Research Proposal

Impact of Theoretical Frameworks and Gamification for the Instructional Delivery of Mathematics in 6th Grade Classrooms.

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Chapter 1

Introduction

At this stage in society with technology, with its advancement, it is conceivable that technology is able to make a significant difference in the way that knowledge is transferred. The probability "to improve student performance" is high depending on how technology is perceived, and how it is "integrated in teaching and learning" (Nair et al., 2021). Integration of technology should be founded on the knowledge of educational theories and frameworks (Angeli et al., 2016). A non-theoretical approach to technology integration will produce limited success and access to teaching and learning (Angeli et al., 2016). According to Nair et al. (2021), researchers have elaborated on "theories and pedagogical frameworks that should be considered for the effectiveness of technology integration." This is why scientists in the technology field speak of "Information and Communication Technology (ICT) of the 21st century" (Nair et al., 2021). The ideal way to get students to become "more interested in subject" matters is through the integration of technology (Terra et al., 2020). But this is not going to happen without research work to build confidence on available technological frameworks and their usefulness in the strengthening of technology integration. Synthesizing "multiple framework models" and explaining "how they fit within each other" theoretically should be the main objective of theorists (Herring et al.,2016). According to Herring et al. (2016), there is significant definitional variation of how constructs and concepts are used and understood." Therefore, there is a need for a holistic view of theoretical models.

Theoretical Frameworks

The framework that will guide this research project is the TPACK model that stands for technology, pedagogy, and content knowledge. This theoretical structure was "developed and published by Mishra and Koehler" (2006 as cited by Hill et al., 2020). According to the TPACK model, teachers should know their content material, the pedagogy, and the technology that aligns with concepts and standards (Hill et al., 2020). In this manner, as described by Hill et al. (2020), pedagogy is "the teacher's knowledge about the methods, practices, and processes for teaching and learning." This pedagogy should be used to facilitate the transmission of knowledge, which determines the teacher's approach to teaching (Terra et al., 2020). In other words, there is a correlation of how a teacher decides to teach to the level of TPACK knowledge meaning that "technology, pedagogy, and content are intricately linked" (Herring et al.,2016). A teacher's success in models depends on the teacher' ability to manipulate its features (Loong et al., 2018).

Statement of the Problem

What a teacher believes about technology is what determines the teacher's use of technology. Students need skills and abilities in the use of technology as a lifelong potential. This practice has to begin in the classroom. If teachers are not integrating technology in the classroom, students are not building the twenty-first century skills that they need to succeed. According to Caminiti (2019), "many investigations have reported low levels of technology integration by teachers." Researchers are still investigating what they should do for technology to have a full positive impact on education, teaching and learning. At the same time, very little

is done to ensure that the educational community has the mastery of the technological, pedagogical, and content knowledge domains (Nair et al., 2021). Educators working with children should have a profound individualistic knowledge of how effectively pedagogy, technology, and content are able to interact (Nair et al., 2021). Mastery in the field of technology will guide "efficiency in learning" (Terra et al., 2020). It is crucial that theories and theoretical models gain prominence among educators in the development of strategies that will serve to dictate classroom procedures. Although theoretical models are "widely used in teacher preparation," there is a lack of theoretical emphasis (Kimmons et al., 2018).

Technology Status

Technology is a need. Technological benefits are countless, but they must be applied in "a structured way" (Bruyckere et al., 2016). As Bruyckere et al. (2016) affirms, "the use of technology in a randomly unstructured manner does not always have lasting effects." Technology is so advanced, manageable, and ubiquitous, it does not make sense that it is not activated that student achievement exceeds expectations. "The classroom environment being no longer books, blackboards, pictures, and overhead projectors" should operate within the designation of "chosen pedagogical strategies" (Taş, 2017) along with "information communication technology" (Bruyckere et al., 2016) organized in an "active way" (Taş, 2017). "Efficiently timed," technology will contribute to having "permanence in learning, concreteness in learning, increase in student activity, motivation in learning, and better time management in the classroom" (Taş, 2017). Technology works best with teacher-to-student and

student-to-student involvement with “explanative feedback, differentiation, and advice” (Bruyckere et al., 2016).

Benefit of this Research Study

The result of this study may guide on how best teacher professional development may be conducted and that teacher may develop the willingness to use technology in the classroom to meet student technological needs. “Teachers must make a considerable investment of their time to prepare themselves to use technology resources well” (Roblyer et al., 2010). A focus on the development of theories will enable educators to experience novelty educational methodologies (Nair et al., 2021). Students experience a transition from school to life and to work. School as a training ground should prepare them to meet the expectations of the workplace such as “the changing ways of communication and the tools” (Nair et al., 2021). This is why there should be technology in the subject matters to prepare students for the future (Nair et al., 2021). It is not the curriculum that is going to be changed. What is going to be changed is how the curriculum is taught.

Relevant Prospect of Technology

Technology, as a “medium and a tool, cannot change education” (Bruyckere et al., 2016). What a student receives and what a teacher transfers through instruction are not the direct result of a computer, the Internet, or a software application. According to Bruyckere et al. (2016), it is not the “tool, or the resources, or the medium” that will make an impact, but their “correct use.” Technology, whether digital or analog, has to be within a well-designed format. A

classroom setting may have “television, computers, smartboards, tablets, and iPads,” if there are no strategies, no methods, and pedagogy involved, with the employment of these mediums, “education will not change,” meaning significant learning will not take place (Bruyckere et al., 2016). The impact will be with the collision of technology and frameworks (Nair et al., 2021).

Purpose of the Study

This study will seek to document that teachers that are trained in the knowledge of theories and pedagogical frameworks will be more inclined to integrate technology in teaching. With technology integration, the classroom will be better managed and students will be more engaged (Caminiti, 2019). However, to have that engagement and for teachers to have that preparation, they have to have been exposed to the knowledge and theories of educational models. Researches that have documented training of teachers on theoretical frameworks with an emphasis on theories are few. Knowledge of theories and pedagogical frameworks are important in the integration of technology. If educators want to improve performance, they need to investigate where they should put the most time and effort. According to Herring et al. (2016), frameworks “act as a coat closet” that gives a total view of what is ought to be seen. With frameworks as “a spotlight,” there is a clear view of what ought to take place for procedures, processes, and products (Herring et al.,2016).

The Role of Pedagogy and Strategical Methods in Instruction

According to Clark (1983 as cited in Bruyckere et al., 2016), what “makes a difference in learning” is the “pedagogy.” It is the way the lesson is introduced, developed, and concluded. It is the checking for understanding as instruction unfolds. It is the timely feedback on student

products. It is the personalization of instruction to boost up morale, trust, and to subside student anxiety. It is to differentiate instruction at all proficiency levels. To see improvement in learning and an increase in the rates of "achievement," there must be more than the media which are "mere vehicles for the delivery of instruction" (Clark, 1983 as cited in Bruyckere et al., 2016). As Taş (2017) states, for the "educational services to be more effective, the educational activities, such as the sources, the process, the equipment, the characteristics of students should be pre-arranged and predetermined." The result that educators are seeking will be found when they find the good match of technology and theory (Kimmons et al., 2018). Researchers should not focus on the appearance and usefulness of one model over another, but on what all together they might produce (Kimmons et al., 2018).

The Profitability of Good Teaching

As Bruyckere et al. (2016) emphasizes, education develops when "the good use of technology is paired up with good teaching." Media has a role in education. They are the "supplement, the amplifier, the encouragement, the motivator, and the "engager" although not for all students (Bruyckere et al., 2016). Based on Clark and Felon (2014, as cited in Bruyckere et al., 2016), "multimedia are more beneficial to students with advanced prior knowledge." Multimedia, when it is poorly planned and differentiated, is useless to the novice and the struggling student. Therefore, teachers should not be "passive; rather they should be active in the arrangement of technological environments" (Taş, 2017). Time should be used for productivity, and "technology in the classroom environment should not be used in a perfunctory manner" (Taş, 2017). This would "cause monotony," boredom, and disruption in

the classroom environment, with the creation of " new classroom management problems' ' (Taş, 2017). According to Loong et al. (2018), classroom engagement and the maintenance of student's attention are the right reasons to use technology in a classroom. Additionally, a teacher should also have knowledge and depth in technology to be able to enrich a classroom experience (Hill et al., 2020). According to Gina (2009 as cited in Sandholtz, 2001), technology combined with pedagogy "offers richer, more varied, and more engaging learning opportunities for students." Hence, TPACK is selected to encourage "the integration of educational technology across curriculum" (Gina, 2009 as cited in Sandholtz, 2001) so that students do not lag behind in success, achievement, growth, and development.

Dimensions of Technology in the Classroom

There has been research done on percent of technology and pedagogy that should be allocated in a classroom. This research would like to demonstrate that technology also should be timed in a classroom so that technology can have its full effect and success. Timed meaning that students are practicing a task, or an activity within a percentage of a class period using a technology tool. For instance, the teacher introduces a lesson during 15% of the time. The students discuss the lesson and demonstrate their understanding for 20% of the time. Then, the students practice the learned skills on an integrated technology tool for 50% of the time. Finally, the students present a summary of the lesson in the remaining 15% of the time." This accords with Taş (2017) that "a teacher should use time well to be able to teach well and to be a good classroom manager." Student time should not be wasted since "wasted time" is irreplaceable and lost forever (Taş, 2017). Technological time, in this case, refers to time on task developing

a skill whether solving equations, writing an English composition, and/or developing a science or social study project. The intent is to promote changes in digital pedagogical techniques that students may experience greater success. As students develop "their social and metacognitive strategies," their performance on time on tasks will improve (Chung, nd).(Djiwandono, P. I., 2020).

Passive and Active Use of Technology

According to Gina (2009), "the fundamental methods and techniques of teaching have not changed although most classrooms have Internet connection and a significant number of computers." The emphasis is on an independent practice that is timed to produce a positive and promising result. For instance, the use of technology tools such as Google Slide and Nearpod PowerPoint presentation will be accounted as pedagogy on the passive side. It is the same as watching a video, another passive case of using technology. However, when children are creating and editing a video, that would be an active use of technology, which may be counted towards the percentage of constructive use of technology. The goal is to work on a "detailed plan for how technology would support larger curricular goals" (Gina, 2009, as cited in Keane, Gersick, Kim, & Honey, 2003, p. 15).

Supplementation to Technology

It is documented that technology all by itself is insufficient to produce great success in education (Hill et al., 2020). It is not that technology is inadequate and incapable. The problem is that technology has been used mostly in the passive manner such as watching a video, playing

a game, and taking a quiz. “New educational technologies can help transform schools, but only if they are used to create new models of teaching and learning” (Gina, 2009). Technology should be redirected more towards the stages of the SAMR model. For example, for substitution and augmentation, a student uses Google Docs to write and edit an answer. For modification, a student creates a video with a Google slide presentation. Still with the same topic and prompt, a student creates a movie for redefinition. Technology and pedagogy can do it. “In certain circumstances, technology has been shown to help students learn more, at a faster rate, with more motivation, and with greater connections to the community and the outside world” (Gina, 2009 as cited in Lemke & Coughlin, 1998; Niederhauser, Lindstrom, & Strobel, 2007; Schacter & Fagnano, 1999).

New Development with Technology

This research will focus on setting a path that will ensure that digitized technology is used for excellence in productivity. Technology should be used not simply to keep students emotionally engaged, but also intellectually invested in a classroom setting. “In its many forms, technology has become a powerful tool to enhance curriculum and instruction" (Gina, 2009 as cited in Clark, 2006, p. 482). There are computers in the classroom. However, the impact is still “minimal on teaching and learning” (Gina, 2009). Interactivity will have to go beyond clicking a, b, c, or d on a remote or wireless device. It will mean sitting on a device, for a substantial amount of synchronized time, critically thinking through a subject. Meanwhile, the teacher may have access to the work, providing feedback as part of pedagogy. This research will revolutionize technology approaches to teaching and learning. “Technology” will be used as “a resource for

achieving critical competencies such as higher level thinking skills" (Gina, 2009 as cited in Moersch, 1998).

Research/Guiding Questions

1. How would knowledge of technological theories impact student performance at the middle school level?
2. What changes should educators expect to encounter in education, communication, and transfer of knowledge with the right perception of technology integration?
3. How should theories and pedagogies pair up with content activities to improve classroom management and student performance.
4. What is the percentage of classroom time that should be allocated for digital technology in a middle school classroom setting that students may experience complete success in learning with smoothness in classroom management?
5. How does technology contribute to the development of high achievement at the middle school level for all students?
6. How do the responses of the qualitative interviews and the observations combine with the questionnaire scores from the quantitative phase to demonstrate the amount of time that should be set to active learning through digital technology?

Limitations and Delimitations

This study is about technology integration in an urban middle school. It means that it is not applicable for high school or higher education. However, it is purposely designed to study how technology can be effectively integrated in a middle school. The participants are 6^{th}, 7^{th},

and 8th grade educators including teachers, administrators, and counselors, at these levels. This study can be replicated to include higher education professionals and contexts to determine the applicability of this design in higher levels. Moreover, the spectrum can be enlarged to include multiple and diverse middle schools to generate universal theories and frameworks on strategies and techniques to integrate technology on a general stage.

Definitions

Technology integration, theoretical frameworks, gamification, theory, digital vs. non-digital, methodology, technology, classroom management, instructional delivery, correlation, metacognitive strategies, digitality

Outline of the Study

Chapter 1 introduces the research foundation laying out the ground work explaining the role of theories and pedagogy in technology integration, including the purpose of this study. It discusses the level and nature of knowledge that is critical for the advancement of technology integration in the classroom. Chapter 2 centers on the historicity of theories, documenting the journey of theorists in their search to present a scientific view of education, establishing distinction, coherence, and complementation among theorists. It elaborates on theorists' pedagogical views, learning theories, and instructional prescriptive methods with an emphasis on some influential theorists such as Piaget, Vygotsky, Dewey, and Skinner. Chapter 3 exposes the methodology that will be used to "plan, conduct, and evaluate" the data in this research (Creswell, 2019). It presents a justification for the research design stressing on statistics and the

means by which the data will be triangulated, validating, setting up reliability with a descriptive and inferential analysis of the data.

Conclusion

In today's society, digitality, within the four walls of a classroom, is a need. In the same manner that one individual necessitates food, shelter, and clothing, a classroom has to have enhanced use of technology for basic student growth and development as a requirement of the time. Digitality in a classroom is no longer a prerogative, but an imperative. The matter is not simply what and why technology should be integrated in content knowledge, but how. Therefore, educators have to be adept in the classroom in the use of advanced technology, pedagogically and theoretically. And, this is the goal of this study: to research the techniques, the conceptualizations, and the perceptions that would guide twenty-first educators to fulfill their ultimate mission. There are available frameworks in the educational arena that have the potential to reach this objective. The paradigm has to be shifted to focus on theories and the body of knowledge that is at the foundation of their inception in a holistic "pedagogical purview" (Lyddon, 2019).

Chapter 2

Review of the Literature

Introduction

Contemporary “Good teaching” and on what it is based are the main purpose of this research study (Woolfolk, 2007). Many learning theories were developed to explain the approach to good teaching and the learning process. According to Woolfolk (2007), teaching has always been founded on theories and technology whether digital or non-digital. At any time in history, there have been “challenges and possibilities with teaching,” and digital technology has not changed the landscape. Teachers are impactful and their beliefs “make a difference” in their area of influence (Woolfolk, 2007). This is why they need to be trained to understand the place of technological models and theories and to be able to combine theory, technology, and pedagogy. The goal is “not to divorce the theoretical from the practical,” but to allow theories to assume their role and their proper place in the science of teaching (Richard-Amato, 2003).

Piaget versus Vygotsky

To develop “a better understanding of the teaching and learning process,” educators need to have “theories” (Woolfolk, 2007). Many of the theoretical applications that are the bases for teaching and learning today were developed by Jean Piaget and Lev Vygotsky (Woolfolk, 2007). Piaget developed the concept of cognitive development theory whereas a person gathers “new facts and ideas to an existing store of information” (Woolfolk, 2007). In addition, Richard-Amato (2003) theorized on “connectionism” with the belief that the brains have a storage network system which works as a site of knowledge and development. What the brains do and what they are able to store work in pairs (Richard-Amato, 2003). With the connectionist theory, Piaget and Richard-Amato rejoin each other. In addition, Piaget speaks of “social transmission” that occurs as we interact with the “environment” (Woolfolk, 2007). The relevance of the “social transmission theory” is that students develop cognitively with

interactivity. Students have to be challenged. The primary role of the teacher is to place students in that challenging environment. This concept is a deduction of Piaget's social transmission. According to Piaget, students will develop "information processing skills and learning strategies" as students interact with content with "biology being the determiner" (Woolfolk, 2007) (Richard-Amato, 2003). However, Vygotsky has a different theoretical view. To Vygotsky, "society is the determiner" of cognitive intelligence (Richard-Amato, 2003).

Behaviorist Theory and Audio-lingualism

The connection of teaching and theory is nothing new. Woolfolk (2007), believes that teaching is a theory-based science." There is effectiveness in teaching when teachers are "theoretically knowledgeable, using and inventing strategies" (Woolfolk, 2007). For instance, it is believed that "audio-lingualism, a new scientific oral method, was based on behaviorism," a Skinner's theory" (Richard-Amato, 2003). For instance, language is learned through listening, repeating, rehearsing, connecting, and responding as a result of some sort of theoretical behavioral reinforcement in accordance with Skinner's conceptualization of environmental stimulus response (Richard-Amato, 2003). Behaviorism has been an important theory in education for more than half of a century. With all its implications in education, behaviorist and neo-behaviorist theoretical concepts will continue to assume their spotlight in Information Communication Technology.

Evolution of Learning Theories

Over the years, researchers have developed "general theories" and other theories that answer to "specific situations" (Woolfolk, 2007). Therefore, learning theories have evolved.

Learning theories explain “processes inside the brain that allow human beings to learn and remember” (Roblyer et al., 2010). Learning theories go as far back as Aristotle (384 – 322 B.C.) (Woolfolk, 2007). With Aristotle, to learn, there must be” comparison, contrast, and contiguity” (Woolfolk, 2007). When students analyze information, break it up into pieces, make inferences, rearrange it into a shape that has a meaning to them, they have learned. This is what is “a permanent change in knowledge or behavior through experience” in accordance with the definition of knowledge (Woolfolk, 2007). This takes place within the “schemata” theory of Piaget or “the social cultural theory” of Vygotsky (Woolfolk, 2007). According to Vygotsky, individuals have around them “cultural tools” such as computers, the internet, and communication” where knowledge and potential unfold with “human activities” (Woolfolk, 2007). The individual knowledge and how the individual thinks is a direct result of his environment (Woolfolk, 2007). Within the social structure, what the student acquires “becomes part of the cognitive development.” (Woolfolk, 2007). Nevertheless, in Piaget’s view, an individual acquires a cognitive development within a frame in the brain that was naturally and innately predesigned for that purpose (Richard-Amato, 2003).

Zone of Proximal Development Theory

One learning theory of Vygotsky is “the zone of proximal development” (Richard-Amato, 2003). Based on the zone of proximal theory, there should be an increase in challenge, but the student has to be “ready” for it. This is to say, instruction, acquisition, and challenging communicative knowledge have to be apportioned, approximated, and appropriated in the right time. This is called the “readiness principle” (Richard-Amato, 2003). “Students must be neither bored by work that is too simple nor left behind by teaching that they cannot

understand" (Woolfolk, 2007). In theory, Vygotsky believed that a student has to mature to the actual development level" (Richard-Amato, 2003). However, for Piaget, to have learning, there must be a foundation, but with Vygotsky, the learning builds a foundation that will be stronger, more established with more learning (Richard-Amato, 2003). Piaget had not specifically discoursed on the zone of proximal development. Connections between Piaget and Vygotsky on the zone of proximal development are implied deductible analyses.

Constructivism Theory

Nevertheless, Vygotsky and Piaget were both constructivists (Richard-Amato, 2003). To them, knowledge is an individual derivative. As individuals actively, interactively and collaboratively, investigate ideas, they derive concepts and form their own perception and deductibility (Richard-Amato, 2003). This is in sharp contrast to the behaviorist who thought that knowledge is from the outside (Richard-Amato, 2003). It is a dual conflict whereas one theorist believes that knowledge is from within and another one believes that knowledge is from without (Richard-Amato, 2003). Therefore, the constructivist teacher gets students to exchange ideas and to find commonalities, however the behaviorist is didactic, lecturing the knowledge and using reinforcement to encourage retention. (Richard-Amato, 2003). This dichotomy exemplifies the student-centered approach classroom to the teacher-centered view. In the former, the teacher is a facilitator, and in the latter, the teacher is a lecturer.

Variated Theories

With concepts such as classical conditioning, operant conditioning, cueing, prompting, and shaping, Skinner developed his behaviorism theories (Woolfolk, 2007). Skinner's theories

work in tandem with reinforcement: positive and negative. “Today, many classroom management techniques are based on behavior modification principles derived from Skinner’s reinforcement principles” (Roblyer et al., 2010). With themes such as “racial inequality and women’s suffrage,” John Dewey developed his “social activity theory” (Roblyer et al., 2010). Dewey does not believe that there should be standards; also, curriculum should reflect a student’s wish (Roblyer et al., 2010). Then, there is Howard Gardner with the multiple intelligences theory.

Social Learning Theories

Among others, researchers speak of “social learning theory,” where the focus is on “the social influences or the social factors.” This is an implication of “learning through observation” (Woolfolk, 2007). This was the result of “a demonstration of Albert Bandura” that people learn by watching the work of others (Woolfolk, 2007). Teachers are encouraged to model, to provide feedback, and to use instructional activities. These are all components of social cognitive theory, which also includes self-efficacy theory (Woolfolk, 2007), which “predicts'' a teacher’s persistence and perseverance in search of high achievement for students (Woolfolk, 2007). As a result of the teacher’s high confidence and high expectations in children, the teacher will create a personalized learning environment that triggers growth and development for all children (Woolfolk, 2007). Besides, there is also the constructivist theory of learning that is based on social interaction and the proactivity of the learner to develop knowledge (Woolfolk, 2007). “Constructivism views learning as more than receiving and processing information transmitted from teachers and texts'' (Woolfolk, 2007). According to constructivist theories, learning occurs

when “one constructs both mechanisms for learning and one’s unique version of the knowledge, colored by background, experiences, and aptitudes'' (Roblyer et al., 2010).

Paulo Freire Social Theory

Educational scientists have spent a lifetime working on theories and strategies to develop learning. Richard-Amato (2003) addresses compatible theories that are connected “to innateness and connectionism.” Paulo Freire spoke of critical pedagogy theory referring to methods and activities that a teacher should establish to reach out to children. According to Paulo Freire’s theory, there should be a profitable “dialectical relationships between teacher and students” (Richard-Amato, 2003). Society has a need for a pedagogy that is authentic, “apolitical, and transformational” that focuses on “learners and their needs” (Richard-Amato, 2003). This implies the principles of “initiation, negotiation, and feedback” (Richard-Amato, 2003). In so doing, students will begin to make connections with learning strategies: cognitive or metacognitive as taught by “participatory teaching theory” where teachers and students negotiate on learning (Richard-Amato, 2003). Then, the role of the teacher is “to assist students in the development of their learning strategies, which should “match learning styles and preferences” (Richard-Amato, 2003).

Connection of Theory and Practice

According to Richard-Amato (2003), “theory informs practice; practice informs theory,” and “methods dictate theories.” A teacher will integrate skills, introduce methods, and utilize gamification based on their perception of education. Richard-Amato (2003) speaks of skill integration, which is important in teaching and learning. “Naturally,” children will build skills into

their activities when teachers “encourage its normal flow (Richard-Amato, 2003). This is how students will develop and show tremendous improvement “performing far above expected levels” will occur (Richard-Amato, 2003). As students collaborate and establish connections in a diversified community, they will trade in understanding, knowledge, and skills “without affecting the nature of each other” (Richard-Amato, 2003). But it is not a solo phenomenon. Students cannot do it alone without the directives and the facilitation of teachers and the partnership of peers (Richard-Amato, 2003). With games, with direct or indirect instruction, with classroom discussion, with homogeneous or heterogeneous groupings, with individual presentation, with technological features and involvement, whatsoever strategies, the focus should remain on theories, pedagogies, models, frameworks, and their utility.

Conclusion

If one seeks for “technology integration models,” one will find a variety in the educational field (Kimmons et al., 2018). However, the abundance and the knowledgeability of technology and technological frameworks do not translate “to effective use.” Similar to the parade of theories that are spread out in this literature review, it is not the shallow acknowledgement of a concept that makes a difference, but its proper use (Graham et al., 2009). Also, one single model or theory might not be “universally valuable and understandable” to answer to every need (Kimmons et al., 2018). For instance, the cognitive learning development theory of Piaget all alone does not hold up without “the social cultural theory” of Vygotsky. One theory complements another according to Graham et al. (2009).

Schools need technology integration. The process to effectuate technology integration is the challenge. According to Lyddon (2019), It is not why “but how” that technology should be integrated (Lyddon, 2019). Seeking the how to transform education has pushed educational scientists to produce a variety of theories, frameworks, strategies, and even technologies (Lyddon, 2019). Similar to the past, the push to improve education had led to theorists such as Piaget, Vygotsky, Dewey, and Skinner to just name of few. Their rich repertoire of theories, concepts, strategies, and methods has produced the vastness of knowledge and pedagogy that literature enjoys. Generations have benefitted from their investment. Similarly, our generation needs to invest in the development of technological frameworks to better teach and prepare this generation. Educators need to invest themselves in the theories and knowledge of TPACK, SAMR, TAM, TIM, and PICRAT to better prepare the youth. The knowledge of “theory, pedagogy, technology, content,” is a need that should be met (SAHIN, 2011). Including gamification, researchers should persist with no “dissuasion” in the search synthesized theories, pedagogies, frameworks, and strategies for greater success and performance in education (Sanchez-Mena et al., 2017).

Chapter 3

Methodology

introduction

Qualitative and quantitative research design cohere, but each has its own distinction. According to Nigatu (2009), the main objectives of qualitative research methods are to "understand context, people, and interaction." It involves "the development of concepts to understand social phenomena in a natural environment" (Nigatu, 2009). The goal is to find out "the views and the meanings" of a few individuals on a topic. According to O'Connor et al. (n.d.), qualitative inquiry is "concerned with meaning." However, quantitative inquiry is different and focuses on how a large number of people think about a topic. It is numerical, statistical, quantifiable, and "follows trends, tendencies, describing why something occurs" (Creswell et al., 2019). To get data from a quantitative research design, as instruments, researchers use surveys, questionnaires, pre-and-post tests. With quantitative inquiry, there is a hypothesis and pre-formulated questions. The results are predictable "with predetermined response categories and standard measure" (Nigatu, 2009). Nevertheless, with qualitative inquiry, the results are not predictable. It goes with the wind wherever the participants take the research. With quantitative inquiry, the research question is "fixed," while with qualitative inquiry, the research question is "broad, contextual, and flexible" (Nigatu, 2009). With the quantitative method, sampling is "random, and it is selective" with qualitative inquiry. The researcher must find the candidates that would push the investigation forward with the needed insight.

Methodological Foundation and Trends

A recent and recommended trend in research design has been to co-execute a mixture of qualitative and quantitative as a mixed methods research approach. According to Creswell et

al. (2019), “a mixed methods research design is a procedure for collecting, analyzing, and mixing both quantitative and qualitative methods in a single study or a series of studies to understand a problem.” The researcher can begin with a quantitative method and continue with a qualitative method. The advantages of mixed methods studies are that the results are triangulated. The data either “converges or diverges.” When the data converges, there is validity and reliability. One source of information is used as a support or a reinforcement. The results and the findings are strong in their correlations. The researcher is able “to compare the results and explain any discrepancies in them” (Creswell et al., 2019). With a quantitative design, there is one type of data, the numbers. It is the same with qualitative research studies. There are ideas. However, with mixed methods research, there is validity through reinforcement. It raises the reliability level of the design.

Advantages and Disadvantages of Mixed Methods Design

The disadvantages of mixed methods research are that it takes a long time. It involves much more planning. It is also more demanding because the researcher has to have “many sets of skills.” “When one combines quantitative and qualitative data, we have a very powerful mix” (Miles, Huberman, & Saldana, 2014, pg. 44 as cited in Creswell et al., 2019). However, the researcher has “to understand both quantitative and qualitative design” (Creswell et al., 2019). With quantitative designs, there is statistics. With qualitative designs, there is coding. The researcher has to know both rather than just one. To master both techniques is much more challenging. But the results are more universal.

Direction of this Research Design

This study will follow the convergent and concurrent mixed methods design. By convergent and concurrent, it means that there will be “simultaneity” in the research design. (Creswell et al., 2019). The processes of collecting, analyzing, and comparing data will coincide in time (Creswell et al., 2019). Since it is a mixed methods design, there will be two sets of data: the quantitative and the qualitative ones that will be merged in the final analysis for probable digression or convergence. The significance of “quantitative and qualitative research is that they have distinct and complementary strengths,” together forming a whole and producing a complete narrative of the research questions (Bowen, 2005).

While quantitative data is statistical dealing with mathematical, numerical, and derivative scores and values such as “mean, median, mode, and significant correlation coefficient,” qualitative data is “inductive dealing with words, images, pictures, and documents” that are developed into themes, concepts, and theories (Creswell et al., 2019). Their complementation is that they reinforce and validate each other. The qualitative approach “encourages respondents to tell their own stories and reflect on their day-to-day experiences,” creating a “level of intimacy and naturalistic inquiry” among the respondents, the researcher, and the investigative ideas, providing quality of data (Patton, 2015), (Bowen, 2005).

Validity and Reliability

The mixed methods, quantitative-qualitative, design is selected so that the findings of the research questions are validated (Creswell et al., 2019). The design selection is purposeful to

establish an equilibrium that the results are balanced out and that one side confirms or rejects the other side. It is planned so that there may be a comparison of the perception of a few individuals to a larger population (Creswell et al., 2019). With qualitative, the expectation is an average of about 10 to 15 respondents. With quantitative, the maximum may go up to 150 or even more. Therefore, there will be the collection of the view of a few to the view of a meaningful majority. The goal is to capture “a better understanding of the research problem” (Creswell et al., 2019). This methodology is intended to study and evaluate, if any, gaps of knowledge, conceptualization, and understanding among diverse groups.

To triangulate and for validity and reliability, three types of data will be collected. There will be the publication of a survey questionnaire that will be emailed to participants. The researcher will design the survey instrument. A group of at least 10 participants will be interviewed. In addition, some participants will be observed in their setting to evaluate, with a checklist, the application of the TPACK model, and the utilization of digitized technological software that is meant to challenge students and to develop critical thinking skills. According to Golafshani (2003), “reliability, validity, and triangulation are multiple ways to establish truth.” It is a means of checks and balances where forms of data from varied sources come together in the support of each other to “control biases, establishing valid propositions” (Mathison, 1988 as cited in Golafshani, 2003). If researchers are not replicable, they have no true value, therefore invalid, useless. The “combination” and the interpretation of diverse sources of data indicate the degree to which a research study may be duplicated, producing similar results and confirming “its trustworthiness and validity” (Patton, 2001 as cited in Golafshani, 2003). As a

result, this research project will use a questionnaire, interviews, and observations to collect and analyze data.

Quantitative Data Analysis

Different criteria will be used to analyze quantitative and qualitative data. For quantitative data, “numerical scores” will be attributed to questionnaire survey questions using the Likert scale model where respondents may “select on a scale such as strongly agree, agree, undecided, disagree, and strongly disagree” associated with a 5, a 4, a 3, a 2, and 1 respectively (Creswell et al., 2019). Once the scores are tabulated, statistical software such as SPSS and Excel Pivot Table will be designated for data analysis. Using “descriptive statistics and measures of central tendency such as mean, median, and modes,” the data will be interpreted to corroborate the research questions. The questionnaires will be scored, graphed, and interpreted. From the quantitative data, there will be analyses of “trends and general tendencies” (Creswell et al., 2019). Findings and results will be discussed and summarized in tables.

In addition, to analyze the quantitative data, there will be the use of statistics with descriptive and inferential methodologies. Beside mean, median, mode, and correlations, there will be the usability of linear and multiple regression with the t-tests and the ANOVA tests. Additional analyses will take place with p-value, f-value, R square, Pearson’s r, and the establishment of statistical significant differences depending on the location of the p-value in the normal curve whether it falls in the tail or not. The data location of the p-value in the normal curve will indicate the response to the hypotheses whether they will be null or not.

According to the normal curve theory, a p-value that is less than .05 is statistically significant, which means that a hypothesis is valid, not rejectable. Not only tests' examinations, but also "graphs showing correlations" will be used for data demonstrations (SkillsYouNeed, 2022). The results from the instruments, surveys and pre-and-post tests, will be exhibited in tables for closer reflections and precision in their quantification.

Qualitative Data Analysis

To analyze the qualitative perspective of the research, "grounded theory" will be used. Codes, themes, and theories will be formulated as a result of the interviews. "Word transcription" will be prepared through "a computer document analysis" (Creswell et al., 2019) before the coding process. The process will be inductive, which is to say, "patterns, themes, and categories of analysis come from the data and emerge out of the data rather than being imposed on them prior to data collection and analysis" (Patton, 1980, p. 306 as cited in Bowen, 2005). There would be no undue pressure. The qualitative approach should be naturalistic and constructivist (Patton, 2015). Without anxiety, participants will open themselves up to share and exchange their information deliberately. This will create the ideal setting to gather data in its purity: reliable and valid. At the end, the qualitative and quantitative data will be reviewed to identify whether the information "converges" in support of each other or "diverges" in the rejection of each other. A discussion of the results will reveal the findings. "Method matters most." This methodology will be used "to develop theory and refine concept" (Bowen, 2005) so that there is a trustworthy conclusion.

Sampling

In the case of this research project, sampling will be random and purposeful, at the same time. In both cases, quantitative and qualitative, the unit of analysis will be teachers. For the quantitative phase, sampling will be random to "control for selection bias, for generalization, and for control of selectivity errors" (Patton, 2015). Results should indicate findings from the population as a whole with no inclination to a side, a group, or a position. For the qualitative version, sampling will be "intentional" (Creswell et al., 2019). The goal is not to gather a large "quantity" of information, but "quality" data into saturation (Padgett, 1998, p. 52 as cited in Bowen, 2005). This methodology rejoins Creswell et al. (2019) who believes that researchers should "choose participants who are information rich." Patton (2015) also supports the idea of a purposeful sampling that "one can learn a great deal about issues of central importance to the purpose of the inquiry."

Participants

The participants will be teachers for the survey, the observations, and the interviews. For "accessibility, convenience, and manageability," the site will be a middle school, in East Orange, in New Jersey, that houses 6th, 7th, and 8th graders (Bowen, 2005). Teachers will be interviewed as part of the qualitative phase and surveyed as part of the quantitative phase. There will be a greater pool of teachers for the surveys, which will be as many as they are "available" and willing to complete the survey. The plan is to have five times as many surveys as there are interviews. The observations are included strategically that there is multiplicity of perspectives (Creswell et al., 2019).

Selection of the Participants

To select teachers for the interviews, I will talk to some of them and ask them to volunteer their time for an interview. With the permission of the school principals, I will also attend some staff meetings, make an exposition of the research title and its need, and ask for volunteers to be willing to be interviewed. I will need between 20 to 30 respondents for the interviews. At least 10 classrooms will be observed. In total, there should be between 100 to 150 surveys. The expectation is to have a five-to-one qualitative-quantitative scale. The selection process, for the interviews, will be deliberate.

Means to Contact the Participants

To contact the interviewees, gatekeepers, and principals, I will establish an email and phone list. Participants will be contacted based on their preferred means of communication through email, text, or phone. Interviewees will be provided with a short questionnaire that includes name, phone number, email address, and preferred means of communication. Consent forms will be emailed to all participants and volunteers to explain the research, its purpose, and its need.

Potential Issues

Getting participants for the interviews, scheduling the interviews, and finding locations for the interviews will be a complicated task. The plan is to be as flexible as possible and to make it up to the participants. If there is no convenient site for an interview, we will schedule it in Zoom. Also, this topic requires a depth of understanding of the knowledge and correlation between pedagogy and technology. Available candidates may be minimal to debate this issue. In

addition, the statistical factor, getting a vast number of participants to fill out the survey questionnaires, is another cause for concern.

Conclusion

This study is important. Its significance is to find the companion that technology needs to be the provider of high achievement and success in the domain of education. Research has shown that technology all alone is not enough to deliver the high level of success that is expected among students. The TPACK framework model explains that technology should be combined with pedagogy and content knowledge. TPACK has been exhaustively researched, but the problems remain. There has been integration of curriculum and technology with application tools such as Nearpod and Edpuzzle. Still, the lack of success has persisted. It means that there is a need for more research to determine what should be done to assist technology to be a greater, better provider of knowledge. A study of how the use of technology can be defined in terms of being passive and/or active, that passive use should be defined as passive use, and active use should be defined as active use, and active use of technology should be documented as the means that will produce the highest quality of success, is a needed study. If students spend a fair amount of quality time constructing knowledge through technology, their improvement will be highly meaningful. This is the primary goal of this research.

Appendix A

Types of Questions

1. What does it mean to regulate time spent, in technology, in a classroom?

2. What is a passive use of technology?

3. What are examples of passive use of technology?

4. What is an active use of technology?

5. What are examples of active use of technology?

6. What makes TPACK an insufficient model to resolve the problem of learning through technology?

7. What percent of a class period in technology would be qualified as sufficient to generate meaningful growth?

8. What role can the SAMR play in producing?

9. What part of technology is pedagogy?

Brief Description of the Types of Questions and the Processes of their Developments

Technology has been used widely, in the last decade, in classrooms, across the world. If it was up to technology, based on its use, a large number of students would be writers, scientists, technologists, mathematicians, and engineers. Some students spend their whole day in front of a computer or a digital device, but their scores show minimal to no growth. Therefore, the types of questions will seek to investigate why those children are failing. The questions will work to find solutions on how to remedy this tragedy. Students watch countless videos; students play a great deal of interactive games, and students are exposed to a substantial amount of slides

whether from Google Slides, Nearpod, Pear Deck, Edpuzzle, and others. What have students benefited from all these exposures? This is one type of question that will be asked. At times, instructors use technology in a classroom for the purpose of pedagogy. Can the use of technology for teaching be accounted for by the use of technology, for learning, for the purpose of growth and development? These are questions that this research project will attempt to find answers for. The answers to these questions will help to better understand how technology may be properly used in a classroom to benefit children fully.

The questions for the survey were developed based on the literature review, the objective of the research project, and the research questions. For instance, there are questions on the correct use of technology, on multimedia application, and on active and passive use of technology. These are questions that the research project will discuss and find answers for. Referring to pedagogy, the survey asks questions on timely feedback, procedural strategies, and dimensions of student engagement. These are instructional techniques that should walk side by side with digital technology implementation. The survey enquires on effective classroom management, the subdivision of time period, and the profitability of digital technology. Every single question accords with an idea, a concept, or another question. The instrument is designed as an instructional narrative that defines and clarifies meaning for the participants while there is an inquiry for their input. It all reverberates to the review of the literature.

Appendix B

Survey Questions

1. Do you consent to participate in this survey?

2. I am a teacher.

3. I work with middle school students.

4. I have been a teacher for at least three years.

5. A classroom needs “the correct use of technology.”

6. Technology is “a medium and a tool to support teaching and learning.”

7. Every instructional lesson should have a beginning, a middle, and an end.

8. Well planned digital technology integration contributes to student engagement and effective classroom management.

9. Digital technology should be a part of the instructional method.

10. Timely feedback, personalized instruction, and check for understanding should be included in every lesson.

11. “The good use of digital technology is to use it as a supplement.”

12. “Multimedia is beneficial to students with advanced prior knowledge.”

13. Watching a video clip is a passive use of technology.

14. Technology use in a classroom should be active and engaging.

15. Developing a PowerPoint presentation is an example of an active use of technology.

16. Reading a PowerPoint presentation is an example of a passive use of technology.

17. Pedagogy is the method, the strategy, the routine, the resources, the connection, the expectation, the format used to get students to understand.

18. Digital technology is a pedagogical means.

19. A classroom period should be divided into lesson presentation, 15%, lesson development, 20%, independent practice, 50%, and lesson closure, 15%.

20. Effective classroom management requires the subdivision of a class period.

21. A PowerPoint presentation to lead direct instruction is a passive form of using technology.

22. Technology use in a classroom is profitable when students spend a substantial amount of class time 40-to-50% actively engaged working on a task.

23. A teacher must have in-depth knowledge of technology to make good use of it.

24. A teacher needs a combined knowledge of pedagogy and technology.

25. High achievement in education will result through depth of knowledge in technology and the development of best practices using digital technology.

Appendix C

a) Instrument for the Qualitative Research Design

1. What is technology integration?
2. What are the benefits of technology integration?
3. How does the integration of technology support teaching and learning?
4. How would a school's infrastructure contribute to an effective technology implementation?
5. How should technology be used in a classroom?
6. What role does technology play in classroom's motivation, achievement, and engagement?
7. How should technology be used to differentiate instruction?
8. How should teachers be trained to integrate technology in a classroom?
9. How do you evaluate the effectiveness of technology in a classroom?
10. What is the relationship between content, pedagogy, and technology knowledge (TPACK)?

b) **Instrument for the Quantitative Research Design.**

This instrument will be measured based on two Likert scale parameters.

1. ***(Barely, a little, not at all, very much, a lot)***

I know what technology to use in math classes.

I know how to link technology and pedagogy.

I know how to link technology and content.

I know how to link technology, pedagogy, and content.

I am able to use technology to engage students.

I am able to use technology to motivate students.

I keep myself abreast of technology development.

I use technology to differentiate instruction.

I am aware of the benefits of the knowledge of theoretical models.

I know how to pair technology and activities.

2. **(Strongly disagree, disagree, neutral, agree, strongly agree)**

Technology is an excellent tool for classroom management.

Students should be engaged in the active use of technology.

Video presentation and PowerPoint presentation are the passive use of technology.

Technology is a science and a pedagogy tool.

Good use of technology contributes to a student's high achievement.

“Different classroom activities should be paired with different technologies.”

“Technology use can be digital and non-digital.”

Students should have a time limit for each classroom activity whether digital or non-digital.

A classroom period should have a variety of activities.

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