunded, technology received 30% of development funds on curriculum improvements, 7% on teacher pedagogical courses, and 0% on capacity building for assessment, monitoring, and evaluation. The remaining development funds supplemented ongoing funded activities (PMOE, 2018). Teacher training and development is more critical to student success than technology (Lawrence, Al-Bataineh, & Hatch, 2018) and certainly requires more funding to undertake (Ra, Chin, & Lim, 2016; Wade, Rasmussen, & Fox-Turnbull, 2013). In this situation, illustrative of the general concern, the PMOE

leadership lacks the information to make research-based decisions about the appropriateness of the 30% versus 7% allocations to technology and teacher pedagogical courses respectively. This study enables such decision-making by providing the needed research with local context and relevance.

Before the 1:1 tablet program, when school-based technology resided in computer labs, anecdotal information from the director of curriculum and instruction at the Bureau of Curriculum and Instruction (BCI) indicated teachers have lagged the students in technology literacy and adoption. The PMOE leadership had to address teacher computer literacy and, with only about 7% of the PMOE's teachers having received preservice training, the approach had to be measured and feasible. The PMOE leadership identified the lesson planning process as the entry point for increasing teacher use of technology: It was something teachers had to do, and informal teacher feedback indicated that many acknowledged the benefits technology could bring to the process. According to the chief of teacher training, in the last 5 years before the 1:1 tablet program, BCI staff increased its efforts to improve teacher use of technology in lesson planning and presentation through in-service training, workshops, and teacher observations and follow-up; however, success has been elusive. The 1:1 tablet program puts technology directly into the hands of individual teachers. Combined with BCI's training and various tools developed to help teachers with lesson planning, there is a higher expectation of increased technology use. Starting with this study, PMOE leadership may develop more precise information about teacher use of technology in lesson planning and presentation.

In this study, I investigated whether teacher use of technology in lesson preparation and presentation has increased after rollout of the 1:1 tablet program. The 1:1 tablet program is the PMOE's primary technology initiative going forward. Per the director of curriculum and instruction, Phase 1, 2015 to 2017, was completed and covered 163 teachers and their students with the modest initial objective of increasing the level of technology used by teachers in lesson planning and lesson presentation.

## Rationale

The PMOE leadership attempted to be at the forefront of educational technology and, therefore, provided 163 teachers and their students with a tablet. The director of curriculum and instruction stated that the intent was to increase the level of technology used by teachers in lesson planning and lesson presentation and continue to provide students with reinforcement and practice activities using modern devices instead of the increasingly outdated computer labs. In keeping with the local context and need, I focused on teachers in this study. The 1:1 tablet program was implemented with the assumption that teachers will learn, prepare, and present their lessons through experience from using the tablets. According to the director of curriculum and instruction, in this sense, the 1:1 tablet program depended somewhat on experiential learning (see Kolb, 1984) to increase teacher use of technology in lesson planning and presentation.

The purpose of this study was to investigate the difference in the level of teachers' use of technology for lesson planning and lesson presentation following the rollout of the 1:1 tablet program. According to Wade et al. (2013), Onalan and Kurt (2020), and Woods (2020), personal computers provide opportunities to strengthen and expand teachers'

options when planning and delivering the course content; therefore, investigating the use of the technology by teachers meets the PMOE's needs and specific context. The independent variable was the provision of tablets to the teachers through the PMOE's 1:1 tablet program. The dependent variable was the level of teacher use of technology in lesson planning and preparation. The data consisted of a single sample of teachers for whom the dependent variable was measured before and then after they received tablets through the 1:1 tablet program.

## Definition of Terms

*Experiential learning*: Making meaning from direct experience (Reshmad'sa & Vijayakumari, 2017).

*Lesson planning*: The plan provides meaningful ways that students can integrate technology or manipulative into their learning and activities (Cowan, 2008).

*One-to-one (1:1) tablet program*: A program that provides technology devices per student in a school district (Delgado, Wardlow, McKnight, & O'Malley, 2015).

*Use of technology in lesson presentation*: Instruction that uses a variety of ways to meet individual learning styles using media and manipulative when appropriate (Cowan, 2008).

## Significance of the Study

For the advancement of general knowledge, the study serves as the first of a series and the beginning of an effort to establish research where none exists at the PMOE. This study may advance the decision-making process, and as a consequence of that decision-making process, may also improve the return on investment of the PMOE's scarce

resources.

The PMOE is not alone in this situation. The Commonwealth of Learning reported that small developing countries in the Pacific, Mediterranean, and Caribbean regions have yet to integrate technologies that can assist teachers in facilitating learning (Vaa, 2015). Some researchers (see Govender & Govender, 2014; Natia & Al-hassan, 2015; Ngajie & Ngo, 2016; Solano, Cabrera, Ulehlova, & Espinoza, 2017) are starting to look at developing nations and how these problems are expressed and can be managed in their environments. In 2007, the United Nations Educational, Scientific and Cultural Organization Bangkok reported on the progress and plans of information and communication and technologies (ICT) in education in the Asia-Pacific region. The countries in the Pacific region were Micronesia (i.e., Federated States of Micronesia, Marshall Islands, and Palau), Polynesia (i.e., Samoa, Tonga, Tahiti, Cook Islands, Tuvalu, Tokelau, and Niue), and Melanesia (i.e., Fiji, Papua New Guinea, Solomon Islands, and Vanuatu). At the time of the report, these countries had no involvement whatsoever in the following three critical areas: teacher education to improve teachers' capacities in teaching and learning with the use of technology, facilitate and deliver the use of educational technology in schools, and measure changes as a result of technology in education (UNESCO Bangkok, 2007). Since then, Palau has yet to address these areas of integrating technology in PMOE schools.

There are also schools in Africa, Europe, and South America that have the same challenges as the PMOE schools. The use of technology for teaching and learning has not been successful in South African schools (Chikasa, Ntuli, & Sundarjee, 2014;

Mwapwele, Marais, Dlamini, & Biljon, 2019). Swedish upper secondary school teachers also share similar experiences and challenges on the use of technology in their classrooms (Lindberg, Olofsson, & Fransson, 2017). The Ghanaian Basic Schools mirror what the PMOE has already done, where the government is only interested in procuring technology for schools without addressing the accessibility or integration of the technology into the teaching curriculum (Natia & Al-hassan, 2015). Solano et al. (2017) also shared similar challenges in 10 schools in southern Ecuador, where teachers lack instructional technology knowledge and enthusiasm for student engagement.

All of these jurisdictions and nations, along with PMOE, value the results of existing research from developed nations and expect 1 day to be in a position to make use of the research findings. Although there has been rapid development and progression of information technology and Internet in 2017 in Palau (Belau Submarine Cable Corporation, 2017), the use and adoption of technology in the classrooms by teachers still pose challenges to a developing country such as Palau. In the meantime, the PMOE and these other countries have to deal with existing realities for the next decade or two and are starting to undertake the research needed to address a similar problem regarding their situations.

## Research Questions and Hypotheses

The purpose of this study was to investigate the difference in teachers' use of technology for lesson planning and lesson presentation before and after they received tablets through the 1:1 tablet program. To achieve this purpose, I used a quantitative approach with the independent variable being teachers' possession of a tablet from the

1:1 tablet program, and the dependent variable being the level of the teachers' use of technology as measured by the Classroom Instruction Observation Tool (CIOT). The following research questions and hypotheses guided this study:

RQ1: What is the difference in the level of teachers' use of technology in lesson planning as measured by the CIOT before and after they received tablets through the 1:1 tablet program?

$H_0$1: There is no difference in the level of teachers' use of technology in lesson planning as measured by the CIOT before and after they received tablets through the 1:1 tablet program.

$H_A$1: There is a difference in CIOT planning scores between teachers who taught before the introduction of the 1:1 tablet program and teachers who taught after the introduction of the 1:1 tablet program.

RQ2: What is the difference in the level of teachers' use of technology in lesson presentation as measured by the CIOT before and after they received tablets through the 1:1 tablet program?

$H_0$1: There is no difference in the level of teachers' use of technology in lesson presentation as measured by the CIOT before and after they received tablets through the 1:1 tablet program.

$H_A$2: There is a difference in the level of teachers' use of technology in lesson presentation as measured by the CIOT before and after they received tablets through the 1:1 tablet program.

## Review of the Literature

This subsection contains a report of recently published scholarly literature on the use of 1:1 technology in education across the United States and other parts of the world. In this review, I discuss the theoretical foundation and how it relates to the study. In addition, I review the literature on the broader aspects of the problem, including the benefits of 1:1 educational technology initiative, barriers to successful implementation, the role of leadership, 1:1 technology initiative policy, and the role of professional development.

I conducted an extensive review of the literature using multiple databases and keyword search terms and phrases that included *information and communications technology, technology, one-to-one, 1 to 1, 1:1, one-to-one technology, education reform, education policy, experiential learning, leadership in education, lesson plan, teacher preparation, professional development, mobile learning,* and *technology integration.*

### Theoretical Foundation

In this study, I used Kolb's (1984) experiential learning theory (ELT) as a lens through which to understand if the 1:1 tablet program has resulted in changes in the level of teachers' use of technology in lesson planning and presentation because it best fit how the PMOE's BCI central office implemented the program. ELT is a concept of learning whereby learners learn from experience and apply them in a real-world situation (Bishop, Justice, & Fernandez, 2015; Chorazy & Klinedinst, 2019). As such, the learning cycle model of the ELT applies to all learning contexts (Kolb & Kolb, 2018). The experiential learning cycle of an individual's experiences, reflections, thoughts, and actions in ELT

was useful in understanding teachers' experience with the 1:1 tablet program in their lesson planning and presentation. The ELT framework served as a guide in the collection and explanation of the data.

Triangulation of comments from 1:1 tablet program decision-makers and facilitators showed that the implementation strategy was to put the devices into the hands of teachers, provide basic training, and encourage the use of specific tablet apps. The director of curriculum and instruction, a BCI technology specialist, and an information technology manager explained that the idea was to wait for a period of time until teachers, through trial and experience, have adopted and begun using the devices, before starting any evaluations. The PMOE decision-makers were essentially promoting learning from experience by doing that encourages reflection. Their assumption was that eventually these experiences will help teachers develop new skills or new ways of thinking and teaching. This strategy was deemed to be the only available approach in a rushed situation where funds were available only within a limited time window and not doing anything exacerbated a condition where students would be left behind in terms of technology.

At the outset, the PMOE leadership and 1:1 tablet program implementers described the ELT model and how it closely relates to teachers' use of tablets for their lesson planning and presentation. The ELT is a model consisting of four primary learning modes: (a) concrete experience, (b) reflective observation, (c) abstract conceptualization, and (d) active experimentation (Kobe, 1984). The BCI central office staff completed Mode A by providing teachers with tablets, conducting basic training, and continuously

encouraging and facilitating the use of tablet-based apps. They also worked on Mode D by conducting teacher observations. The central office staff was less empirical for Modes B and C. From BCI central office staff descriptions of how the project was implemented, they were expecting a kind of professional development through experiential learning. Like professional development, learning through experience by doing changes an individual (Girvan, Conneely, & Tangney, 2016). While BCI's central office staff were actively promoting interteacher collaboration and discussions on how to use technology, there was no formal documentation of this process. Even though the theory was not formally stated, there is formal evidence for Modes A and D, and Modes B and C were and continue to be actively pursued. The PMOE can, therefore, accept what the 1:1 tablet program decision-makers and facilitators said they were doing and move on to find out what the results were so that the next steps in policy-based decision-making can proceed.

The PMOE teachers and students have access to technology. In this case, a 1:1 tablet program was implemented to ensure every teacher and student have access to technology to enhance teaching and learning. For the success of any program or model, access is critical (Harris, Al-Bataineh, & Al-Bataineh, 2016; Solano et al., 2017; Statti & Torres, 2020). The primary challenge is not the availability of the technology in the classroom but how it is used by the teachers to improve their instructional practices (Kalonde, 2017). Using ELT as a lens for this study, I focused on teachers' use of technology before and after the implementation of the 1:1 tablet program.

The experience of teachers with the device was critical in understanding how they implement technology in their daily lesson planning and presentation. In this instance,

understanding teachers' daily instructional planning and presentation revealed the effectiveness of the 1:1 tablet program before and after the program implementation. Considering the principles of ELT, the assumption of the PMOE leadership was teachers learn most from hands-on experience with the tablets when they actively participate in their learning. As consequences of those experiences, teacher experience encourages reflection that leads to new skills and thinking (Jesuit & Endless, 2018). Furthermore, Baker and Robinson (2017) recommended that teachers should be aware of their roles and design their teachings to meet the needs of different learners. Using ELT as a guide for this study, teachers' and teacher trainers' experiences with the 1:1 technology may lead them to pursue the quality delivery of instructional methods.

**Review of the Broader Problem**

The areas I focused on in the review of the most recent literature include the benefits of 1:1 technology initiatives, barriers to successful implementation, and the roles of leadership and professional development. The ELT underpinned these four areas of emphasis. The speed at how schools in the United States and many parts of the world implement 1:1 tablet programs continues to increase (Cole & Sauers, 2018; Holen, Hung, & Gourneau, 2017). For example, in 2018, $19 billion were spent on technology in U.S. schools (Lamb, 2018). In 2008, a report from the National Center for Education Statistics showed that each public school had at least one computer as an instructional tool (Gray, Thomas, & Lewis, 2010a). In 2009, 97% of teachers from public schools had at least one computer in their classrooms (Gray, Thomas, & Lewis, 2010b). As technology becomes

ubiquitous in schools, school districts, and countries, researchers seek to understand how technologies affect teaching and learning.

Several reviews of research and empirical studies (e.g., Fleischer, 2012; Harper, 2018; Penuel, 2006) have examined how technologies affect teachers and students, teacher learning, and technology use in the classroom. Such studies, however, have not focused on teachers' experiences with 1:1 technology initiatives relative to the context of this study. This review builds on two influential studies from Penuel (2006) and Fleischer (2012) on the use of 1:1 technology in the classrooms in the last 5 years. In my review of literature on 1:1 technology programs, I could not locate a research study more relevant in scope than those of Penuel or Fleischer. The references from the most recent literature on 1:1 technology in education from this study reflect on the work of Penuel and Fleischer. In an analysis of 123 research articles on 1:1 technology, Penuel summarized four goals: (a) improve academic achievement, (b) increase access to technology, (c) increase the economic competitiveness of a region, and (d) transform the quality of instruction. Fleischer concluded there was difficulty in determining the success of 1:1 technology programs because the results may depend on contextual conditions and theoretical perspectives. Furthermore, the majority of the reviewed studies published in the last 5 years on the 1:1 technology programs were either case studies or self-reported studies, which limited their scope and application. If the expectation is for student achievement gains, 1:1 technology programs would need to be more comprehensive to improve instruction (Penuel, 2006). In the following subsections, I further emphasize

Penuel's four goals and Fleischer's emphasis on context and framework within the four focus areas of this review and how they relate to this study.

**Benefits of one-to-one educational technology**. One-to-one technology in schools is changing the way teachers teach and how students learn. Such technology increases student engagement, collaboration, teacher-student interaction, and personalized learning (Harper, 2018; Wright, 2018). If technology, such as hand-held devices, offers many benefits to student learning and teacher performance (i.e., if such technology in the classroom is well designed and applied), it can expand and amplify teaching practices (U.S. Department of Education, 2017). Technology in the school has changed how students learn beyond teacher instruction and textbooks as well as how teachers assess students (Kalonde, 2017). Mobile technology has unique advantages for supporting interactive activities where technology applications provide teacher-to-student and student-to-student interactions in terms of mobility and functionality in creating a learning environment (Kim, Choi, & Lee, 2019). From these interactions, student engagement, reflection, collaboration, and individual learning are possible with 1:1 technology. Varier et al. (2017) added that 1:1 technology provides easy and quick access to learning that otherwise would be nearly impossible with dedicated computer labs. With technology, students can keep track of their work that can help create their sense of responsibility.

One-to-one technology should increase student engagement; however, according to a report conducted by Project Tomorrow (2019), only 38% of middle and high school students associate learning engagement as a result of the use of technology. Given that

current traditional methods of teaching and learning are mostly abstract, teachers should engage students in learning by doing (Raja & Najmonnisa, 2018). De Bruyckere, Kirschner, and Hulshof (2016) found that using 1:1 technology increases student engagement. This technology may provide different opportunities and simulations to make learning more enjoyable if teachers can teach the same things in new ways. For example, teachers vary their teaching by using various teaching programs and applications (Fransson, Lindberg, & Olofsson, 2018). Teaching variations encourage the learning process and participation that can be hard to accomplish in a traditional classroom. Teachers can use technology to maximize their strategies in their lesson planning to deliver collaborative activities with students or among peers.

With access to 1:1 technology, teachers and students are experiencing shifts in their roles. In a review of published journals between 2005 and 2016, Harper (2018) concluded that technology encourages collaboration between teachers and students. Collaboration between teachers in the same classrooms, the same school, or other classrooms around the world is now possible with technology and that technology allows the opportunity to improve communication, teaching, and learning (Harper, 2018; Raja & Najmonnisa, 2018). Teachers and students having access to 1:1 technology is a critical condition for student-centered learning in education (Francom, 2016; Wolfe & Pace, 2019). Students have changed the way they access knowledge, while teachers shift their role as facilitators for learning (Gherardi, 2018; Varier et al., 2017). Hull and Duch (2019) reported evidence on the use of 1:1 technology that led to a decrease in student absences and changes to student behavior that led to the technology program's success.

Technology encourages independent learning provided that teachers have had prior training and experience with the device that reflected in their lesson planning and instructional practices. Teachers can provide personalized learning that meets the needs of different student learning styles and different abilities; however, this shift may take time and considerable technical and pedagogical knowledge (Blundell, Lee, & Nykvist, 2020; Byers, Hartnell-Young, & Imms, 2018). Wright (2018) asserted that personalized learning allows more free time and resources for teachers to work one-on-one with each student while they are not on computers. Technology encourages individual learning and reflection, where students can learn useful lifelong skills (Kopevev, Mubarakov, Kultan, Aimicheva, & Tuyakov, 2020; Sert & Boynuegri, 2017; U.S. Department of Education, 2017). Students can develop skills through technology that are essential for success in the future and meeting the needs and expectations of the 21st century.

**Barriers to successful implementation of one-to-one technology.** Several barriers exist in the 1:1 technology implementation. Although published decades ago, Leggett and Persichitte (1998) identified barriers to overcoming 1:1 technology implementation challenges that are still relevant to the success of the program today. The barriers they identified were time, access, resources, expertise, and support. To date, researchers continually find similar barriers to successful 1:1 technology implementation in schools (Fransson et al., 2018; Harris et al., 2016; Harper, 2018; Jack & Higgins, 2019; Lawless, 2016; Lewis, 2016; Nicholas & Fletcher, 2017; Swallow, 2015). According to Kalonde (2017), technology access is just the beginning. For example, Natia and Al-hassan (2015) investigated the extent to which school administrations promote teaching

and learning through the use of technology in Ghanaian Basic Schools. They found that while Ghana public schools already had a technology policy in place, the challenges were the lack of adequate infrastructure and teacher training on integrating technology in schools. Given that teachers have access to technology; however, what they do with the technology to improve their instructional practices and pedagogies remains to be seen.

Research has consistently shown that teachers are an important influence on student performance. Ditzler, Hong, and Strudler (2016) stated that the knowledge, unfamiliarity, and comfort level affecting teachers' use of technology have an impact on how they are used in the classroom. As such, teachers need time to learn, experience, and reflect on the technical and pedagogical uses of technology. Challenges in education systems include the absence of leadership visions, teacher training on technology, and classroom support for teachers (Dinc, 2019; Sheppard & Brown, 2014; Tosuntas, Cubukcu, & Inci, 2019). Access to the Internet and lack of instructional devices limit teachers from using technology in the classroom (Barbera, Gros, & Krischner, 2015) While good teaching goes beyond merely presenting information to students, support from leadership is essential to the success of the 1:1 technology programs.

**The role of leadership.** To avoid similar failures and discouraging results of the 1:1 technology initiatives in Los Angeles Unified School district and the state of Maine (Herold & Kazi, 2016; Newcombe, 2015), school leaders and educators should be cautious about optimistic rhetoric surrounding new technology (Raja & Najmonnisa, 2018; Wright, 2018). While technology becomes ubiquitous in the schools, the role of the school leaders needs to change if they were to meet the demands of the new learning

environment. School leadership is a critical component to guide the teaching-learning process and prepare students with relevant 21st-century skills for an economically driven workplace (Penuel, 2006). The leadership role in the success of 1:1 technology integration is critical. For example, in a phenomenological study to explore school superintendents' perceptions related to 1:1 initiative, Cole and Sauers (2018) highlighted themes related to vision by focusing on infrastructure, and provide needed support for teachers and students before the rollout. Leaders will need to first create a vision with relevant stakeholders to meet the needs of all learners (Fleischer, 2012; Lamb, 2017; U.S. Department of Education, 2017), a vision that emphasizes the development and training of new pedagogies with 1:1 technology (Lawless, 2016). In addition, school leaders will need to cultivate a culture of growth and change that is beneficial to students and teachers.

Simply adding technology in the classrooms will not change the teaching and learning culture that may lead to improvement. By creating a culture of teaching, whereas teachers and students interact, instructional delivery will be more meaningful than the curriculum alone (Mohale, Litshani, Mashau, Sebopetsa, & Moyo, 2020; Soebari & Aldridge, 2015). Mitchell, Wohleb, and Skinner (2016) asserted that the technological resources that are available to teachers are not enough for them to already know how those resources should work. To overcome barriers for successful implementation of the 1:1 technology initiatives, researchers found that school leaders plan for learning strategies to support teachers (Simmons & Martin, 2016), conduct review of the literature (Chang, 2019), and provide cohesive policy implementation (Gherardi, 2017). According

to Keane and Keane (2017), delegated leadership, adequate infrastructure, knowledgeable teachers, and appropriate professional learning are drivers for the success of 1:1 technology initiatives.

Context matters. Leaders need to provide a context where technology programs have the potential to change the attitude and behavior of teachers. Fleischer (2012) concluded that the success of 1:1 technology is dependent on the program's context. Thus, the role of leadership is critical in helping teachers overcome new learning experiences that create a safe and ideal classroom environment for students. As technology continues to increase in schools, school leaders must prepare for such an environment in the classrooms (Cole & Sauers**,** 2018). As student achievement remains the goal of 1:1 technology programs, leaders may focus on teachers in providing time for more experience in planning for student-centered learning (Francom, 2016). School leaders must, therefore, identify a teaching and learning framework that can create a space where teachers and students practice, experience, and reflect on what they learn with the 1:1 technology in a continuous cycle. While school leaders are role models to all learners, Gherardi (2017) recommended that they model flexibility in which allows teachers to be open with their frustrations with 1:1 technology initiatives. Leaders should approach this new learning environment with a holistic view.

**Role of professional development.** Professional development on the use of 1:1 technology is an essential strategy for supporting teachers' learning. One of the essential functions of school leadership is to address the ongoing availability of professional development for teachers; however, many teachers are not receiving professional

development to support the use of technology. According to a report from a U.S. sample of 1,200 teachers on technology in schools by The Common Sense, only 4 out of 10 teachers received professional development that supports their educational use of technology (Vega & Robb, 2019). Perhaps one of the most crucial obstacles for the success of 1:1 technology implementation in schools is a lack of adequate professional development of teachers.

To prepare students for college and career, teachers need to know more about various forms of teaching and pedagogies (Darling-Hammond, Hyler, & Gardner, 2017). For 1:1 technology programs to be successful, teachers must continue to learn about effective technical and pedagogical approaches to using technology in the classrooms. Ongoing professional support is a crucial factor in a successful 1:1 technology implementation (Lewis, 2016). Professional development about 1:1 technology implementation has been a common theme among researchers (Hassler, Hennessy, & Hofmann, 2018; Kim, Choi, & Lee, 2019; Koh, Chai, & Lim, 2017; Parrish & Sadera, 2018). As new technology continues to develop, the need for ongoing teacher development will never end.

One of the goals of the Penuel study was to provide instructional quality, and teachers expect to effectively use technology (U.S. Department of Education, 2017); however, teachers still face further challenges with technology as an instructional tool. An enduring problem to 1:1 technology implementation is the lack of support for teachers. One-to-one technology implementation is time-consuming that imposes additional workload on participants (Barbera et al., 2015); therefore, teachers will need

time to learn and support each other (Lamb, 2018). For example, by creating an infrastructure that supports teachers' work is necessary for enhanced and sustainable use of technology (Camburn & Han, 2015; Hill & Valdez-Garcia, 2020). Provide support of teachers to further their professional learning and skills (Hall & Trespalacios, 2019; Karolcik, Cipkova, & Kinchin, 2016), and support teachers' attempts to change their practice (Romero & Vasilopoulos, 2020; Soebari & Aldridge, 2015). Building teachers' knowledge and skills with support from school leaders are necessary.

Teachers' attitudes and beliefs are essential in influencing the adoption and acceptance of 1:1 technology programs. With professional development, teachers' perceptions may determine their challenges for successful technology implementation (Kim et al., 2019). Thus, teachers need to be viewed as individuals with specific beliefs, knowledge, and experience (Abbott, 2016). For example, in their study, Kimmons and Hall (2016) indicated that teacher beliefs were driven by their daily classroom practices rather than being part of an institution. Principals' roles can contribute to the effective integration of technology in the classrooms. Alghamdi and Prestridge (2015) and Kalliom and Halverson (2020) found that when principal and teacher beliefs are in coherence for learning technology, a transformation of teacher's practice shift to student-centered teaching and learning. Teachers are more likely to adopt and integrate technology if they believe it has the potential to improve teaching and learning (Chikasa et al., 2014; Mwapwele et al., 2019; Powers, Musgrove, & Nichols, 2020). For the successful implementation of 1:1 technology, effective teacher professional development and learning must take teachers' attitudes and beliefs into consideration.

When using technology in the classroom, leaders must also be mindful of what their instructional goals are, how will technologies enable them to reach those goals, and how technology can help students make connections to those goals. In addition, for the success in implementing technology in the schools, perceptions of students and teachers in how they use the devices can help determine implementation challenges and inform strategies for future development (Ditzler et al., 2016; Siefert, Kelly, Yearta, & Oliveira, 2019). Although there are several digital learning theories and models for teaching with the technology available for schools and teachers to adopt, perhaps using a more holistic learning approach that can bring work experience and learning into classroom context may advance student performance. When carefully planned and applied, technology initiatives can expand and transform teaching practices. One such model that leaders may include in their planning is the implementation of experiential learning as an overarching framework for the school district. According to Kolb and Kolb (2018), the learning cycle model of the ELT applies to all learning contexts. In the theory's learning cycle, there are two stages (concrete experience and abstract conceptualization) that involve the learner's experience. The other two stages (reflection and active experimentation) include the transformation of the learner. The ELT model emphasizes on learner's learning style and flexibility to gain new knowledge; therefore, effective instructional models must be flexible enough to adapt to the needs of learners, the same is true for implementation plans.

## Implications

This study may advance the decision-making process, and as a consequence of the decision-making process, may also improve on the return on investment of the PMOE's scarce resources. Considering the potential advantages and the concerns of the 1:1 tablet program, the PMOE leadership will be in a better position to plan steps to help schools and teachers with adequate infrastructure, integrated curricula, ongoing professional development, and funding. The study is set out to provide opportunities for the PMOE leadership and teachers to reinforce positive capabilities of the 1:1 tablet program. By investigating the teachers' use of the tablets in their lesson planning and presentation, the possible outcome of this study may drive the PMOE leadership to revisit the goal of the 1:1 tablet program before and after the deployment.

In understanding teachers' experience with the technology to determine if there are changes in their lesson planning and presentation may lead to the development of an extensive and framed technology policy. As a step towards developing a system for a sustainable implementation of the program, creating a vision about addressing changes to teaching and learning (Cole & Sauers, 2018), resources, infrastructure, pedagogy, and professional development, will be critical for the program's success. Given that this initiative requires considerable investment, evidence-based policies and decisions about technology implementation may determine the future of the 1:1 tablet program at the PMOE and other public school systems.

As a step forward, the PMOE teachers have access to technology, a positive sign of improving their performance. Harris et al. (2016) found that access to technology is an

advantage. Concerning the ELT cycle, teachers were provided tablets with basic training. While they are using the tablets, classroom observations continue. What remains are teachers' reflections and what they have learned from those experiences with the technology. While the implications of this study may indicate gaps in practice on the teachers' use of technology, the results may lead to a focused professional development. In using ELT as a framework to understand teachers' use of the 1:1 technology, professional development may also be appropriate to address the current practices of the teachers as a tentative direction of this study.

## Summary

In Section 1, I described the context of the local problem at the PMOE. The PMOE leadership continues to invest in a 1:1 tablet program, yet there has been no investigation on whether the technology used in lesson planning and presentation affects teaching and learning. Without technology policy and instructional model to follow, 1:1 tablet program was implemented with the assumption that teachers will learn, prepare, and present their lessons from using the tablets. This study offers a unique opportunity, through investigation related to ELT model, to understand how teachers use the 1:1 technology in their lesson planning and presentation.

A variety of factors such as technology policy, leadership support, and professional development provide opportunities for teachers to move toward a positive change in teaching and learning with technology. The implications of this study may continue to advance the success of 1:1 tablet program implementation and sustainability as they relate to the ELT model. The teachers' use of the 1:1 technology may also help

guide current and future success of schools and leaders as they prepare students. In Section 2, I will explain the methodology and research design used to answer the guiding research questions from Section 1.

# Section 2: The Methodology

## Introduction

In this section, I present the methodology in detail. First, I discuss the research design and approach for this study followed by the setting and sample used in the study. Then I provide the instrumentation and materials that were used to collect data. The data collection and analysis procedures of this study as well as the assumptions, limitations, scope, and delimitations are also presented. The section is concluded with a discussion of the protection of participants' rights and the results of data analysis.

## Research Design and Approach

In this study, I used an ex post facto, causal-comparative design. This quantitative research approach tests for significant differences between the groups but does not explain why there are differences between them (Lodico, Spaulding, & Voegtle, 2010). The approach was appropriate for the local context because, at the time of the study, the immediate question of whether a difference exists needed to be answered before any investigation could be launched into improvements, challenges, etc. The data for this study came from archival records of a group of school teachers that were observed in 2015 before they were provided tablets. They were provided tablets again in 2018 after they had received tablets, undergone training, and had used the tablets for at least a year. I conducted a repeated measures, matched pairs, *t* test to the data set to determine if there was a significant difference between the two observations.

## Setting and Sample

The PMOE is the Republic of Palau's governmental agency responsible for K–12 education. The agency operates and manages public K–12 schools and approves 3-year charters for individual, private K–12 schools (PMOE, 2018). The elementary school covers Grades 1 to 8 for ages 6 to 13 years old, and high school includes Grades 9 to 12 for ages 14 to 17 years old (PMOE, 2018). The PMOE is a small and isolated island school system with 3,100 students and 280 teachers that are part of a population of 20,000 people (PMOE, 2018). The primary languages are Palauan and English, and the school structure, curriculum, and programs are similar to the U.S. school system.

The PMOE's (2017a) teachers are over 90% Palauan, mostly without formal teacher training (less than 8%) with any pedagogy or methodology knowledge gained through the job experience and in-service. The population from which the sample was drawn was the group of PMOE teachers who had received tablets through the 1:1 tablet program. Investigating this group allowed me to analyze the level of teachers' use of technology before and after they got tablets through the 1:1 tablet program. The data from the BCI specifically related to the program's objective and provided a match-paired sample with the preassessment made in 2015 before tablets were distributed and the postassessment made in 2018 after all the teachers had used the tablets for at least 1 year. The deployment relied on the tablets as stand-alone systems not dependent on the Internet or external resources, which decreased confounding factors that might be expected when such devices are Internet dependent.

A power analysis for repeated measures *t* test with an effect size of 0.5, the alpha error probability of 0.05, and a sample size of 63 resulted in a power of 0.97. The sample size of 63 was the teachers who had CIOT scores before and after they received program tablets. The selection criteria were that the participant must be a PMOE teacher who received a tablet through the 1:1 tablet program and had CIOT scores before and at least a year after receipt of the tablet.

The teachers in the sample all came from PMOE's elementary schools (by 2018, the 1:1 tablet program was still targeting elementary schools) where the school environment, language, and curriculum are similar. The educational level of teachers is not high, with 1.3% having had preservice training (i.e., in pedagogy and methodology and a degree from teacher college; PMOE, 2017a). All teachers are required to prepare and submit lesson plans to the school office.

## Instrumentation and Materials

The data source for the study was archival data of elementary school teacher observations performed by the PMOE's BCI, the office which administers the instrument. The instrument was used for all elementary school teachers before, during, and after the deployment of the 1:1 tablet program. The instrument is the official form used in the PMOE's teacher observation process. The instrument was developed and used by BCI content coordinators who are trained to use it to observe teachers. BCI collects and maintains the data from the form and uses the data for need sensing and development of intervention and in-service activities.

The data collection was conducted at the schools by content coordinators from the central office independent from the school principals and the PMOE leadership; hence, I was not part of this process. All the data are kept at the BCI. The CIOT is a measurement tool for rating teachers on 30 items covering the desired teacher traits or behavior. Each item is rated using the following scale: 1 = not observed, 2 = needs improvement, 3 = shows progress, 4 = meets standard, and 5 = exceeds standard. In this study, I focused on the following two items related to technology use: (a) the plan provides meaningful ways that students can integrate technology or manipulative into their learning and activities, and (b) instruction uses a variety of ways to meet individual learning styles using media and is manipulative when appropriate.

For the validity of the observations, an observation protocol was created to ensure the CIOT measures what it was intended to measure. There are five observers from the BCI that conduct teacher observations using the CIOT. The observers are former classroom teachers with years of experience and training in various content areas. A chief of teacher training supervises the observers under the direction of the BCI director. The BCI staff created the CIOT with reviews and recommendations of external experts from the Regional Educational Laboratory: Pacific, administered by the Institute of Education Sciences' National Center for Education Evaluation and Regional Assistance. According to the chief of teacher training, the observers were trained to ensure the reliability and validity of the results of the observations. The observers attended a training where they watched videos of technology use in the classroom while they completed a CIOT during the video session. The observers discussed findings and other pertinent details following

the video session. The observers were then able to compare and contrast results from their findings to establish interrater reliability. Before actual classroom observations using CIOT, observers conducted observations with several teachers at different sites to ensure accurate interpretations of the experiences of teachers and students during active learning.

## Data Collection and Analysis

Data collection consisted of acquiring a de-identified list of teachers pre- and post-CIOT scores for lesson planning and lesson presentation from the BCI. The BCI ensured that this list consisted of at least 34 records, and the pre-CIOT scores were for the 2015 school year before teachers received tablets and post-CIOT scores were for the 2018 school year after teachers had used tablets for at least 1 year. To carry out the inferential analysis, I used a repeated measures *t* test that was appropriate for matched pairs data, given that the data were from the same group of teachers on the same measure before and after the 1:1 tablet implementation.

## Assumptions, Limitations, Scope, and Delimitations

I assumed the completeness of the records used in the analysis due to the accuracy of teacher scores. The data came from PMOE official records that are stored and maintained by the BCI, which is the unit responsible for developmental curriculum and instruction programs, including technology initiatives. The CIOT process is performed by a cadre of the BCI staff trained by regional educational experts on teacher observation and whose official role is to implement the CIOT.

The limitations of the ex post facto design include that the results cannot be generalized (Simon & Goes, 2013); however, the usability of results from research with this design is also well understood when investigating life-event experiences that occur in real-life situations in natural settings (Black, 1999). This ex post facto design also happened to provide limited data based on the data being collected at only two times (i.e., pre- and postimplementation). The research design might be different if there was longitudinal data or the data were collected closer to the time when the program was implemented. According to the director of curriculum and instruction, the PMOE leadership understood those limitations and saw the results of the current study as usable within the local context, especially in informing the immediate deliberations about the continuation of the technology program.

The scope is bound by the implementation of the PMOE's 1:1 tablet program, which was rolled out in 2015–2017. During this period, all teachers in primary school were provided tablets to use in their work. The implementer, the BCI staff, used an ELT framework. For the evaluation phase, they used an existing teacher observation process based on their internal CIOT. Deployments occurred in 2015, 2016, and 2017, while the classroom observations were conducted in 2015, 2016, 2017, and 2018.

The delimitations were within the boundary of the defined problem related to whether the technology purchased by the PMOE was being used by all teachers for lesson planning and classroom instruction following the roll out of the 1:1 tablet program. The purpose of this study was to investigate the difference in the level of teachers' use of technology for lesson planning and classroom instruction before and after they got tablets

through the 1:1 tablet program; therefore, theoretical frameworks other than the experiential learning approach taken by the BCI were not considered. As defined by the ex post facto research design, I did not include nonteachers, principals, students, or their parents as a part of this study.

## Protection of Participants' Rights

I requested the archival data from BCI. Because the data were de-identified, there was no need for informed consent because no individuals were contacted. Once I received Institutional Review Board approval (Approval No. 01-23-20-0592324) from Walden University, I wrote a formal request letter to the BCI director requesting permission to conduct the study. Included in the letter was the purpose of the study, an explanation of how the data would be used, relevant activities related to the study, and the benefits to the organization because of the study (see Creswell, 2002). The archival data generated from the CIOT are part of the PMOE's normal educational practice. The data are collected by the BCI staff to improve the instructional delivery of elementary school classroom teachers. I received the electronic, de-identified data set, in Microsoft Excel spreadsheet format, from the BCI director after they signed the data use agreement.

## Data Analysis Results

In this subsection of the study, I provide a detailed overview of the statistical analyses applied to the data and the research findings derived from the results. An ex post facto, causal-comparative research design, involving the statistical analysis of archival data, was employed to test for significant differences between levels of teacher use of technology before and after the deployment of the PMOE's 1:1 tablet program. The

provided data set consisted of the 63 eligible records where the teacher was observed using the CIOT in 2015 and again in 2018. The data set corresponds to before and after the deployment of the 1:1 program. The de-identified archival data were provided by the PMOE's BCI in tabular format with three columns: teacher, Score 1, and Score 2, where Score 1 was the level of teacher use of technology before deployment of the 1:1 tablet program, and Score 2 was the level of teacher use of technology after. The Statistical Package for Social Sciences (SPSS) software was used to conduct repeated measures *t* test analysis to determine if there was a significant difference between the mean CIOT scores for level of teacher use of technology (lesson planning for Research Question 1 and lesson presentation for Research Question 2) before (pretest) and after (posttest) the deployment of the 1:1 tablet program.

**Nonnormal Distribution of Data**

A post-hoc power analysis for repeated measures *t* test with an effect size of 0.5, the alpha error probability of 0.05, and a sample size of 63 resulted in a power of 0.97. For urgent and timely decision-making on funding priorities and allocation, which was the motivation for this project, the level of power was sufficient to accept the study results and move forward with recommendations. For data normality, I conducted the Shapiro-Wilk test using the SPSS software, resulting in the data displayed in Table 1. In each data set, the significance was substantially less than .05, indicating that the distribution of scores in each data set is not normal and violates the assumption of normality.

Table 1

*Tests of Nonnormality: Shapiro-Wilk for Pre- and Posttest Data*

| Group | Statistic | *df* | Significance |
|---|---|---|---|
| Research Question 1: Technology in lesson planning | | | |
| Pretest | .807 | 63 | .000 |
| Posttest | .869 | 63 | .000 |
| Research Question 2: Technology in lesson presentation | | | |
| Pretest | .817 | 63 | .000 |
| Posttest | .824 | 63 | .000 |

The study sample size of 63 teachers can address the violation of the assumption of normality. According to Ghasemi and Zahediasl (2012), sample size greater than 30 or 40 will not violate assumptions of normal distribution. In a series of simulations, Poncet, Courvoisier, Combescure, and Perneger (2016) found that the power of a *t* test remained robust in comparing normal versus nonnormal data, and in comparing against the nonparametric test. Snijders (2011) stated that the *t* test is robust against nonnormality except for cases with serious outliers. The data for this study has no outliers (scores are restrictive to 1 to 5), and the sample is moderately large. The repeated measures *t* test is robust enough in this situation, and the use case for the results of this study (PMOE decision-making and budget prioritization) allow for proceeding to the testing of the hypotheses.

**Research Question 1 Repeated Measures *t* test**

Research Question 1: What is the difference in the level of teachers use of

technology in lesson planning as measured by the CIOT before and after they received tablets through the 1:1 tablet program?

$H_0 1$: There is no difference in the level of teachers use of technology in lesson planning as measured by the CIOT before and after they received tablets through the 1:1 tablet program.

$H_A 1$: There is a difference in CIOT planning scores between teachers who taught before the introduction of the 1:1 tablet program and teachers who taught after the introduction of the 1:1 tablet program.

The Research Question 1 sample size was 63 and the scores are limited to a range of 0 to 5. The pretest had a mean of 0.92 ($SD$ = 0.98). The posttest had a mean of 1.33 ($SD$ = 1.00). There was an increase in the mean score between the pre and posttest of 0.41 or 10%. The two-tailed repeated measures $t$ test analysis determined that the increase was significant ($t$ = 2.514, $df$ = 62, $p$ = 0.015). The teachers therefore significantly increased the level of their use of technology in lesson planning.

**Research Question 2 Repeated Measures *t* test**

Research Question 2: What is the difference in the level of teachers use of technology in lesson presentation as measured by the CIOT before and after they received tablets through the 1:1 tablet program?

$H_0 1$: There is no difference in the level of teachers use of technology in lesson presentation as measured by the CIOT before and after they received tablets through the 1:1 tablet program.

$H_A 1$: There is a difference in the level of teachers use of technology in lesson

presentation as measured by the CIOT before and after they received tablets through the 1:1 tablet program.

The Research Question 2 sample size was 63 and the scores are limited to a range of 0 to 5. The pretest had a mean of 2.48 (*SD* = 1.544). The posttest had a mean of 3.10 (*SD* = 1.174). There was an increase in the mean score between the pre and posttest of 0.52 or 15%. The two-tailed repeated measures *t* test analysis determined that the increase was significant ($t = 3.070$, $df = 62$, $p = 0.015$). The teachers therefore significantly increased the level of their use of technology in lesson presentation.

**Findings, Conclusions, and Recommendations**

The purpose of this study was to investigate the level of teachers' use of technology for lesson planning and preparation before and after the deployment of the PMOE's 1:1 tablet program. The local context motivated the research that required appropriate applied research to inform the PMOE leadership decisions regarding technology funding prioritization and direction at the critical early stages of its 10-year Master Plan 2017–2026. The findings and conclusions derived from the research results are oriented toward providing practical utility and benefit to the PMOE in its critical long-term decision-making.

The study findings show that there was a 10% increase in the level of teacher use of technology in lesson planning, and a 15% increase in the level of teacher use of technology in lesson presentation. The *t* test analysis showed that the increase in the ratings of the teachers' level of use of technology was significant, with significance level of 0.015 for lesson planning and 0.003 for lesson presentation. In terms of short-term

planning, and in light of the urgency for this type of information necessitated by the PMOE leadership's immediate need to make policy and operational decisions at the critical early stages of its 10-year Master Plan 2017–2026, accepting these findings as indicative of the positive effect of the 1:1 tablet program is reasonable.

The conclusion is that the PMOE's 1:1 tablet program did have a positive effect on the level of teacher use of technology in lesson planning and presentation, and, because of that, the PMOE leadership does not have to take drastic and disruptive measures to change the approach. The primary recommendation from the study is for PMOE leadership to move forward with the 1:1 tablet program and continue to build on the recent investments as part of the PMOE's 10-year Master Plan 2017–2026. Two secondary recommendations, labeled so because they were observed in the context of the study rather than derived from the analysis, are no less important and should be considered.

The first concerns the general lack of any research on the impact of high-cost technology programs of the PMOE, even action research, or similar less rigorous investigations. Such a situation that places PMOE leadership at a disadvantage in critical strategic and operational planning. PMOE leadership should take steps to establish departments or units within its organization tasked with pursuing research-based information for the use of the PMOE. The second expands on the first. Because of the lack of research, and the consequence of not tailoring PMOE data for research, the scope of this study was limited by the comprehensiveness of archival data. There is an evidence that the 1:1 tablet program did have a positive effect on teachers' lesson planning and

preparation. The evidence necessitates the PMOE leadership to determine the factors that contributed to that effect so that detrimental factors can be discarded, and the program can continue to be improved. The PMOE leadership will need to take steps to ensure that research considerations become part of the development and planning of any program. A final recommendation is that a follow-up study be conducted to determine the role and impact of the various components (training, technology literacy, increased observation by CIOT, etc.) of the 1:1 tablet program. This will help PMOE leadership as they start to consider medium-term technology goals and more targeted operational improvements.

**Background and Summary of Analysis/Findings**

The PMOE leadership has undertaken initial steps to transform the ministry to improve outcomes for students in the most cost-efficient and effective manner possible. With the implementation of the PMOE's 10-year Master Plan 2017–2026, it became clear that prioritizing funding allocations is a critical issue at the early stages. This study looked at whether an expensive technology program which, under the substantial investment and operational requirements effectively set the direction for the next several years, and which was not researched or studied, could be justified by its positive effect. Such examination was critically necessary as PMOE leadership had to make immediate decisions on whether the expense of the program can be justified when other equally important strategic goals had effectively no funding.

The study found that, for the terms that the 1:1 tablet program of the PMOE was developed, there was a positive effect from the study findings that the increase in mean scores of the level of use of technology by teachers was statistically significant. The

evidence supports the conclusion that the 1:1 tablet program was not disruptive as a feared worst case scenario might have been. Rather, the stated objective of the program to improve the level of teacher use of technology in lesson planning and presentation was met. With this completed, the PMOE leadership now has data to begin deliberating on the next steps going forward. This information comes late (3 years after the start of the 10-year Master Plan) but is welcome nonetheless.

# Section 3: The Project

## Introduction

In this section, I describe a position paper with policy recommendations as a result of the study findings. A position paper with policy recommendations was the appropriate next step because the motivation behind the study was the urgent need for PMOE leadership to make research-based decisions on how to fund its new 1:1 tablet initiative and how to allocate funds among its many priorities including technology. For this study, I investigated the level of teachers' use of technology in lesson planning and presentation before and after deployment of the 1:1 tablet program. In Section 2, the findings showed an increase in the level of teacher use of technology lesson planning and presentation. As a result of the findings, PMOE leadership can make a research-based policy that addresses how limited funds are best utilized to improve the chances of technology programs successfully implementing the 10-year Master Plan 2017–2026. Using evidence from research in decision-making builds on opportunities for successful implementation and better return on investment (Zagami et al., 2018). In this section, I present a position paper with policy recommendations (see Appendix) to the PMOE leadership to support their decision-making and assist them in effectively setting the direction for the next several years.

## Rationale

The purpose of this quantitative, causal-comparative research design was to investigate the difference in the level of teachers' use of technology for lesson planning and lesson presentation at the PMOE. Accepting the findings that the PMOE's

technology program did have a positive effect on the level of teacher use of technology in lesson planning and presentation, I decided on the position paper genre as the most appropriate approach to take because it addresses the urgent need for understanding the technology program and successful implementation of the 10-year Master Plan at the PMOE. The following subsection comprises a review of the literature on policy development and recommendations.

## Review of the Literature

This subsection contains a review of recently published scholarly literature; doctoral dissertations; and peer-reviewed journals, including subject-specific information published in the last 5 years across the United States and other parts of the world from the following databases accessible through the Walden University Library: Dissertation and Theses, ERIC, Google Scholar, ProQuest, SAGE, and Thoreau Multi-Database. I also used literature published before 2015 in this review about education technology after my search had reached saturation. The following keywords and phrases were used in the search: *education technology, policy analysis, policy development, policy framework, policy recommendations,* and *technology policy.* I used these keywords until all the links were exhausted, which also revealed limited literature on policy recommendations and development published in the last 5 years.

In this section, I offer a scholarly review of the literature on the following guidelines of policy recommendations: (a) define the objective, (b) target an audience, (c) set out an issue clearly, (d) give options where possible, (e) recognize the current economic climate, (f) fit in with existing strategies, (g) provide real-world examples, (h)

remember the audience, (i) show positive social change, and (j) emphasize the importance of action (Centre for Ageing Research and Development in Ireland [CARDI], 2012). I chose the CARDI (2012) as the primary source for writing the policy recommendations because it closely aligned to the specific topic and context of this project study. Additional supporting documentation was mainly taken from Bardach and Patashnik's (2020) guide for policy analysis. The purpose of this position paper with policy recommendations was to provide the PMOE leadership with a position paper to improve its budget allocation decisions for technology.

**Define the Objective**

The objective of this position paper with policy recommendations is to enable research-based decision-making at the PMOE. Providing objective-based research findings for a policy recommendation helps guide decisions (CARDI, 2012). To improve the decision-making process for PMOE, procedures need to be in a place that formalizes the research required to support the decisions, and such procedures are established through policy. According to Bogenschneider, Day, and Parrott (2019), research function is important in policymaking in what to do, how to do it, and why. The findings and conclusions derived from the research results are oriented toward providing practical utility and benefit to the PMOE in its critical long-term decision-making.

**Target an Audience**

The second step in developing a policy recommendation is deciding the most important stakeholders of the policy (CARDI, 2012). The target audience for the policy recommendation was selected beforehand (see Musandu, 2013). They are charged with

priorities, overall planning, infrastructure development, training, and budget allocation. Clarifying their role in policy development is critical to the acceptance and usefulness of the policy (Food and Agriculture Organization, 2010). Successful policy interventions have a target population (Casanova & Price, 2018; FitzGerald, O'Malley, & Obroin, 2019; Moyson, Scholten, & Weible, 2017). It is equally important to select decision-makers who have knowledge or expertise to make decisions (Schneier, 2019). For example, school leaders do not often implement or provide professional development and support in technology for teachers; therefore, school administrators must understand how to effectively engage them (Gonzales, 2020; U. S. Department of Education, 2017; Zagami et al., 2019).

The audience for this policy recommendation is PMOE leadership. The challenges they faced regarding critical budget allocation between technology and other priorities and the return on investment of current technology initiatives motivated this study. They thoroughly understand the need for research-based decisions. The results of this study are anticipated to help with their budget allocation decisions in general and in assessing the return on investment of the current 1:1 tablet program.

**Set Out the Issue Clearly**

The problem or issue should be clearly defined and the findings should be stated based on data (CARDI, 2012; Herman, 2013). Bardach and Patashnik (2020) added that data could be turned into information that serves as evidence to address a problem. The need to collect quality information and analyze it well is essential to policymaking (FitzGerald et al., 2019; Warira, Mueni, Gay, & Lee, 2017). Furthermore, clearly

defining problems leads to what action to take and why it is needed (Bogenschneider et al., 2019; Dercon, 2019). The policy recommendation should be relevant, practical, and contextualized so that they elicit ownership (Zagami et al., 2019).

The PMOE has made a considerable investment in technology that is poised to become its first program over the upcoming years. The problem is that there has never been a study to determine whether teachers' use of technology has increased following the rollout of the program. The PMOE's general management concern is whether evidence can be developed to inform decision-making because they seek to implement an ambitious 10-year Master Plan whose major priorities compete for limited financial resources. The findings of this study provide evidence related to technology expenditures.

This problem was critical because the immediate and effective prioritizing of funds is necessary if the PMOE is to achieve the performance milestones of its 10-year Master Plan (PMOE, 2017b). According to internal financial records, of the key priorities that are unfunded, technology received 30% of development funds on curriculum improvements; 7% on teacher pedagogical courses; and 0% on capacity building for assessment, monitoring, and evaluation. The remaining development funds supplemented ongoing funded activities (PMOE, 2018). The PMOE leadership lacks the information to make research-based decisions about the appropriateness of the 30% versus 7% allocations to technology and teacher pedagogical courses, respectively. The findings of this study enable decision-making by providing the needed research with local context and relevance. Orland (2015) stated that the importance of the collection and reporting of

data fulfill the accountability objective. The findings from the quantitative data analysis show the need to provide the next step moving forward.

**Give Options Where Possible**

When policy decision-makers are presented with an alternative course of action or strategies based on research with evidence, they have the opportunity to make better decisions to solve the problem (Bardach & Patashnik, 2020; CARDI, 2012). For example, policy decision-makers can look beyond the implementation of policies and initiatives on small-scale technology in education. Such small-scale implementations can be from a school initiative, technology companies implementing programs in schools, and foundations implementing technology programs (Sancho-Gil, Rivera-Vargas & Mino-Puigcercos, 2020). Another example is policy borrowing or best practices as a new policy to either add or replace existing practice (Hinke & Candido, 2020). According to Mupinga (2017), schools need to create policies taking into account the advantages and challenges of technology and identifying what is working and adjusting policies as needed. Policy adjustments can help PMOE leadership as they start to consider medium-term technology goals and more targeted operational improvements.

**Recognize the Current Economic Climate**

A policy recommendation that takes into account the cost-effectiveness measures will save costs in the future (CARDI, 2012). Musandu (2013) added that policy decision-makers are interested in making cost-effective decisions. When making decisions, the benefits and the costs of the programs are best weighed before moving forward with technology (Kaebnick & Gusmano, 2018).

The reality at the PMOE is that priorities always exceed available funds, and prudent and wise prioritizing is needed to allocate limited financial resources to priorities. PMOE's funding level is not expected to increase much in the next 5 years. With the implementation of the PMOE's 10-year Master Plan 2017–2026, it became clear that prioritizing funding allocations is critical at the early stages because the effects of bad budget allocation multiply over time and become harder to recover.

**Fit in With Existing Strategies**

A policy recommendation based on research can contribute or influence the current policy changes or future development in policy (CARDI, 2012). Contextual factors are critical determinants of successful policy (Nino-Zarazua, 2016). The data generated for this study are part of the PMOE's normal educational operations; therefore, decisions about technology implementation may determine the future of the technology program at the ministry, which may provide for cohesive policy implementation (see Gherardi, 2017). Policy successes are made when decision-makers understand local needs and have ownership of the policy development processes (Nino-Zarazua, 2016). As a result, the findings and relevant activities related to the study may benefit the organization. According to Hinke and Candido (2020), existing policies can be rejected or ignored, and proposed alternatives are presented rather than just adding new policies or replacing them. King and Kraemer (2019) concluded that policies suggest a future course of action and can be amended over time. The President's Platform 2017 mandates that agencies (PMOE is a top-level agency of the national government) put in place cost-effectiveness measures and utilize data- or research-based decision-making (Republic of

Palau Presidential Platform, 2017). PMOE leadership is trying to transition the organization to fulfill the President's mandate. The current policy recommendation fits existing mandates and the accompanying strategies that are already being promoted within the national government and its agencies.

**Provide Real World Examples**

Presenting the success or drawbacks from real-world examples on policy issues helps decision-makers understand what others are doing in their programs (CARDI, 2012). Warira et al. (2017) shared examples of how researchers and communications experts dealt with research and policy gaps and connected policymakers with evidence in Kenya. Czerniewicz and Rother (2018) provided a content analysis of inequality in technology policy in universities in the United Kingdom and South Africa. Stosich and Bae (2018) drew lessons from four states in the United States on how engaging diverse stakeholders strengthens the policy. Their study showed the importance of stakeholder engagement in addressing policy issues and finding support for their policy implementation. Nabavi and Jamali (2018) used a qualitative approach to understand the different information needs of science and technology policymakers in Iran. Tairab and Ronghuai (2016) investigated how the planning and policy of technology in education can best serve students in Sudan. The need for a policy on technology requires better equipment, evaluation, and assessment for effective solutions and progress in K–12 education. In this project study, I also looked at policies from other countries within the region that had similar contexts to understand their policy development and technology implementation in their schools.

**Remember the Audience**

A position paper with policy recommendations should be in simple language and clear to the decision-makers (CARDI, 2012). Effective communication of research findings to influence decision-makers is central to bridge the gap between research and policy (Warira et al., 2017). A position paper with policy recommendations should also provide concise summaries of the findings to avoid generalizations (Herman, 2013). FitzGerald et al. (2019) added that people involved in making decisions should have some background knowledge or expertise of the issue. To present research information, Bardach and Patashnik (2020) recommended telling your story with language that is familiar to the audience and visual presentation of data analysis and findings using a PowerPoint. The current study provides up-to-date systemic information that is familiar and easily understood by the decision-makers who will implement the position paper with policy recommendations.

**Show Benefit of the Policy Recommendation**

A well-constructed position paper with policy recommendations shows why research-based recommendations benefit many different stakeholders (CARDI, 2012). According to Zagami et al. (2019), the purpose of policy in education technology helps nations move toward the digital future. Recent studies showed that public policies and technology has the potential to influence social change for all levels of stakeholders (Hinke & Candido, 2020; Kaebnick & Gusmano, 2018; King & Kraemer, 2019; Lamb, 2018; Mupinga, 2017; Sancho-Gil et al., 2020; Yiu, Laurie, & Hutchinson, 2019). This

study aims to transform the decision-making process based on research evidence to the benefit of PMOE leadership.

### Emphasize the Importance of Action

A position paper with policy recommendations should ensure that recommended actions are taken as a result of the research that may benefit society (CARDI, 2012). The policy is about the future, and future action is often a contested process (Bardach & Patashnik, 2020; Kaebnick & Gusmano, 2018; Miedzinski, 2018); therefore, the recommended actions are targeted at an audience responsible for the new interventions and its implementation. The ministry's intent to become a research-based decision-making organization can only be achieved by establishing policies and procedures that ensure that the research backing for decisions is undertaken by formally established and accountable units. This position paper with policy recommendations aims to do just that. It targets PMOE leadership, the group with authority, and the intent to establish such policies and procedures. It provides a policy paper with clear and implementable steps that are directly based on the local context.

## Project Description

The project's goal is to enable a better decision-making process at the PMOE. The proposed position paper with policy recommendations provides needed steps to establish procedures and accountability in the PMOE system that will enable decision-making. The proposed policy recommendations to the PMOE leadership should take place in November 2020. The policy adds research requirements to major decisions, modifies the missions and accountability of key units of the organization, and will affect current

routines and workflows. I will work with PMOE leadership to facilitate the adoption of the policies and resolve any issues with changes to unit and staff assignments and accountability.

**Potential Barriers**

The first barrier is the nonadoption of the recommended policies. This barrier will prevent the project from being implemented. The ongoing informal discussion indicates this will not be an issue as PMOE leadership has stated its favorable intent regarding the project and the change mandated by the President's Platform 2017. Subsequent barriers would be insufficient adoption, lack of follow-through, political disruptions in leadership continuity, and major changes in direction caused by political or economic change. These are all normal situations to be faced by leadership and are related to how an organization sustains its mission focus. PMOE leadership is aware of these potential barriers, and I can only trust they are handled as routine matters.

**Proposal for Implementation and Timeline**

The introduction of the position paper with policy recommendations should take place in November 2020 during the new school year. I will present the position paper with policy recommendations at the weekly meeting of the PMOE leadership. The approval of the PMOE leadership will indicate strong support of the position paper with policy recommendations that may influence other stakeholders to support the new intervention. After the PMOE leadership has approved the position paper with policy recommendations, I will also provide a similar presentation to the school principals during their monthly meeting. Before the position paper with policy recommendations is

finalized, a minimum of 6 months is allotted for deliberations and implementation (Rai & Palit, 2016). By April 2021, the entire process for presentation and implementation should be completed.

### Roles and Responsibilities of Student and Others

The position paper with policy recommendations will be a comprehensive document with relevant research, data analysis, and findings, including goals for actions. The presenter and the participants will play a vital role in the approval process of the position paper with policy recommendations. As a presenter, I will provide all the information from the research study and what actions to take based on evidence. My role as a presenter was to identify a problem, conduct a literature review of the problem, collect and analyze data, and present position paper with policy recommendations to the PMOE leadership for approval. It was also my responsibility to ensure that the policy recommendation is research-based and with presentable evidence. The responsibility of the PMOE leadership is to approve and implement the position paper with policy recommendations.

## Project Evaluation Plan

The focus of this position paper with policy recommendations is to enable the PMOE leadership to make better management decisions in implementing its ambitious master plan with limited resources concerning the technology program. Findings and the subsequent offer of the policy recommendation is provided to inform the PMOE leadership on their decision-making process with the use of technology in the schools. This plan provides a way to determine whether the goals of the project were met.

The purpose of this study was to investigate teachers' use of technology. The findings and conclusions derived from the research results are oriented toward providing practical utility and benefit to the PMOE in its critical long-term decision-making. The study findings show that there was an increase in the level of teacher use of technology. In terms of short-term planning, and in light of the urgency for this type of information necessitated by the PMOE leadership's immediate need to make policy and operational decisions at the critical early stages of its 10-year Master Plan 2017–2026, accepting these findings as indicative of the positive effect of the technology program is reasonable. The project's general goal is to enable a better decision-making process of the PMOE leadership, based on evidence derived from research. The specific goal of the project study was to allow PMOE management to make research-based decisions regarding the expensive 1:1 tablet program and the budget allocation it establishes for technology going forward into the remaining years of the master plan.

The key stakeholders involved in the presentation and implementation of the position paper with policy recommendations are the PMOE leadership, which includes the minister of education, bureau directors, division chiefs, and school principals. During project implementation, I will also provide continuous and ongoing support in areas of concern where needed. Other stakeholders are technology specialists and support personnel at the central office.

## Project Implications

The implementation and effectiveness of this project may have implications for positive social change. The proposed policy intervention will possibly lead the PMOE

leadership to become change agents for other stakeholders, not only for the continuous use of technology but also for other programs within the public school system. As a result of this project, this research may also generate knowledge about policy development and implementation processes and how they may benefit the school community. In a broader context, as noted earlier, other jurisdictions and countries, along with PMOE, value the results of existing research from developed nations and expect one day to be in a position to make use of the research findings. This project may have far-reaching implications in offering positive changes in other school systems as they undertake similar research to develop their policies regarding the use of technology.

## Conclusion

In Section 3, I presented a description of a position paper with policy recommendations as a result of this study. In this section, I described a project delivery as a position paper with policy recommendations, followed by a rationale for the urgency of creating a position paper with policy recommendations for the PMOE. I conducted a literature review with the implementation timeline focusing on the position paper with policy recommendations. This section ended with the project evaluation plan with the project's goals and implications on the local and broader contexts. Section 4 includes reflections and conclusions, project strengths and limitations, recommendations for alternative approaches, scholarship, project development, and leadership and change, implications, applications, and directions for future research, and a conclusion.

# Section 4: Reflections and Conclusions

## Introduction

In this section, I reflect on my growth as a scholar and practitioner as well as conclude the project study. The strengths and limitations of the project; recommendations for alternative approaches; my reflections on scholarship, project development, leadership and change as well as the importance of the work; and implications, applications, and directions for future research are provided.

## Project Strengths and Limitations

The strength of this project was that it directly responded to a clear and present need of the PMOE, addressing an urgent decision-making issue regarding high-cost technology programs in the face of difficult prioritizing of scarce resources to implement an ambitious 10-year Master Plan. The project offers PMOE leadership the opportunity to make evidence-based decisions on the continuity of the technology program and funding allocation. This project would be the first locally based research study that provides contextualized data that addresses an issue at the PMOE. The position paper with policy recommendation can serve as a baseline for further policy research and development at the PMOE following a similar policy development process as outlined in Section 3.

The goal of the project deliverable was to provide a research-based position paper with policy recommendations for the decision-makers at the PMOE. Like all studies, there are limitations to this project. The use of archival data limits ambitions for more definitive research because I was restricted to using the data as-is with no chance for further questioning to discover additional potentially valuable information. The use of

archival data prevents finding out what PMOE leadership thinks about how the technology program is implemented, which could mean losing potential useful insights into how it works. Finally, even if the position paper with policy recommendations is approved by the PMOE leadership, there are still inherent limitations, including changing the organization's culture and structure as well as adjusting to political priorities to carry the recommendations.

## Recommendations for Alternative Approaches

I designed the position paper with policy recommendations to address the PMOE leadership's decision-making on the technology program. An alternative way to address the decision-making process would be to provide an evaluation report of the technology program to PMOE leadership. The purpose of program evaluation is to determine the worth of programs and make recommendations for improvement (Lodico et al., 2010). Because the technology program at the PMOE has been implemented, the natural step to take for program improvement would be an evaluation report addressing if the program worked or not during the implementation. An evaluation plan with recommendations may have provided similar outcomes as this project; however, I did not select this genre because establishing a technology policy for the PMOE should take precedence over evaluating the program or providing a teacher professional development training.

Another alternative approach would be creating a deliverable focused on professional development training on decision-making that may help the PMOE leadership implement what they learned as a result of this study. Like the evaluation plan, professional development training aimed at the PMOE leadership should happen after

creating and implementing policy. To improve knowledge of teacher behavior, alternative studies should be conducted using longitudinal data, interviews, and surveys. Such studies will also result in policy, professional development, or evaluation plan recommendations; however, with more opportunity to practice and more data points available over time, the recommendation could be different.

### Scholarship, Project Development and Evaluation, and Leadership and Change

Going through this doctoral program has been, for me, a journey of authentic learning and scholarship. Before this scholarly journey, I thought that decades of working in a complex field of education had adequately prepared me to understand and address complicated issues surrounding the decision-making process and the intricacies of education. Throughout my research study, I have learned valuable insights and lifelong skills that will benefit me in my daily work and workplace. I now understand how critical learning to interpret data into evidence for decision-making is for changing practices. As a practitioner, I have become more respectful of the use of evidence. Creating a structured, research-based policy for decision-makers has given me new perspectives and different ideas of leadership roles and responsibilities.

Throughout this journey, my scholarly growth in reading and writing has changed how I communicate and interact with others. I have become more assertive and confident when sharing new knowledge as a result of critical reading and interpreting peer-reviewed scholarly journals. Analysis of academic journals is a newly acquired skill that changed my worldviews and has extended beyond the PMOE. As highlighted in the literature review on policy development, telling my story is an essential step towards the

scholarship. My attempts to employ clean and carefully crafted sentences and paragraphs display my commitment to be understood. Reflective of the PMOE leadership's promotion of experiential learning, I have gained perseverance in learning by doing. I have learned lifelong skills and new ways of reading, thinking, and writing.

This project study was a confidence-building process where I have accumulated knowledge in reading materials that deal with issues that apply to my local context. The opportunity has provided me as a leader with a focus and clear direction on what it is that I want to do concerning policy development and implementation. Furthermore, the project study has been a capacity-building process for me and may well be for the PMOE leadership that includes developing skills and using research to improve. Altogether, it has been a scholarly journey of humility and confidence.

## Reflection on Importance of the Work

As noted earlier in this study, education technology is becoming ubiquitous in schools worldwide, while spending trends of significant resources continue to rise. The PMOE leadership faces a similar pattern of trying to address the accessibility and costs of the technology; therefore, this study proposes a systemic change. The importance of this research study lies in providing a solution to a problem at the PMOE concerning the technology program. To make a meaningful difference with this study, I addressed the problem by providing a solution with a position paper with policy recommendations. Being the first locally based study that addresses a local issue at the PMOE with contextualized data to inform the decision-making process is groundbreaking work. The research and its results could also serve as a springboard for further action.

This study addresses the need for appropriate decision-making on the technology program. It may also be used for other programmatic issues within the ministry. The goal of this study was to provide a position paper with policy recommendations that gave the PMOE leadership an opportunity to rely on data to drive decision-making and measure progress. The information gained from this study showed that data might transform the functions and purposes of the PMOE leadership decision-making process.

## Implications, Applications, and Directions for Future Research

This study has several implications that can be applied relevant to structural and operational changes. One implication is that, as a result of this study, PMOE leadership should consider formalizing the process of data-driven policy development and implementation. A second implication is that the PMOE leadership can use the quantitative data collected and generated in this study as evidence to connect organizational practices to measure the progress of not only the technology program but also others. A final implication is that PMOE leadership could use this study as a baseline that identifies ways of improving established routines and procedures. The PMOE leadership now has a reliable, evidence-based research position paper with policy recommendations to use to help move forward.

A general implication for positive social change arises from the fact that all levels of the society, from individual to groups, organizations, and national government, now have access to the research cited or conducted by the PMOE to justify its strategies. This independent and unfiltered access to the whole body of information that the PMOE may use will empower individuals, groups, and organizations to fully participate in how the

PMOE, one of the primary movers for social change, carries out its mandate. More specifically, the use of research for decision-making will gradually build a comprehensive and documented foundation for educational strategy, one that can be scrutinized to ensure that, first, no groups or classes within the populace are underserved or forgotten, and second, that allocation of services is fair and equitable. These fundamental aspects of social justice that are difficult to address when the mechanism for change rests only on professional vocation and government hierarchy become accessible when the PMOE open sources the drivers for its decision-making mechanism. Individuals, groups, and organizations who are empowered are better able to help students navigate and succeed in the educational system.

Future research on this topic should include qualitative research methods (e.g., interviews and case studies). Qualitative research gives the participants' voices and perceptions in the study (Lodico et al., 2010). Such a study would look to collect the opinions, understand the perceptions, and seek recommendations of the teachers and PMOE leadership. In this project study, I used quantitative methodology, but qualitative research might examine the teachers' technology skills and use them in depth. A similar study may shed light on the PMOE leadership's experiences with and motives for their decision-making actions.

## Conclusion

The position paper with policy recommendations resulted from a real and urgent need situated within the live context of the PMOE's immediate policy and operational decision-making. The findings of this study that backs the position paper with policy

recommendations enables the PMOE to respond to their needs by making decisions based on reliable and timely research. Systemic reviews of current literature, the findings, and the discussions of assumptions and limitations included in the study can be used to inform the decision-making process at the PMOE by facilitating the next steps, whether in additional research, organizational and functional adjustments, or more. More specifically, the project deliverable marks a turning point in the PMOE as an organization where existing awareness and acknowledgment of the need for research to inform strategies for dealing with scarce resources amid multiple and equally important priorities was finally actualized. For the first time, research was conducted to enable critical decision-making. The findings of this study positively affect the enterprise level in guiding the organization towards its goals down to the program level of how best to implement the 1:1 tablet deployment. By adopting the directions indicated in the findings of the study and the resulting position paper with policy recommendations (i.e., that of improving and increasing the capability for research-based decision-making), the PMOE will achieve what it has long wanted to do, to become a research-based decision-making organization.

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Appendix: Position Paper with Policy Recommendations

*A position paper with policy recommendations to the leadership team concerning the use of technology at Palau Ministry of Education.*

## Introduction

This position paper with policy recommendations aims to address the problem the PMOE leadership currently faces concerning decisions about the allocation of funds for its technology program. School leaders face challenges in budgeting and sustaining technology programs in the schools (Gonzalez, 2020). There are frequent discussions on policymaking with evidence-based decisions (Warira et al., 2017; Zagami et al., 2018). This position paper with policy recommendations enables evidence-based decision making by establishing and implementing the policies and procedures that ensure research evidence with local context and relevance are available to PMOE decision-makers.

## The Problem

The PMOE has made a considerable investment in education technology for over two decades. This habit of substantial technology expenditure plus the Presidential mandate (President's Platform 2017) to leverage technology to improve cost-effectiveness already drives PMOE technology expenditure. As the PMOE ponders its limited financial resources in light of resource-hungry and equally important priorities of its ambitious 10-year master plan (PMOE, 2017b), budgets for education remain constrained without indication of future increase. This pressure on limited financial resources was further increased when in 2015, the PMOE embarked on a new 1:1 tablet

initiative, which would reserve a substantial share of the PMOE's development budget to technology, leaving the other master plan priorities to fight for remaining dollars. The PMOE needed to assess its technology programs and make very prudent decisions on budgets going forward to have a chance for success with its master plan. The problem, therefore, seemed clear - because it has not been done in previous situations, there was a real and urgent need for an investigation of the current 1:1 tablet initiative, the results of which would inform the decisions that needed to be made by PMOE leadership. I conducted a study that investigated whether, as PMOE had planned for, teacher use of technology in lesson planning and presentation has increased after the rollout of the 1:1 tablet program, to provide PMOE leadership with findings on which the merit of the current technology approach and expenditure can be assessed.

## The Current Policy

A starting point would be identifying what existing policy is working and what is not, and make recommendations to improve the status quo (Mupinga, 2017; Musandu, 2013). The PMOE does not have policies or standard practices that ensure major decisions are backed by research and data. Research-based decision making is a goal within the ministry, pursued individually and in top-level plans such as the ministry's management action plan (MAP, 2018). Hinke and Candido (2020) added that existing policies could be rejected or ignored, and proposed alternatives are presented rather than just adding new policies or replacing them. Since the 1990s, Singapore has demonstrated the advantages and successes of enabling technology policies in implementing successive master plans and investments (Butrymowicz, 2014; Hung & Huang, 2016). This position

paper with policy recommendations aims to assist the PMOE leadership in addressing the effectiveness of the technology program and appropriateness of its funding level. It will recognize existing efforts through formalization within the current context rather than just introducing brand new policies.

## Research

In preparation for the position paper with policy recommendations, I conducted a literature review of peer-reviewed journals. I chose the Centre for Ageing Research and Development in Ireland [CARDI, 2012] as the primary source with support from Bardach and Patashnik's (2020) guide for developing and writing the policy recommendations. Successful policy interventions have a target population (Casanova & Price, 2018; FitzGerald, O'Malley, & Obroin, 2019; Moyson, Scholten, & Weible, 2017). It is equally important to select decision-makers who have knowledge or expertise to make decisions (Schneier, 2019). The problem addressed by this project logically dictates that the key stakeholders are the decision-makers who approve policy and drive its implementation. Clarifying their role in policy development is critical to the policy's acceptance and usefulness (Food and Agriculture Organization, 2010). PMOE leadership and the line managers in charge of the programs are charged with priorities, overall planning, infrastructure development, training, and budget allocation in the specific case of the 1:1 tablet initiative and, historically, in previous technology initiatives. They are an obvious and logical audience.

## Synopsis of the Study

I began this study by discussing the local problem at the study site. I then presented supporting data defining the problem with the use of technology at the PMOE. After formulating the research questions, I conducted a review of the literature associated with the use of technology in schools. After conducting the literature review, I decided on research design and approach that was appropriate for this study. I then discussed the setting and sample, as well as the instrumentation and materials for the study.

The purpose of this study was to investigate teachers' level of technology use at the PMOE. The study findings show a 10% increase in the level of teacher use of technology in lesson planning and a 15% increase in the level of teacher use of technology in lesson presentations. The *t* test analysis showed that the increase in the ratings of the teachers' level of use of technology was significant, with a significance level of 0.015 for lesson planning and 0.003 for lesson presentation. The conclusion is that the PMOE's 1:1 tablet program did have a positive effect on the level of teacher use of technology in lesson planning and presentation, and, because of that, the PMOE leadership does not have to take drastic and disruptive measures to change the approach.

The study found that, for the terms that the 1:1 tablet program of the PMOE was developed, there was a positive effect from the study findings that the increase in mean scores of the level of use of technology by teachers was statistically significant. The evidence supports the conclusion that the 1:1 tablet program was not as disruptive as a feared worst-case scenario. Rather, the program's stated objective to improve the level of

teacher use of technology in lesson planning and presentation was met. With this completed, the PMOE leadership now has data to begin deliberating on the next steps.

## The Policy Recommendation

The position paper with policy recommendations from the research study, is for PMOE leadership to move forward with the technology program and continue to build on the recent investments as part of the PMOE's 10-year Year Master Plan 2017–2026. Two secondary recommendations, labeled so because they were observed in the context of the study rather than derived from the analysis, are no less important and should be considered. The first concern is the general lack of research on the impact of high-cost technology programs of the PMOE, even action research or similar, less rigorous investigations. Such a situation places PMOE leadership at a disadvantage in critical strategic and operational planning. PMOE leadership should take steps to establish departments or units within its organization that are formally tasked and accountable for pursuing research-based information for the use of the PMOE. The second expands on the first. Because of the lack of research, and the consequence of not tailoring PMOE data for research, the scope of this study was limited to what the available archival data could support. It is only fortunate and not by design that there was enough to arrive at evidence that the 1:1 tablet program did have a positive effect on teachers' lesson planning and preparation. The PMOE leadership will need to take steps to ensure that research considerations become part of the development and planning of any program and the organization's general data-gathering processes. A final recommendation is to conduct a follow-up study to determine the role and impact of the various components

(training, technology literacy, and increased observation by CIOT, etc.) of the 1:1 tablet program. This policy recommendation will help PMOE leadership as they start to consider medium-term technology goals and more targeted operational improvements.

## Recommended Course of Action

A policy recommendation should ensure that recommended actions are taken as a result of the research that may benefit society (CARDI, 2012). The policy is about the future, and future action is often a contested process (Bardach & Patashnik, 2020; Kaebnick & Gusmano, 2018; Miedzinski, 2018). King and Kraemer (2019) added that policies suggest a future course of action and can be amended over time. The recommended actions are targeted at an audience responsible for the new interventions and their implementation. The evidence suggests that the PMOE leadership move forward with the technology program and continue to build on its recent investments. There are existing units in the ministry that are responsible for research and data collection (Executive Order No. 268, 2009). The leadership must take steps to formally instill the capability, responsibility, and accountability in these units so that they provide research-based information as a matter of routine. If the ministry should continue to invest in technology, research considerations must become part of any program, and follow-up studies must be conducted to determine the role and impact of the various components of the technology program. Rai and Palit (2016) stated that a policy paper should be comprehensive to cover all relevant areas with clear objectives for action, including financial and evaluation plans. The findings and conclusions from this study provide policy recommendations that will benefit the PMOE in its long and short-term

decision-making.

## Project Evaluation

This position paper's focus on policy recommendations is to enable the PMOE leadership to make better management decisions in implementing its ambitious master plan with limited resources concerning the technology program. Evaluation necessarily looks at how to ensure that the goals of the project are achieved. The following are project goals and how they will progress.

The general goal of the project is to enable a better decision-making process of PMOE leadership based on evidence derived from research. The specific goal was to improve funding reallocation within the master plan's priorities, especially regarding the share of the technology tends to attract. First, this position paper with policy recommendations correctly target the leadership and line program managers. This group can effect change and is accountable at the policy and operational decision levels required to enable the success of any change. The measurement of progress will be a formalization of the policy and procedures within the organization structure. Second, this position paper with policy recommendations recognizes the context and targets improvement to existing units in a less disruptive manner that is already aligned with the apparent intent of current leadership and line managers. Another measurement of progress can be by the adjustment of unit operational manuals and review of each unit's production records. Third, the products of the research units themselves can gauge whether the policies are implemented, and research is being done as a matter of routine and in specific cases where essential decisions have documented research backing.

Finally, the implementation timeline is a strong driver of change. Actions are occurring naturally within the implementation of the master plan that will expose whether the recommended policies are in place and useful or not.

## Conclusion

The urgency of prudent decision-making as the PMOE leadership faced a confluence of factors has brought this position paper with policy recommendations to this point. Factors include old spending habits for technology, mandated pressures to invest in technology, new technology initiatives to keep from being left behind by the technology age, and the condition of being a financially constrained organization trying to effect positive change through an ambitious master plan. It is fortunate that in the early stages of the implementation of its master plan, there happened to be an on-going initiative with enough archival data to allow investigation for evidence to help PMOE survive its decision-making challenges. The policy recommendations may not be brand new or unknown to PMOE. They are contextually located and are actual articulations of things the PMOE leadership have been working towards. If implemented, this position paper with policy recommendations can serve as a resource and guide for PMOE leadership to move forward with their efforts to improve their decision-making capabilities.

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