RURAL SCHOOL TEACHERS' ATTITUDES TOWARD THE USE OF TECHNOLOGY IN CLASSROOM ASSESSMENTS

by

Samuel Kwaku Basoah Boateng

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DEDICATION

This thesis is dedicated to my late father, Mr. Kwame Opoku Boateng, my mother, and my entire family. I am grateful for their love, support, and motivation while I pursued this study.

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TABLE OF CONTENTS

TABLE OF CONTENTS CONTINUED

TABLE OF CONTENTS CONTINUED

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

ABSTRACT

This study explored the attitudes of rural schoolteachers toward integrating technology into classroom assessments. Despite significant investments in educational technology infrastructure, the utilization of instructional devices for assessments in rural schools remains limited. The study employed a sequential explanatory mixed methods to address five key research questions, investigating rural school teachers' attitudes towards technology-based assessments, frequencies of technology use by rural, strategies employed by rural school teachers, challenges faced by rural school teachers in tech-based assessments, and the alignment of quantitative and qualitative data. The study relied on a questionnaire and focus group interviews and opened questions for data collection from 80 teachers randomly selected from the Belgrade School District in Montana. Data were analyzed using descriptive statistics and qualitative thematic analysis. The study revealed a positive attitude among rural teachers toward technology integration in classroom assessments. Teachers were willing to use tools like Google Classroom and digital assessments, aligning with broader trends indicating a growing acceptance of technology in education. The study further indicated that teachers in rural schools employ technology regularly for various assessments, utilizing tools like Google Classroom, forms, checklists, and online quizzes. This aligns with the increasing reliance on technology for formative and summative assessments, allowing for real-time data collection and effective student performance tracking. Teachers reported diverse strategies for integrating technology, including digital assessments, online platforms, and technology tools. These approaches align with previous studies emphasizing technology's role in enhancing assessment practices, promoting student engagement, and supporting differentiated instruction. The study also found that rural teachers face challenges such as unreliable internet connectivity, outdated hardware, and insufficient training, highlighting the need for targeted interventions and support mechanisms. The study recommends four strategies to improve rural education: addressing infrastructure gaps, providing professional development for teachers, establishing collaborative networks, and collaborating with policymakers to ensure equitable access to technology resources. These measures aim to create dynamic learning environments, enhance teachers' capabilities, foster a supportive community, and bridge the rural-urban educational divide. The study concludes by highlighting actionable insights for improving technology integration in rural classrooms, emphasizing tailored professional development and flexible implementation strategies.

CHAPTER ONE

INTRODUCTION

Background of the Study

The use of technology in classroom assessments has become an important area of interest in education (Nikolopoulou & Gialamas, 2015). Intentional and developmentally appropriate use of technological-based assessment tools and strategies can enhance students' skills and make them active members of the digital age (Koc, 2014). However, the frequency with which teachers use technology in classroom assessments has remained the same despite this knowledge and increased access to digital technologies in recent years (Blackwell et al., 2015).

According to Aldhafeeri et.al., (2016), teachers are confronted with the burden of learning how to utilize modern technological tools and properly incorporate them into the current curriculum. This research is predicated on the premise that teachers' attitudes toward technology are the most significant predictor of technology integration (Robb & Schomburg, 2013). Even though teacher attitudes and technology usage have been investigated, the degree to which teachers in rural schools and teachers' attitudes regarding integrating technology into classroom assessments still need to be adequately explored (Robb & Schomburg, 2013).

According to Ozdemir (2017), there exists a positive correlation between the level of technological proficiency among teachers and their inclination toward computer-assisted education. As teachers become more adept in utilizing technology, their attitude towards incorporating it into their instructional practices is likely to become more favorable. Consequently, this shift in attitude is expected to result in increased integration of technology

within educational lessons. In a scholarly investigation conducted by Chen (2015), the focus was on preservice teachers and their responses to the potential benefits of incorporating technology within the educational setting. The findings of this study revealed a noteworthy shift in the participants' attitudes towards technology usage, as their intentions to utilize it became increasingly favorable. This research endeavor focused on the examination of the beliefs held by students who were actively pursuing a career in early childhood education. By doing so, it provided valuable insights into the potential correlation that may exist between the level of training received, the attitudes held, and the utilization of technology within the educational setting.

According to Fenty & Anderson (2014), there is evidence to suggest that teachers express a sense of inadequacy in their ability to effectively utilize technology within their classrooms. This sentiment highlights the necessity for an enhanced provision of diverse technological resources to influence the beliefs, knowledge, and subsequent instructional practices of these teachers. In a study conducted by Kerckaert et al., (2015), it was discovered that teachers exhibited favorable dispositions toward the potential benefits of technology for their students. However, various impediments hindered its integration within the classroom, such as deficiencies in knowledge and skills. In a separate investigation pertaining to teachers in the early childhood domain, it was ascertained that said teachers exhibited apprehension regarding their personal requirements for professional development. This apprehension was evident in their attitudes, rather than indicating an outright opposition to the integration of technology within the classroom setting (Kelley-Williams, Berson, & Berson, 2017).

School districts have purchased and installed the types of equipment required for successful instructional applications and classroom assessments for rural schoolteachers' technology integration (Becker, 2000). Nevertheless, despite infrastructural improvements and requests for teachers to use technology for classroom assessments, many schools in the world are using instructional devices for assessment sparingly (Whitworth & Berson, 2003).

According to Schrum et al., (2015), researchers are looking for best practices for educational institutions to enhance student learning, prepare students for the future, promote student engagement, and incorporate learning technology into the curriculum. Hannaway & Steyn (2016) stressed that this is made feasible by bringing technology into the classroom assessments since it can accommodate different learning styles, foster cooperation, and prepare students for the real world. Moreover, with the realization that digital technologies are transforming the world, the content and skills taught using technology-based assessments become crucial in the education of students (Hannaway & Steyn, 2016).

Problem Statement

The relationship between technological attitudes, technology-based assessments, and their relevance in current educational contexts, especially in rural regions, has received little attention (Lynch & Redpath, 2014). As a result, there is an urgent need for a thorough examination of the relevance of this interaction (Lynch & Redpath, 2014). The primary purpose of this research is to perform a thorough investigation of the complex dynamics involved in the connection between teachers' technological beliefs, the use of assessments, and their appropriateness in rural environments. This study hopes to help the advancement of overall

knowledge and educational effectiveness by emphasizing the necessity of a better understanding of these aspects.

Gaining a comprehensive grasp of technology attitudes has significant importance as it serves as the fundamental basis around which teachers construct their strategies for incorporating technology into the realm of education (Blackwell et al., 2013). Blackwell et al., (2013) stressed that the degree to which teachers use technology and the consequential effects on the learning process significantly shape their instructional methods. Furthermore, Lynch and Redpath (2014) stipulate that it is crucial to possess a thorough comprehension of the use of assessments to guarantee the implementation of efficient instructional methodologies. Assessments are pivotal in evaluating student advancement and providing valuable insights for instructional decision-making (Lynch & Redpath, 2014). The utilization of technology in assessments has the capacity to augment the caliber of input and foster individualized learning encounters (Lynch & Redpath, 2014).

Nevertheless, Hooker (2017) emphasized the exploration of the intersection of these dimensions, especially in rural regions, has not been well investigated. In rural environments, Hooker (2017) states that there are distinct problems and possibilities that substantially impact the incorporation of technology in educational settings. Certain factors, such as restricted availability of resources, divergent technological attitudes, and unique pedagogical requirements, contribute to the formation of a distinct educational environment (Pyle & DeLuca, 2017). Despite the increasing volume of scholarly research on technology-based assessments, a noticeable void exists within the literature on the use of technology assessments by teachers in rural settings (Pyle & DeLuca, 2017). Prior research has mostly concentrated on educational

environments in urban and semi-urban areas, overlooking the distinctive characteristics of rural education (Pyle & DeLuca, 2017). The exclusion of this aspect is concerning since teachers in rural areas often encounter unique difficulties that may need customized strategies for using technology (Hooker, 2017).

Moreover, Lynch and Redpath (2014) affirmed that previous studies indicate that teachers in diverse settings tend to use technology conservatively when it comes to collecting student data and incorporating it into classroom assessments, or reports on student learning. The restricted use of technology in assessment prompts inquiries into teachers' fundamental beliefs and attitudes, particularly in rural areas where inadequate resources may further impact technology integration (Lynch & Redpath, 2014). Hence, the primary objective of this study is to investigate the technological attitudes and assessment practices of teachers in rural settings and examine how these beliefs and practices influence the incorporation of technology-based assessments in rural classrooms. This study seeks to provide significant insights into the successful application of technology in education, especially in underprivileged and frequently disregarded rural populations, by investigating the distinctive dynamics of technological attitudes, assessment procedures, and rural surroundings.

Purpose of Study

This explanatory sequential mixed method sought to examine rural teachers' attitudes toward technology-based classroom assessments. The study examined the frequency, degree, and problems rural teachers encounter when employing technology in classroom assessments. The objective of this explanatory sequential mixed-method investigation was to get an in-depth understanding of the attitude of rural teachers in relation to technology-driven classroom

assessments. The objective of the study was to investigate the various dimensions of this phenomenon using a two-phase methodology that integrates both quantitative and qualitative research techniques.

During the initial stage of the study, the authors conducted a quantitative analysis to assess the perspectives held by teachers in rural areas regarding the utilization of technology-based methodologies for assessing classroom performance. This study entailed conducting a comprehensive survey among a representative sample of rural teachers to collect data pertaining to the frequency with which they incorporate technology in their assessment practices, as well as the degree to which they adopt and embrace such methodologies. During the subsequent phase of the investigation, the researcher undertook a qualitative inquiry to further investigate the intricacies of the rural teachers' encounters with technology-driven assessments within the classroom setting.

Research Questions

1. What are rural teachers' attitudes toward using technology in classroom assessments?
2. To what extent and frequencies do teachers use technology in their classroom assessments in rural schools?
3. How do teachers use technology in classroom assessments in rural schools?
4. What are the challenges teachers in rural schools face when integrating technology into classroom assessments?
5. How do the quantitative data regarding technology usage and attitudes align with the qualitative insights about teachers' motivations, challenges, practical usage, and recommendations related to technology in classroom assessment? (Mixed methods question).

Significance of the Study

Assessment is a crucial part of the teaching-learning process (Neumann et al., 2019) and may improve student progress, motivation, and instruction (Cauley et al., 2010). Despite this, practical assessments are complex since teachers must plan and execute high-quality assessments. Activities, analyzing evidence, producing outcomes relevant to assessment objectives, providing feedback, reporting, and involving students as active participants in their assessment and learning are several components that makeup quality assessments (Looney et al., 2018).

Unsurprisingly, technology is increasingly interwoven into learning and educational experiences since it has impacted several facets of learners' lives. Some have hailed educational technology as having the capacity to revolutionize the educational system (Kozma, 2003). Nonetheless, certain educational stakeholders, such as teachers, school administrators, students, and parents, may continue to worry about the assessment methods that must be utilized with technology and the circumstances necessary for students to be appropriately utilizing technology. This study provides a deeper understanding of teachers' assessment identities and technological assessment instances.

This study's findings could assist educational leaders in implementing and providing access to technology-related professional development programs for teachers in their organizations. This added assistance might improve the use of technology by teachers in the classroom, which would go a long way to positively impact student learning outcomes (Wohlwend, 2015).

Definition of Terms

Technology.

Technology refers to resource tools used in classrooms to enrich instructional methods without sacrificing the quality of the content through differentiating learning (Lim, Zhao, Tondeur, Chia & Tsai, 2013).

Technology integration

Technology integration involves incorporating computer and technology skills into the classroom, transforming the learning environment from passive to active to build a deeper understanding of the content (Shehu & Hammad, 2013).

Assessment

Assessment is an activity that measures students' learning. Its nature may be formative or summative. (Reeves, 2000).

Teacher Attitudes

Attitudes are characterized as particular emotions that reveal a person's preference for or opposition to something. Teachers' attitudes toward technology in the context of technology integration can be categorized as either preferring or disliking the use of technology. (Simpson et.al.,1994).

CHAPTER TWO

LITERATURE REVIEW

Introduction

Teaching and learning environments have changed over the past ten years because of the rise in scholarly work on educational technology and classroom assessments (Coombs et al., 2018; DeLuca & Johnson, 2017). According to Hooker (2017), it is the responsibility of teachers to know how to use technology as a tool to support the learning of all pupils and assess learning outcomes. According to Lynch & Redpath (2014), there has been a small but growing body of research on the use of technology to enhance classroom instruction, however, little research on the use of tech-based assessments by teachers in rural American schools has been conducted. Despite increased access to digital tools, there has been no discernible shift in the frequency with which teachers use technology in classroom assessments (Blackwell al., 2015). Hooker (2017) stressed that studies on school assessment techniques have shown that teachers use technology selectively to record data, rather than incorporating the technology in classroom assessment, assessments, or reporting on student learning. By integrating what is already known and identifying any potential knowledge gaps that need future research, my literature review attempts to explore this environment and assess the state of research on ass and technology in rural schools. First, the researcher explored the attitude of teachers towards the use of technology in schools. Moreover, the researcher would like to look at the barriers to technology integration in schools. Next, the review of literature highlighted the concept of classroom assessment and how

teachers use technology in classroom assessments. Finally, I will explore the challenges teachers face when using technology in their classroom assessments.

Research Purpose and Questions

The purpose of this study was to analyze teachers' attitudes toward the use of technology in classroom assessments in rural schools. The study would explore how teachers use technology in their classroom assessments, the extent to which teachers use technology in their classroom assessments, and the challenges teachers face when using technology in their classroom assessments in rural schools. The study sought to answer the following questions:

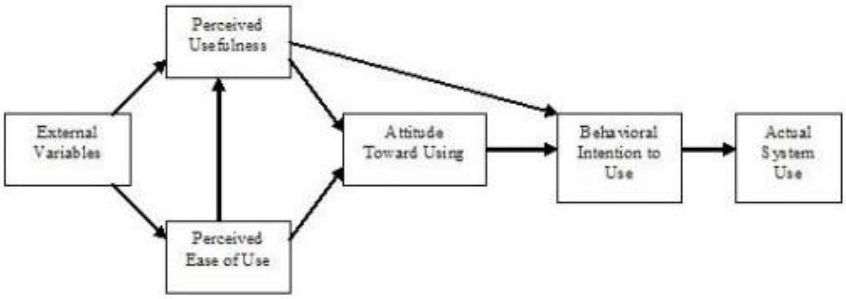
1. What are rural teachers' attitudes toward using technology in classroom assessments?
2. To what extent and frequencies do teachers use technology in their classroom assessments in rural schools?
3. How do teachers use technology in classroom assessments in rural schools?
4. What are the challenges teachers in rural schools face when integrating technology into classroom assessments?
5. How do the quantitative data regarding technology usage and attitudes align with the qualitative insights about teachers' motivations, challenges, practical usage, and recommendations related to technology in classroom assessment? (Mixed methods question).

Theoretical Framework

The Technology Acceptance Model (TAM) can be traced back to its theoretical foundation in the Theory of Reasoned Action (TRA), which originally focused on behavioral intentions as the primary determinants of behaviors (Marangunic & Granic, 2014). Davis (1989)

introduced the Technology Acceptance Model (TAM) as an extension of the Theory of Reasoned Action (TRA) to incorporate the influence of an individual's attitude and subjective norm on their behavioral intentions toward computer usage. Despite the empirical validation of the Technology Acceptance Model (TAM), it is important to note that the existing studies have only provided a proportional explanation for the variance observed in technology usage (McFarland & Hamilton, 2006).

Figure 1. The Technology Acceptance Model Proposed by Davis in 1989.



The Technology Acceptance Model (TAM) proposed by Davis, Bagozzi, and Warshaw (1989) offers a framework for examining the influence of external factors on internal cognitive processes such as beliefs, attitudes, and intentions (p. 985). In the present investigation, Davis et. al., (1989) posit a correlation between user attitudes, specifically in perceived usefulness and ease of use, and its impact on technology adoption. Notwithstanding this association, it is imperative to acknowledge that the Technology Acceptance Model (TAM) possesses certain limitations, as it fails to provide a comprehensive explanation for user acceptance behaviors solely based on the factors of perceived ease of use and perceived usefulness (Juhary, 2014). Henceforth, the inclinations of teachers towards the integration of technology, encompassing their convictions regarding the ease of use and the potential enhancement of job performance,

would inevitably impact their intentions to employ technology within the educational setting (Courduff, Szapkiw, & Wendt, 2016). Prior research indicates that providing adequate support to users in the implementation of technology can effectively mitigate barriers and enhance the benefits derived from technology acceptance (Gu, Zhu, & Guo, 2013). Numerous scholars in the field have validated the conceptualization of perceived usefulness as a construct.The Technology Acceptance Model (TAM) has been widely employed as a tool for assessing the acceptance and perceived usefulness of technology by users (Amin, Rezaei, & Abolghasemi, 2014; Holden & Rada, 2011; Moses et al., 2013; Williams, Slade, & Dwivedi, 2014).

Teacher Attitude Towards the Use of Technology in the Classroom

There are a variety of variables that may affect how well computer technology is used in education. Regarding the usage of technology in the teaching and learning process, Hourigan et al. (2016) stress that teachers' attitudes are one of these variables. According to research, teachers' desire to use technology has a significant role in how well they use it in classrooms (Hourigan et al. 2016). The way one feels or thinks about something may be considered as having an attitude, (Hourigan et al.2016), which is often shown in behavior. Hourigan et al. (2016) combined several of the traits of attitude identified in earlier research to come up with the definition of attitude, as a propensity that is learned to react consistently in a positive or negative manner to a particular phenomenon, person, or item. Previous studies have shown that how teachers feel about technology affects whether it is used in the classroom (Aldhafeeri et al., 2016). Explicitly focusing on attitudinal transformation is more crucial given the complexity of human connections (Mueller, Lim, & Watson, 2017). The usage of technology in the classroom

is impacted by teachers' attitudes toward technology, hence it is vital to investigate how teachers' attitudes could be modified.

Positive attitudes and teacher readiness regarding the use of technology are prevalent elements connected with technology integration (Pittman & Gaines, 2015). A quantitative study conducted by Petko et al. (2018) on 349 primary school teachers in Switzerland reported that school and teacher preparedness significantly impact teacher and student preparation when using educational technology in the classroom. Neglecting elements like the professional growth of the teacher might exacerbate issues like attitudes (Oliver & Townsend, 2013). The attitude teachers have toward the use of technology was shown to have the highest link with the incorporation of technology in the classroom in a quantitative study of 218 third, fourth, and fifth-grade teachers in the Florida school district (Pittman & Gaines, 2015). According to the authors, studying the variables affecting teachers' attitudes would be advantageous since they believe that knowing the importance of such attitudes to learning is just as essential as having good attitudes. According to a quantitative study by Ozdemir (2017) on 87 Turkish secondary school teachers on the reshaping of in-service teachers' knowledge and thinking through the lens of digital competencies and technology integration, the author reported that there was a stronger correlation between teachers' attitudes toward computer-assisted education and their level of technology operation than there is between their use of technology and their level of technological competency. This suggests that attitudes toward computer-assisted education are more significant than levels of technological competency (Ozdemir, 2017). To properly incorporate technologies in classes, one must have a good attitude toward technology. The findings of mixed-methods research involving 661 elementary school teachers in Korea on the

utilization of technology by teachers and variables affecting such utilization in primary schools in Korea by Shin (2015) found that while the integration of technology into the classroom was at a lower level, the teachers' attitudes, and disposition toward it were the most crucial elements. Although the author speculates that technological professional development could promote teachers' meaningful use of technology, it is not directly addressed in this research.

Integration of technology has been proven to be impacted by the physical environment, the population of the community, and the readiness of the teacher (Nelson et al. 2019). An investigation into this statement uncovered a study conducted by Kale and Goh (2014), in which the authors explain that educational technology integration might be impacted by the rurality of the town or the size of the school district. Varberg and Platt (2018), noted that the obstacles that rural school districts face include a lack of infrastructure, a lack of teacher professional training, and less financing for the procurement of technology. According to the findings of the research conducted by Nelson et al. (2019) on the elements that operate as mediators in the relationship between technology and the practices of teacher teachers in America reports that teachers of all different demographics need an approach to the incorporation of technology in the classroom that is varied and enables the teachers to build their own unique competencies. It should be possible for teachers working in rural or suburban regions to get expertise that enables them to develop relevant curricula and demonstrate good technology usage (Nelson et al., 2019). The absence of infrastructure and bandwidth in rural areas makes this experience particularly difficult for such groups (Welch, 2019). In their quantitative research of 117 South African teachers on the perceived utility of educational technology and cultural factors as determinants of teacher attitudes toward technology in the classroom in South Africa, Hart and Laher (2015) found that

cultural relevance was more significantly associated with teacher attitudes toward technology usage. The authors pointed out that if attitudes about cultural relevance are negative, this might be a significant barrier to the use of technology in the classroom (Hart & Laher, 2015). The environments in which learners operate include their families, peer groups, classrooms, schools, neighborhoods, communities, and societies. Teachers' knowledge of how language, ideas, and behavioral norms affect situations and their potential impact on students may improve education (Lucariello et al., 2016). According to a quantitative study of 349 teachers of students in grades 4 through 6 in Switzerland on the interaction of students and teachers' preparedness for the incorporation of technology in the classroom, stressed that to encourage the use of educational technology in the classroom, teachers needed to be ready. This readiness was based on the idea that having the confidence and skills to use the technologies is good for teaching and learning (Petko, et al., 2018). The authors concluded that schools, in addition to providing the digital tools themselves, should also make it clear what they want to accomplish with the resources. This would strengthen teachers' abilities and beliefs.

Examining predictive elements influencing the attitude of teachers towards technology integration in the classroom is of very great essence (Al-Zaidiyeen 2010). Mention can be made of a quantitative study that was carried out by Li et al., (2018) on predicting high school teachers' use of technology in the United States. The study found that teachers' instructional approach, openness towards technology, perceived teaching, and training effectiveness were more important factors to consider when attempting to predict teacher use of technology. According to the results, pedagogical preparedness among teachers is just as crucial as technical readiness among teachers to successfully incorporate technology into the classroom. Many studies have

measured how successfully technology tools interact with student-centered teaching and learning by measuring teacher technology usage (Aldunate and Nussbaum 2013). Few research addressed the determinants of teacher practices for utilizing technology for students' needs rather than their own. The goal of the research was to examine the independent contributions of several teacher characteristics in predicting teacher attitudes toward the usage of technological tools to support both conventional instructional methods and student-centered teaching objectives. Similarly, Agyei and Voogt (2011) performed quantitative research to predict prospective and real teachers' technology use in Ghana using the will, skill, and tool model with 120 prospective mathematics teachers and 60 practicing mathematics teachers from Ghana. The research emphasized the will, skill, and tools as critical predictors of technological integration. According to the research, a teacher must have the will (positive attitudes), the ability (technology competence), and the tool (access to technological tools) to successfully incorporate information technology into classroom activities. Furthermore, quantitative research on the use of technology by 100 teachers in rural Chile done by Aldunate & Nussbaum (2013) found that most teachers do not effectively integrate technology into their lessons. The study's objective was to show how two variables, that is technology type and teacher attitude toward innovation interacted. It concluded that teachers are more likely to accept new technology if they are early technology adopters and devote a large amount of their time to integrating educational technology. For teachers to be able to properly integrate technology into the classroom, they must have a good mastery of the content area to be able to align it with the needed technology to enhance learning (Li et al.,2018). In addition, Nussbaum (2013) asserts that effective technology integration into the classroom is not based solely on the needs of the learner but the competency of the teacher in using the technology and

the available technology is what propels teachers to be able to use the technology. Agyei and Voogt (2011) did not consider in-service teachers alone but also looked at pre-service teachers' attitudes. Agyei & Voogt (2011) took cognizance of rural teachers and teachers in the urban center to arrive at their conclusion. Agyei and Voogt (2011) informed us that, the willingness of teachers to use technology is basically not due to the availability of the technology for the teachers to use but the competency or the skill needed to use the technology is very paramount hence the need for regular training and development programs in instructional technology.

When investigating technology usage in the classroom, it is crucial to know whether technology is being used and determine how the technology is being utilized Al-Zaidiyeen (2010). Research on how 16 primary school teachers utilized technology in the classroom in rural Spain was carried out by de Aldama and Pozo (2016). The study was based on the views held by teachers and the use of technology in the classroom. Even though teachers recognized the pedagogical potential of technology and exhibited positive behaviors that encouraged the incorporation of technology in the classroom, the reality was that the recommended practices majority of the time ended up making very limited use of the possibilities that exist when using technology. Similarly, a survey was utilized by Pittman and Gaines (2015) to study the nature of technology use among third-, fourth-, and fifth-grade teachers in a Florida school system. According to the findings of the research, teachers can influence how their pupils think about and interact with various forms of technology. Only 18.7% of those who responded could meet the qualifications to be classified as high-level technology integrators. There is a need to use technology to develop the potential of learners in the 21st century hence teachers must develop their technological competence using technology to develop the technical skills of learners (An

& Reigeluth, 2011). Learner-centered or constructivist practices are often associated with advanced technological applications (An & Reigeluth, 2011). This emphasizes the development of skills in areas such as communication, collaboration, critical thinking, creative problem-solving, and sound decision-making, all of which led to the generation of new knowledge as opposed to merely the memorization of previously learned material (An & Reigeluth, 2011). In a quantitative study of 16 primary school teachers in rural schools in Spain on how technology is used in the classroom, the researchers discovered that despite the teachers' favorable sentiments about the use of technology in the classroom, the activities were confined to memorization and retrieval (de Aldama & Pozo, 2016). Students get the necessary skills to use the wide range of internet resources available today by having technology integrated into the classroom. Furthermore, it gives teachers the chance to teach their pupils about digital citizenship and the latest threats to academic integrity (An & Reigeluth, 2011).

Classroom Assessment

Current educational research gives significant support to the practice of using assessment in the classroom with the aim of promoting student learning (Coombs et al., 2018). McMillan et al. (2013) describe classroom assessment as the collection, appraisal, and application of information to assist teachers to make choices that increase student learning. The primary focus in classrooms is assessment, and it gives teachers and students uninterrupted and actual statistics that inform and support teaching (Ramsey & Duffy, 2016). According to Brown (2004), assessment is a continuous process that involves a larger range of activities than testing. Every time a student answers a question, makes a remark, tries out a new word, or uses a new sentence structure, the instructor unconsciously evaluates the student’s performance (Brown 2004). In

research and policy pertaining to education, three different methods of assessments are often mentioned: Summative assessment, also known as assessment of learning, formative assessment, sometimes known as assessment for learning, and assessment as learning, which has been described as a subset of formative assessment (DeLuca, 2018).

When collecting assessment data to provide reports on learning outcomes, assessment of learning places an emphasis on measuring students' current level of knowledge or competence at a given time point (Kibble, 2017). Assessment for learning, on the other hand, is the process of gathering and analyzing data or feedback on a student's learning to identify their next steps and the teaching strategies that will support them (DeLuca et.al 2019). Student participation in assessment tasks that encourage review and self-reflection on their own learning is referred to as assessment as learning (Earl, 2013). Formative assessment's main goal is to advance student learning, not to serve accountability needs or to report on student performance. DeLuca et.al (2019) emphasize the importance of continuous assessments as it relates to classroom instruction. Around the globe, policies require teachers to include assessments into all aspects of their work. This calls for the ongoing gathering and analysis of data on student learning that is relevant to both academic and developmental objectives. The active use of this evidence by teachers and students is to advance learning in a positive way.

How Technology Facilitates Classroom Assessments

In all levels of assessment, Herman (2013) suggests that technology may play a part in the implementation of assessment techniques. Numerous technologies have been used in various forms during the process of assessments. For instance, technology has been used to gather immediate responses from students, administer online tests, formulate effective and engaging

lectures, and carry out assessments using different types of media like internet films (Davis, 2017). Socrative, Kahoot, Nearpod, and Seesaw are a few examples of tools that are often used for handling the assessment tasks described above. Assessment may be conducted using Socrative in the form of pre-designed quizzes or brief questions like polls, which enable teachers to involve students in the learning process.

According to Seesaw (2019), using pre-designed quizzes or fast questions like polls, teachers are given the opportunity to engage students in assessments using Socrative. The Kahoot application is a student response system that is built on a game, and it gives students the ability to respond to questions using a mobile device that they hold in their hands (Seesaw,2019). Students can remain connected to their instructor's lectures via the web browser on whatever device they want thanks to the interactive slide presentation tool known as Nearpod (Seesaw,2019). Seesaw facilitates the creation of digital portfolios that are driven by the students themselves, which teachers may then utilize to get a deeper understanding of their pupils' academic development and provide education that is tailored to their specific needs (Seesaw,2019). Research on the influence of virtual manipulatives on student learning was carried out by Reimer &Moyer (2005). The study was carried out in a third-grade classroom with 19 students. The researchers came up with handouts to direct formative feedback and summative assessment of a variety of virtual fraction manipulatives. The findings of the study demonstrated that the use of technology raised student involvement by differentiating the task and assessments from more conventional methods and giving students the impression that they were participating in a game. Other researchers who employed technology to engage students in assessment came to similar results on generating engagement and gamifying assessment (Johns, 2015).

The research on the use of technology tools in formative assessment has been categorized into two groups by Close (2017). The two groups categorized by Close (2017) are computer-based assessment and student response system assessment technique. According to Close (2017), computer-based exams often integrate assessments into the process of learning and give feedback for students to use in self-regulating their own learning. Utilizing cutting-edge technology in the classroom opens new avenues for classroom assessment, which includes giving teachers the ability to evaluate learners' problem-solving abilities directly. Moreover, the efficiency with which teachers monitor the steps students take as they solve problems, model, and simulate complicated reasoning tasks is richly enhanced (National Research Council, 2001). Joshi & Babacan (2012) emphasized the significance of blogging as a technique for delivering formative assessments in education. In a similar vein, Fuller & Dawson (2017) studied the use of e-portfolios as a teaching tool for beginning biology courses. Students were given low-stakes reflecting activities to complete as a means of assessment, and the teacher promised to provide them with customized feedback at a later point in time. It was discovered that using an e-portfolio shortens the amount of time between the submission of an assignment, receiving feedback on it, and revising it, which in turn drives an increase in student involvement.

Student response systems are popular in education and are used to evaluate students' learning in courses in real-time (Sarvary & Gifford,2017). Much research in technology-facilitated assessments used student response devices, originally called "clickers" but swiftly expanded with many new possibilities due to wireless internet. Beatty and Gerace (2009) studied assessment using clickers in science classes in America. They offered four concepts for the technology-enhanced assessment using student response systems. "Question-driven teaching"

was the first premise. Second, teachers must "increase pupils' comprehension and scientific fluency via dialogue." Third, formative assessment should guide teaching and learning choices. Technology-facilitated formative assessment should be utilized to "assist students to acquire metacognitive abilities and collaborate in the learning process". Shirley et.al., (2009) found that using a student response system in assessment might assist teachers to comprehend students' thinking by implementing instructional assignments. Shirley et. al., (2009) stated that student response systems may aid in this area. All the research in the student response system focused on integrating developing technology into assessment procedures. Despite the aid of technology to conduct good assessments in the classroom, Shirley et. al., (2009) suggested that integrating technology into the classroom does not bring about assessment. However, it gives teachers a way to conduct rich educational assignments and assess student knowledge. Similarly, Elmahdi et. al., (2018) conducted a survey on the efficacy of using a classroom response system known as “Plickers” using 166 basic school children in Turkey. The purpose of this research was to evaluate whether using a classroom response system such as Plickers may help students learn more effectively. The study reported that students are of the opinion that assessments is an extremely important component of both learning and teaching. According to the findings of the researchers, using Plickers reduces the amount of time spent on learning, ensures equitable possibilities for participation, and produces learning environments that are both enjoyable and stimulating.

The provision of feedback is an essential element of assessments. The next processes in teaching and learning are informed by the feedback information that students' achievements provide, which in turn makes those steps better (Black & William, 2009). Dialogical and

automated forms of feedback are both made possible by technological advancements. Either the teachers and learners or the students themselves might participate in the dialogical feedback session. Webb (2010) stated that the use of simple technology tools, such as Web 2.0 apps, might make the processes of peer assessments and feedback more streamlined. According to Gikandi and Morrow (2016), a collaborative asynchronous discussion forum facilitated peer formative input. When it comes to providing timely and relevant feedback to large groups of online learners as they go through a variety of learning activities, one of the greatest challenges lies in the fact that it is very difficult to do so (Spector et al., 2016). As a result, automatic feedback could be an alternative method that works well. One example of a straightforward feedback system is one in which, depending on a learner's response, the system automatically directs them to a question-and-answer database. Analyzing the massive amounts of data produced by technology-based testing has recently been suggested as a use for the term "learning analytics" (Gibson, et. al, 2015). Spector et al., 2016 stressed that feedback that is effective enables the learner to reflect on their own learning as well as the methods they are using to learn, allowing them to make modifications that will allow them to make greater progress in their learning.

Challenges Teachers Face When Using Technology in Classroom Assessments.

Zhan and So (2017) conducted a study by focusing on teachers' opinions and the use of a multimedia learning platform for assessment rather than the design of computer-based assessment. The study reported four difficulties teachers had while using a computer-based assessment platform and these were poor student engagement, poor assessment task design, poor teacher feedback, and poor follow-up problems. Additionally, the teachers questioned the validity of the assessment tasks, the difficulty of the assessment tasks, as well as the degree to which the

assessment tasks aligned with the curriculum. These issues were intricately intertwined with the efficient planning of assessment activities that were supported by technology. According to Zhan and So (2017), the completion of scientific assessment tasks should not be impacted by variables like typing skills and reading ability. However, Zhan and So (2017) noted that the complexity of various assessment activities was far greater than the level that the students are now at in this investigation. Assessment activities should be suitable within the "zone of proximal development", and technology might be offered to function as scaffolds to aid students in completing the tasks (Vygotsky, 1978). All these factors highlight the significance of designing an assessment that is centered on the user and is supported by technology (Webb et al., 2013). Zhan and So (2017) explain that when designing settings for technology-supported assessment, researchers should consider the characteristics of the students.

Feedback is an essential element of formative assessment, and it might be provided either to teachers or to students, as well as either by other people or by a smart engine (Webb et al., 2013). Technology has made it possible for both teachers and students to provide feedback to one another (Webb et al., 2013). Formative assessments are becoming more possible for teachers and students to carry out thanks to advancements in technology. On the other hand, a study conducted by Zhan and So (2017) focusing on teachers' opinions and the use of a multimedia learning platform for formative assessment reports that neither the teachers nor the pupils seem to comprehend the massive amounts of data in the feedback report on students’ performance in classroom assessments. In the future, Zhan and So (2017) stated that it would be prudent for researchers to investigate both the efficacy of various ways of showing data and the possibility of using data representation for the purpose of increasing assessment literacy among teachers.

Similarly, a study conducted by Beaumont-Bates (2017) analyzed the perspectives of teachers on the implementation of an e-portfolio program in a New Zealand preschool classroom. The researchers discovered that the use of e-portfolios increased the reported level of collaboration between teachers and parents and that they were a significant improvement over paper portfolios. Nevertheless, difficulties associated with the use of technology in classroom assessments were identified, which included the lengthy process of uploading and organizing visual data (Beaumont-Bates, 2017). This research highlighted the fact that possessing the abilities necessary to use technology tools with ease does not guarantee high-level integration, but rather pointed to the need of exploring those aspects that may influence the frequency of technology usage.

Studies have also concentrated on providing training and technical assistance for teachers to further the incorporation of technology in classroom assessments. The failure to provide enough training and technical assistance for the integration of technology in classroom assessments may lead to a variety of difficulties and make it more difficult to make use of technology in assessments (Francom, 2020). Welch (2019) recently conducted research that investigated rural regions and stakeholders regarding educational technology and schooling in rural schools. Welch (2019) threw light on the issues that rural teachers are confronted with when using technology in classroom activities like the assessment of learning outcomes. The findings of the study highlighted inadequate infrastructure, inadequate internet connectivity, inadequate training, and inadequate finance as part of the challenges affecting rural teachers in the use of technology-based assessments in schools.

Conclusion

To increase the use of technology in rural classrooms, this study sought to identify a connection between teachers' attitudes toward technology integration and technology-based assessments. However, it also provides insight into how technology is being used, not just whether it is being used. Previous studies across all grade levels have shown that most of the teachers' use of technology is judged to be low-level and non-transformative (Gibson, & Cotten, 2017; Pittman & Gaines, 2015). Teachers must take their technological integration to the next level, therefore preparing pupils to be active participants in the 21st century. Kerckaert et al. (2015) stated that technology professional development programs should assist teachers in elevating their technology integration.

An explanatory sequential mixed method of research will be used for the study. The objective and core assumption of mixed methods research is that the combination of quantitative and qualitative techniques gives a deeper grasp of study challenges and complex phenomena than each method alone (Creswell & Plano Clark, 2007). By triangulating one set of findings with another, one may get a deeper understanding and increase the validity of conclusions.

The subsequent chapter will discuss the exact research strategy and variables of the study. In Chapter 3, the dependability and validity of the research instrument and an explanation of its applicability to this study will be presented. The suitability of the approach and the data-gathering process will be specified.

CHAPTER THREE

METHODOLOGY

Introduction

This chapter explains the methods used for the explanatory sequential mixed method of research. The goal of this study was to explain the attitude of teachers toward the use of technology in classroom assessments in rural schools. Initially, the section on research design outlined the sort of research design, the population and sample, the instrument, and the study's processes. Secondly, the data analysis section will specify all research variables and detail the statistical analysis procedure and qualitative data collection and analysis. The validity part focuses on the reliability and validity of the instruments, as well as the overall validity of the research study. The focus of the study was based on these research questions:

1. What are rural teachers' attitudes toward using technology in classroom assessments?
2. To what extent and frequencies do teachers use technology in their classroom assessments in rural schools?
3. How do teachers use technology in classroom assessments in rural schools?
4. What are the challenges teachers in rural schools face when integrating technology into classroom assessments?
5. How do the quantitative data regarding technology usage and attitudes align with the qualitative insights about teachers' motivations, challenges, practical usage, and recommendations related to technology in classroom assessment? (Mixed methods question).

Research Design

A mixed methods design integrates both quantitative and qualitative components within a single study, thereby allowing the researcher to explore various types of data in greater depth (Creswell, 2014, 2015). According to Roberts (2010), the utilization of the mixed methods research design enables the presentation of results that possess a wider scope and greater depth. This approach enhances the findings of the data by providing explanations for the "why" and "what" aspects of the research (p. 145).

After thorough deliberation, the most suitable mixed methods design for the research study was determined to be an explanatory sequential mixed methods approach. This approach was chosen due to its ability to offer a more comprehensive understanding of the subject under investigation (McMillan & Schumacher, 2010, p. 401). According to McMillan and Schumacher (2010), the explanatory sequential approach is commonly employed when there is a clear need for quantitative data collection, but further analysis using qualitative methods is required to clarify the quantitative findings (p. 401). The sequential approach described in this study consists of two successive phases that are interrelated and facilitate the integration of data (Creswell, 2015; McMillan & Schumacher, 2010).

The Quantitative Phase of the Study

During the initial stage of the explanatory sequential design, the collection and analysis of quantitative data are undertaken (Creswell, 2015). McMillan and Schumacher (2010) assert that quantitative research designs emphasize objectivity when measuring and describing phenomena. These designs strive to enhance objectivity through the utilization of numerical data, statistical analysis, structured methodologies, and rigorous control measures (p. 21). Methods

that are quantitative facilitate the collection of numerical data by researchers (Patton, 2002). Quantitative data often consists of responses that are limited to predetermined options, commonly found in survey instruments (Creswell, 2014). The chosen quantitative data collection method for Phase 1 of this study was an electronic online survey questionnaire, which was deemed to be the most effective hence the use of a descriptive survey.

According to Creswell (2014), a survey design is a method that allows for the quantitative or numeric presentation of trends, attitudes, or opinions within a population by examining a representative subset of that population (p. 155). Hence, the utilization of electronic online surveys was considered suitable for the present research endeavor, with the aim of investigating the prevailing attitudes of teachers towards the use of technology in classroom assessments in rural (Creswell, 2014, p. 155). The purpose of this approach is to gain insights into the attitude of teachers toward the use of technology classroom assessments in rural schools and the extent and frequency of the use of technology in classroom assessments in rural schools. The outcomes of the quantitative inquiry ascertain the specific findings that necessitate additional elucidation during the subsequent phase.

The Qualitative Phase of the Study

During the second phase of the study, qualitative data were collected with the purpose of enhancing and providing further insights into the quantitative data that were obtained during the initial phase (Creswell, 2015). Qualitative methodologies afford researchers the opportunity to collect data in the form of verbal expressions pertaining to naturally occurring phenomena (Patton, 2002). The collection of qualitative data is commonly undertaken by researchers through various methods such as observation, artifact examination, or conducting interviews (Creswell,

2015). During the process of conducting interviews, it is customary to employ open-ended questions that do not possess predetermined responses (Creswell, 2014). In the present study, it is pertinent to note that participants did not have ample time to engage in lengthy interviews due to tight instructional hours. Consequently, in Phase 2 of the study, a qualitative data collection approach was employed, specifically employing a focus group interview and follow-up opened questions to ask participants about how they used technology in classrooms and the challenges they faced when integrating technology into classroom assessments in rural schools.

The primary objective of focus group research is to leverage the perspectives, emotions, convictions, encounters, and responses of participants in a manner that would be impractical to achieve through alternative methodologies, such as observation, individual interviews, or questionnaire surveys. Attitudes, emotions, and convictions may possess a certain degree of autonomy from a collective entity or its societal context. However, they are more prone to manifest themselves through the communal assembly and the interpersonal exchanges that transpire within a focus group. In contrast to individual interviews, which seek to gather personal attitudes, beliefs, and emotions, focus groups facilitate the exploration of a diverse range of perspectives and emotional dynamics within a group setting. The individual interview offers a higher degree of researcher control compared to a focus group, as the latter setting allows participants to potentially assume a more proactive role. In contrast to mere observation, the utilization of a focus group affords the researcher the opportunity to acquire a greater volume of information within a compressed timeframe and facilitate the engagement of the participants in further elucidation of specific inquiries that remained unaddressed during Phase 1.

Population

The study population was drawn from a Montana school district that the Department of Education officially recognizes as having rural elements. The setting of the study is closer to a semi-urban urban area which has both rural and urban elements. The recent figures from the Department of Education reveal that while the district is classified as rural, it is worth noting that although the population for the study is considered rural, it has some urban elements. This research specifically targeted over one hundred school teachers working in different elementary schools around the district.

Sample Size

Quantitative

According to Dworkin (2012) and Mason (2010), it is essential for a study's sample to be representative to facilitate statistical analysis, draw precise conclusions, and make valid inferences. The quantitative aspect of this study used Yamane's (1967) method to determine the sample size. The calculated sample size was 80, drawn from a population of 100 teachers within the elementary schools within the Belgrade school district. The number of participants from each school was determined using a simple percentage, considering the population distribution of the various schools.

Qualitative

Lune and Berg (2017) stressed that in order to facilitate in-depth analysis, which is a crucial aspect of qualitative research, it is recommended to have a small sample size in

qualitative inquiry. According to Creswell (2002), a recommended sample size range of 10-20 is advised for qualitative research. In this study, a sample consisting of 10 participants was used.

Sampling Techniques

Quantitative Sampling

The study used the nonprobability convenience sampling method to choose the teachers for the study. The study used a nonprobability convenience sampling selection procedure to ensure that each participant from the various schools in the Belgrade school district had an equal opportunity to be chosen (Cooper & Schindler, 2014).

Qualitative Sampling

The researcher used the homogenous purposive sampling strategy to carefully pick participants for the qualitative investigation. The reason was to obtain a homogenous sample, which refers to a sample in which the units possess identical or very comparable qualities or attributes (Creswell & Clark, 2011), and to ensure that sufficient information on the subject matter is provided (Etikan et al., 2016).

Instrumentation

Technology Integration in Classroom Assessment Survey

In this study, a self-structured questionnaire was developed by the researcher to collect data on the extent and frequency to which rural school teachers use technology in their classroom assessments. The questionnaire consisted of eight items. These items sought to examine the extent to which teachers use technological tools in their classroom assessments. The questions included in the questionnaire were constructed based on the authoritative perspectives presented

in the literature that was studied. The items were rated on a five-point Likert scale as outlined below: 1- Do not use 2-once a semester, 3-once a month, 4-weekly, and 5-Daily.

Teacher Technology Assessment Attitudes Questionnaire

This questionnaire was adapted from the Attitudes Toward Computers (TAC) questionnaire that was used to measure the attitude of teachers toward the use of technology in classroom assessment. The original instrument had 284 questions on 32 Likert and Semantic Differential scales comprising the TAC's 10-part composite measure (Christensen & Knezek, 1997). The construction procedure picked questions from 14 well-validated computer attitude survey instruments (Christensen & Knezek, 1996). Due to the focus of the research, our study focused on parts 1 and 2 sections of the instrument which focused on the comfort and interest of teachers' technology usage.

Teacher Technology Assessment Attitudes Questionnaire consists of 20 items with items on a 5-point Likert scale which was ranked from "strongly disagree to strongly agree". The instrument has two parts namely parts one and two. Part, one looks at the interest of teachers in using technology in classroom assessments and part two focuses on the feeling teachers have been integrating technology in their classroom assessments.

Focus Group Interview Guide

The focus group interview guide was used to collect the narrative data. The focus group interview for teaching staff was made up of 18 questions. The merit associated with using semi-structured interviews is that it allows the investigator to probe further to elicit detailed responses from participants. It also gave the researcher the freedom to refine and pose more enhanced questions than initially planned ones (Phellas et al., 2011). The focus group interview aimed at

collecting detailed descriptions of teaching staff experiences on educational technology integration in classroom assessments. Some of the significant questions included: What is your view on incorporating educational technology into classroom assessments? How often do you integrate educational technology into your classroom assessments? What specific educational technology devices do you usually integrate into your classroom assessments? Which activities do you employ these technologies to perform in your teaching and assessments? What challenges do you encounter in your quest to integrate the identified educational technologies into your classroom assessments? Since you started working in the institution, have you had any training in educational technology? If yes, how many times and in which specific area? Do you think you would need further training in educational technology? How has the integration of educational technologies in teaching helped your teaching?

Data Collection

Quantitative Phase

The data collection approach used for the quantitative component of this study was the administration of a questionnaire. A questionnaire is a commonly used instrument for research utilized in survey studies. The survey is comprised of a set of questions and corresponding choices, presented in a sequential manner on a document designed explicitly to get targeted data from those participating in the study. The collection of questions on a survey instrument provides a comprehensive platform for collecting responses from participants. Within this platform, there are several types of questions that may be found, including closed-ended or multiple-choice questions, as well as open-ended questions. This method is used to gather data from a large cohort of individuals pertaining to a certain area of the study. The use of questionnaires

offers several benefits, one of which is its capacity to ensure consistency. All participants in the study provide responses to an identical set of questions. The strategy is cost-effective and eliminates investigator bias. Additionally, it provides students with sufficient time to contemplate and formulate their responses to the questions using their own language. Due to its extensive scope, research participants living in remote places may be readily accessed.

Qualitative

This study used the focus group interview approach as one of the data-collection strategies, often utilized in qualitative research. Interviews include the collection of data via the use of questioning, which may be conducted in person, over the phone, or by video conferencing. Data may be acquired via several methods, including actively listening to study participants, capturing visual information by filming, and documenting through recording, either alone or in combination. The data-collecting approach often used involves the gathering of data from a limited number of study participants, on a broad range of topics. The process of conducting interviews is characterized by a higher level of human interaction, which in turn facilitates a greater likelihood of obtaining a higher response rate from participants. Additionally, it provides the ability to exercise control over the sequencing and progression of questions. The utilization of interviews enables researchers to implement essential modifications and pose probing questions to elicit more comprehensive and thorough responses from persons involved in the study.

Validity and Reliability

Quantitative

Creswell and Plano Clark (2011) elaborated on the importance of employing existing instruments by underscoring the need to identify instances in which these instruments have been historically utilized with commendable levels of validity and reliability. The concept of "content validity" refers to the degree to which the questions in a questionnaire effectively encompass the full range of possible inquiries within a specific field of knowledge (Creswell & Plano Clark, 2011).

Ihantola et al., (2011) stressed that internal validity has significant importance in the context of mixed methods research. It encompasses the degree to which a study effectively and reliably answers the research question or hypothesis by using a mix of qualitative and quantitative data gathering and analysis methodologies, while also mitigating any sources of bias, error, or confounding factors (Ihantola et al.,2011). With respect to this study, some of the threats to the internal validity of this study were selection bias, instrumentation bias, and maturation. Henderson et al., (2007) stipulate that selection bias occurs when the sample for a study is not representative of the entire population. Chenail (2011) asserts that when there are inconsistencies or changes in the measurement tools or procedure between the quantitative and qualitative phases, it is termed instrumentation bias. Throughout the duration of the study, it is possible for participants to undergo changes or exhibit maturation that might potentially impact the outcomes, especially if there exists a temporal gap between the collection of quantitative and qualitative data (Alkharang, 2011).

The concept of external validity is of paramount importance in the context of mixed methods research (Onwuegbuzie & Johnson, 2006). It refers to the degree of generalizability or applicability of the results and conclusions derived from a mixed methods study to a wider population or environment outside the confines of the study (Onwuegbuzie & Johnson, 2006). The assessments determine the relevance and applicability of the findings to contexts, populations, or circumstances outside those specifically investigated (Onwuegbuzie & Johnson, 2006). Time-related factors and the influence of the researcher were the two threats to the external validity of the proposed study. Onwuegbuzie and Johnson (2006) stressed that when there is a lag of time between the quantitative and qualitative phases of the study, there may be changes that might arise in the environment which might have a negative impact on the generalizability of the findings. Furthermore, if the involvement and the emotions of the researcher are not controlled in the qualitative phase, it might impact the generalizability of the findings of the study (Onwuegbuzie & Johnson, 2006).

To mitigate threats to validity, the researcher designed the study meticulously in accordance with the research conditions. Although it is difficult to eradicate extraneous variables, employing solid research designs helped mitigate threats to internal validity (Mitchell & Jolley, 2010). Moreover, the researcher made use of suitable sampling procedures, reduced biases, gave full explanations of the research setting, and was upfront about the research process and the possible limits of the study (Mitchell & Jolley, 2010). In a diligent effort to strengthen the instrument's validity, two knowledgeable experts in the field of instructional technology were consulted to conduct a thorough assessments of the individual items in relation to their ability to accurately measure the specified research questions.

At the Montana State University (MSU) campus, a combination of quantitative and narrative instruments was used throughout the pilot phase. The selection of MSU for the pilot exercise was based on the similarity of some of the pre-service teachers in MSU to those of the Belgrade School District. The questionnaire was administered to a sample of eight (8) teachers, representing about 10% of the population under study, to collect their responses. The objective of this initiative was to rectify any faults and inconsistencies present in the instrument. Prior to the completion of actual administration, ambiguous questions were reformulated to enhance clarity. The participants' opinions were also included prior to the actual administration of the instrument. Following the development of the focus group interview questions, a pre-testing phase was conducted at the same institution. During this phase, select teachers were given the opportunity to provide feedback on the pretested questions.

The internal consistency of the quantitative instrument was assessed using Cronbach's Alpha reliability coefficient. In order to assess the internal consistency of a test, reliability estimates are derived using the mean inter-correlations among all individual items inside the test. The internal consistency coefficient for each dimension was computed by the author using the Statistical Package for Social Sciences (SPSS) version 21 software. Based on the findings from the test results, it was determined that the Cronbach Alpha internal consistency coefficient yielded values of 0.94 and 0.91 respectively for the interest and feelings dimensions, of the Teacher Technology Assessment Attitudes Questionnaire. In addition, the internal consistency results of the Technology Integration in Classroom Assessment Survey was 0.76. These findings suggest that the instruments exhibited a high level of reliability.

Qualitative

There are several definitions and criteria that pertain to trustworthiness, with the most well-recognized characteristics being credibility, transferability, dependability, and confirmability, as outlined by Lincoln and Guba (1985). In order to enhance the credibility of the data, techniques such as the member check were used. In relation to the use of member checks, the transcripts of the interviews were sent to the participants for the purpose of obtaining their input. Furthermore, a discussion was convened with the respondents to evaluate their understanding and address any apparent misinterpretations. Ultimately, the results were given to the participants to get their validation. To enhance the transferability of the study findings, the researcher used the method of dense description and purposive sampling.

The use of a comprehensive and detailed description of events enhanced the credibility of the study by accurately conveying the real occurrences under scrutiny, as well as providing some insight into the surrounding settings. To verify the reliability of the study results, a process of peer examination was conducted. The prospect of having one's study subjected to examination and assessments by colleagues, peers, and scholars was met with enthusiasm. The researcher used the comments and observations to enhance and improve the study design, as well as to bolster the arguments in response to the criticisms received. The use of an audit trail was employed to guarantee the confirmability of the narrative data.

Administration of Instruments

Quantitative

Before commencing data collection for this study, the researcher sought approval from the Montana State University Institution Review Board (BUIRB) to conduct the research. The

study in question underwent a thorough review and received approval from the MSUIRB on March 1, 2023. After obtaining approval from the MSUIRB, a formal email was sent to the Superintendent of the Belgrade School District, seeking authorization to administer the survey in the Belgrade School District. Upon receiving authorization from the Superintendent of the Belgrade School District, the researcher commenced the initial stage of the explanatory sequential study.

During the quantitative data collection phase of this explanatory sequential study, an electronic mail was sent out to solicit the involvement of teachers in the survey. This communication was sent out on April 18, 2023, and concurrently conveyed the survey's deadline of August 30, 2023. The survey was conducted using the online survey platform provided by Qualtrics. For teachers who expressed their willingness to partake in the study, an embedded hyperlink was furnished within the electronic mail. The participants were directed to a hyperlink that led them to an electronic document containing an informed consent waiver and the Participant's Bill of Rights, as mandated by the MSUIRB regulations. A total of 80 (eighty) surveys were sent to teachers within the Belgarde school district, with 57(fifty-) questionnaires being successfully recovered. This indicated a response rate of 71%.

Qualitative

The focus group interview was conducted promptly after the completion of the quantitative analysis. The first focus group interview session was conducted at Saddle Peak Elementary School and it was followed by a second interview session at the Story Creek School. All the interviews conducted with the teaching staff were carried out using an in-person or face-to-face format. The interview was conducted with teaching personnel who participated in the

quantitative phase of the study. The duration of the interview conducted with the teaching staff ranged from 40 to 45 minutes. The interview with the teachers was conducted in the month of September 2023.

Data Analysis Procedure

Quantitative

In this study, quantitative data were evaluated using the Statistical Package for Social Sciences to address the first research question (SPSS). Participants were asked questions on their attitude, the frequency, and to what degree they utilize technology in their classroom assessments. The various choices made by participants were noted and individually acknowledged. Frequency percentages means, and standard deviations were among the descriptive statistics employed in the data analysis of the quantitative data.

Qualitative

The researchers used Braun and Clarke's (2006) theme analysis approach as a model to conduct the analysis of the narrative data. The use of the model proves to be a versatile and advantageous approach in the analysis of narrative data. The steps include the essential process of becoming well-acquainted with the data, creating code, formulating themes, establishing, and enhancing themes, and composing the final report. The data were manually analyzed. The analysis encompassed structured and methodical procedures that necessitated the documentation of data, transcription of recorded interviews, acquainting oneself with the data, selecting a subset of data from the extensive collection, coding the concepts, assigning codes to the overarching themes, categorizing the themes, and ultimately, providing descriptions and explanations based

on these themes. The categorization process included meticulous labeling of all the categories, drawing on relevant literature.

The interview was recorded using a mobile phone recorder. The audio recordings were uploaded into a laptop and then recorded on both a CD and a USB drive. These storage devices were then securely stored in a designated location. In addition, the written message was also seen as a contingency measure. Additionally, it furnished the contextual background for the interview. The recorded material obtained from the teachers was transcribed verbatim. The researcher dedicated a significant amount of time to thoroughly reading the transcription to familiarize myself with the facts, ensuring accurate analysis and interpretation.

Additionally, the researcher thoroughly examined the transcribed material on many occasions in order to discern any recurring phrases, connections, patterns, keywords, and concepts that encapsulated the essence of the study inquiry. The subsequent step was the coding of the data. The process involves identifying certain phrases or sentences within the text and assigning them codes or labels to indicate their meaning. The phrases were visually distinguished by being highlighted in a variety of colors according to distinct codes. Each of the codes represents a concept or emotion expressed in the given portion of the text. I thoroughly reviewed the transcripts of each interview many times, systematically identifying and marking any pertinent material that emerged in relation to the conversation. Phrases and sentences that correspond to a certain code were also emphasized. Additional codes were included into the analysis when the text was further examined.

The transcripts of the participants were carefully examined many times in order to get a comprehensive understanding of the data and refine the analysis to align with the relevant

construct. The process of repeatedly reviewing and analyzing the transcripts of participants aided in comprehending the data and directing the investigation toward relevant constructs.

Prior to assigning codes, the transcripts were analyzed to identify any variations and commonalities in the data. Finally, narrations were used to elucidate and establish the underlying ideas that address the study inquiry. Ultimately, the qualitative analysis concluded by providing an account of theme patterns and relationships that are pertinent to the research. The identification of thematic linkages and patterns played a crucial role in facilitating the interpretation process and bolstered the comprehensive examination of the study results.

Ethical Issues

Researchers were unable to determine who took the survey or shared it with others because of the several layers of anonymity provided to participants via the distribution of survey links. With Qualtrics XM, respondents could respond to the survey without fear of having their identities revealed. Raw data was kept on a password-protected external hard drive, and it remained anonymous. Participants were made to sign the Informed Consent Agreement and say "I agree" to participate in the study. The Informed Consent Agreement contained details of the research, how much time is needed, whom to contact with concerns, and what each participant must complete.

Summary

This explanatory sequential mixed method study first conducted a survey to determine the degree to which and the frequency with which rural school teachers use technology-based assessments. This was done since there is a vacuum in the existing literature on how rural

schools employ tech-based assessments. Additionally, data on how teachers utilize technology in classroom assessments in rural schools and the problems teachers face when utilizing technology-based assessments in rural schools were obtained via the use of open-ended questions.

CHAPTER FOUR

RESULTS

Introduction

This section presents findings from the survey and interviews of teachers on the attitude (e.g., interest, feelings, perceptions, inspiration) of teachers towards technology and the use of technology in classroom assessments.

The Interest of Teachers in the Use of Technology in Classroom Assessment.

The table below (Table 1) provides information about the interest of teachers in using technology in rural classroom assessments. The table includes the following items, along with the corresponding number of respondents (n), mean scores (M), and standard deviations (SD)

Table 1: Teachers' Interest in the Use of Technology in Classroom Assessment.

Item	n	M	SD
I think that working with computers for classroom assessment is enjoyable and stimulating.	39	3.61	1.07
I want to learn a lot about technology for classroom assessment	39	3.89	0.77
The challenge of learning about technology for classroom assessment is exciting.	39	3.82	0.95
Learning about technology-based assessment is boring to me.	39	2.29	1.01
I like teaching with technology-based classroom assessment.	39	3.57	0.88
I enjoy lessons when I integrate technology-based assessment.	39	3.79	0.74
I can learn many things when I use computer-based assessments.	39	3.79	0.79
I believe that mastery of technology-based assessment is important for me to learn how to use technology for my classroom assessments.	39	3.71	0.90
I believe that I am a better teacher with technology.	39	3.71	0.94

Based on the mean scores, teachers generally have a positive attitude toward using technology in rural classrooms for assessment purposes. The mean scores range from 2.29 (for the statement "Learning about technology-based assessment is boring to me") to 3.89 (for the statement "I want to learn a lot about technology for classroom assessment"). Overall, the mean scores indicate a moderate to high level of interest and positive attitudes toward integrating technology into classroom assessment. The standard deviations provide information about the variability of responses within each item, suggesting some level of diversity in opinions among

the teachers surveyed. However, the relatively low standard deviations in most cases indicate a fair amount of agreement among the respondents.

These findings suggest that most teachers in the sample are open to and enthusiastic about using technology in their rural classrooms for assessment purposes. They perceive technology as enjoyable, stimulating, and important for enhancing their teaching skills.

The Feelings of Teachers in the Use of Technology in Classroom Assessment.

Table 2 provides information about teachers' feelings and attitudes in using technology in rural classrooms, specifically related to technology-based assessments. It includes the following items, along with the corresponding number of respondents (n), mean scores, and standard deviations (SD):

Table 2: Teacher Feelings Toward the Use of Technology in Classroom Assessments.

Item	n	M	SD
I get a sinking feeling when I think of trying to use technology-based assessments.	39	2.59	1.15
Working with technology-based assessments makes me feel tense and uncomfortable.	39	2.33	0.96
Working with technology-based classroom assessments makes me nervous.	39	2.33	1.07
Using technology-based assessments intimidates me.	39	2.37	1.21
Using technology-based assessments is very frustrating.	39	2.93	1.24
I feel comfortable working with technology-based assessments.	39	3.56	1.01
Technology-based assessments are difficult to use.	39	2.74	1.02
I think that technology-based assessments are very easy to use.	39	3.59	0.84
I have a lot of self-confidence when working with technology-based assessments.	39	3.48	0.85
Technology-based assessments are hard to figure out how to use.	39	2.56	0.97

The mean scores in the table suggest a range of feelings and attitudes among teachers towards the use of technology-based assessments in rural classrooms. The mean scores vary from 2.33 (for the statements "Working with technology-based assessments makes me feel tense and uncomfortable" and "Working with technology-based classroom assessments makes me nervous") to 3.59 (for the statement "I think that technology-based assessments are very easy to use").

Based on these mean scores, teachers generally have positive feelings and attitudes toward technology-based assessments. Teachers did not experience negative emotions such as sinking feelings, tension, discomfort, nervousness, and intimidation when thinking about or working with technology-based assessments. This is evident from the lower mean scores in these statements (ranging from 2.33 to 2.93).

Teachers indicated having a positive attitude and feeling toward technology use in classrooms as indicated by the higher mean scores for statements related to comfort, self-confidence, and perceived ease of use of technology-based assessments (ranging from 3.48 to 3.59). These scores suggest that some teachers feel more at ease and confident when using technology-based assessments, and they perceive them as relatively easy to use.

The standard deviations indicate some level of variability in responses within each item, suggesting diversity in feelings and attitudes among the teachers surveyed. Overall, the interpretation of this table indicates that teachers did not feel apprehensive or frustrated with technology-based assessments. Also, teachers felt comfortable, and confident, and found it easy to utilize technology-based assessments in classrooms.

Extent and Frequency to Which Teachers Use Technology in Classroom Assessments.

The section presents findings on the technology tools used by teachers and the extent and frequency of technology used by teachers in classrooms.

The table below- Table 3 provides information about the extent and frequency to which teachers use technology for various purposes in the classroom. The table includes the following items, along with the corresponding number of respondents (n), mean scores, and standard deviations (SD).

Table 3: Results on the Extent and Frequency of Technology Use for Classroom Assessments by Rural School Teachers

Item	n	Mean	SD
I use technology to gather real-time evidence of student learning simultaneously from all my students with quick check techniques like clickers, ABC cards, whiteboards, and or thumb-ups (EXTUSE1)	39	2.91	1.68
I use technology to provide descriptive feedback to my students about their performance. (EXTUSE2)	39	3.83	1.30
I use technology to help my students monitor their learning over time, using record-keeping techniques (EXTUSE3).	39	3.61	1.12
I use technology to provide my students with the opportunity to self-assess and set goals (EXTUSE4).	39	4.04	1.22
I use technology to post learning targets for what I am currently teaching (EXTUSE5).	39	3.87	1.42
I use technology to give my students time to revise their work based on the feedback they receive (EXTUSE 6).	39	4.22	1.24
I use technology to help my students develop checklists and/or rubrics (EXTUSE8).	39	4.61	1.03
I use technology to target my instruction to learning gaps, misconceptions, or other incomplete understandings identified through formative feedback (EXTUSE9).	39	2.87	1.36
I use technology to help my students to provide each other with descriptive feedback (EXTUSE10).	39	4.17	1.23

Note: Table 3 summarizes the responses from 39 rural school teachers on the extent and frequency of technology use for classroom assessments. Mean scores and standard deviations are provided for items such as real-time evidence gathering, providing feedback, and targeting instruction to learning gaps. Higher mean scores indicate more frequent use of technology in these aspects, shedding light on the technological practices in rural classrooms.

The mean scores in the table reflect the extent and frequency to which teachers use technology for various purposes in their classrooms. The mean scores range from 2.87 (for the statement "I use technology to target my instruction to learning gaps, misconceptions, or other incomplete understandings identified through formative feedback") to 4.61 (for the statement "I use technology to help my students develop checklists and/or rubrics").

Based on the mean scores, it can be inferred that teachers have a moderate to high extent and frequency of using technology for the identified purposes. Teachers report using technology more frequently for providing opportunities for self-assessment and goal setting (mean: 4.04), giving students time to revise their work based on feedback (mean: 4.22), providing checklists and/or rubrics (mean: 4.22), helping students develop checklists and/or rubrics (mean: 4.61), and enabling students to provide each other with descriptive feedback (mean: 4.17). These statements indicate a strong emphasis on leveraging technology to facilitate student reflection, revision, and collaborative feedback.

On the other hand, the mean scores for statements related to gathering real-time evidence of student learning (M=2.91) and targeting instruction to learning gaps (M=2.87) are relatively lower, suggesting a lower extent and frequency of use in these areas. It indicates that teachers may be using technology less frequently for real-time assessment and targeting instruction based on formative feedback. The standard deviations provide insights into the variability of responses

within each item, indicating that there may be some diversity in the extent and frequency of technology use among the surveyed teachers for each specific purpose.

How Teachers Use Technology in Classroom Assessments in Rural Schools.

This section presents the views of participants on the strategies employed by teachers in the use of technology in the classroom, which is how teachers use technology for classroom assessment in schools. Some of the strategies enable student learning, understanding, engagement, and others like providing timely and effective feedback, facilitating the creation and review of activities, and monitoring progress of students. Some of these are:

Enhancing Student Learning.

Teachers revealed a variety of technology-driven strategies aimed at enhancing student understanding across different subjects, particularly focusing on writing and mathematics. In the domain of writing, technology tools, including Google Classroom, Google Forms, and Seesaw, played a pivotal role in supporting students' development of proper writing techniques. Teacher (H) emphasized the significance of these tools in writing workshops, stating that:

> During our writing workshops, technology is more than simply a resource; it is a constant companion on the path to mastery. Tools like Google Classroom, Google Forms, and Seesaw is now fundamental. They improve students' understanding of writing principles and provide them with a platform for imaginative expression. Writing becomes an active and engaging activity when you do this every day.

In mathematics, teachers acknowledged technology as a valuable resource for reviewing and reinforcing concepts. Platforms like Lookit, a game-based tool, were integrated into lessons to set up questions related to math. Through interactive activities on Lookit, students received

immediate feedback, gaining insights into their understanding of specific skills. Teacher (A) highlighted the benefits of Lookit in mathematics education, stating:

> Mathematics is currently playable on platforms such as Lookit. Students benefit greatly from the immediate responses they receive to their questions on a vast array of subjects. The assessment tasks conducted by Lookit track the development of students and the class's incremental mastery of complex ideas such as fractions. I utilize Lookit to administer an assessment in which students are required to calculate individual percentage scores and the class average when fractions are introduced.

Teachers observed that technology plays a pivotal role in facilitating experiential learning and enhancing student understanding through multimedia elements. In scientific education, students are encouraged to capture visuals, such as pictures or videos, to visually explain complex concepts. Through video or audio recordings, students articulate their understanding of scientific principles, enabling a deeper comprehension of how things work. Teacher (B) emphasized the transformative impact of technology on scientific education, stating:

> Technology changes scientific education by moving learning from reading to doing. I use technology to help students explore whys and hows using multimedia records, which helps them get a greater knowledge of scientific subjects. They do this by using visuals, such as images and films.

Similarly, in reading comprehension, teachers reported utilizing online reading sites that integrate written components into comprehension activities. Students practice specific reading strategies, such as extracting evidence from the text to identify themes or main ideas. At the conclusion of the exercise, students engage in written expression, and the platform self-grades their submissions, providing instant feedback. Teacher (D) highlighted the impact of online reading sites on reading comprehension activities, stating:

> The way we approach reading activities has changed due to online reading sites. Students participate in written components in addition to responding to comprehension questions. In addition to reducing the amount of work required for assessments, the self-

grading option offers instant feedback, strengthening written expression and critical thinking.

Enhancing Student Engagement

Teachers highlighted the role of technology in creating stimulating and interactive learning environments. Additionally, the incorporation of multimedia elements and interactive features was emphasized to further enhance the overall learning experience. Teacher B exemplified the integration of interactive elements, stating, "*And it's got a lot of interactive things where the kids can go up to our smart board and compose a piece of music, or they can figure out what rhythm is being played. So, I use it quite a bit in my classroom*."

Monitoring Student Progress.

It became clear to me from my conversations with the teachers that technology plays a significant role in tracking students' development. This was evident in the comment of Teacher D, “I use digital tools that provide ongoing feedback and assessment data. It's important to know where each student is in their learning path rather than only keeping track of grades”. Teachers emphasized using technology strategically to pinpoint areas that need more focus. *"I use technology strategies to review and monitor progress, especially focusing on identifying areas where students may need additional support,"* said Teacher F.

Teachers further reported that they are able to effectively gather and evaluate data for focused interventions because of technology. *"I can quickly identify struggling students, collect real-time data, and analyze it to provide timely and tailored support,"* Teacher B said. In addition, the interactive aspect of using technology to study arithmetic topics was stressed by teachers. For examples, Teacher B said, *"I use technology to help students review concepts at their own pace, receive immediate feedback, and engage with features that make learning math*

more enjoyable with digital resources and applications like interactive math games and simulations." Teachers are able to get real-time data on student development via the integration of technology into the assessment process. Teacher D said, *"We can spot gaps, clear up misunderstandings, and offer timely support when we have access to real-time data." It involves adjusting education to each student's unique requirements”*

Technology Tools Used by Teachers

Teachers acknowledged employing a variety of technology tools to enhance teaching practices and engage students actively. Gaming platforms, including Lookit, were identified as significant contributors to improved student engagement, as highlighted by Teacher (D), who noted, "*I’ve noticed a significant improvement in student engagement since I started using gaming platforms like Lookit. It's amazing how students are more motivated to answer subject-specific questions when presented in a game format*."

Similarly, popular tools like Kahoot, Nearpod, and Quizziz were reported to make learning enjoyable while providing instant feedback on student understanding, as mentioned by Teacher (A): *"In my classroom, I've found that incorporating technology tools like Kahoot, Nearpod, and Quizziz not only makes learning fun but also helps in gauging student understanding instantly. It's like turning a traditional quiz into an exciting game.*" Moreover, CommonLit and Lookit were identified by teachers as key platforms that are helpful in recording student work, fostering collaboration, and evaluating comprehension. Teacher (E) emphasized the role of online platforms in assessment by mentioning, "*CommonLit and Lookit is now a crucial component of my assessment approach. The goal is to build a store of knowledge, not only to record student effort. I can monitor students' development over time and adjust my*

instruction to meet their requirements thanks to the internet." Furthermore, teachers acknowledged the adaptability of Chromebooks, likening them to Swiss army knives for their versatility in using various digital resources and platforms, including Google Classroom, Seesaw, and FastBridge. In addition, Teacher (F) stated that:

> We may compare Chromebooks to our Swiss army knives. Their adaptability makes them indispensable for using a wide range of digital resources and platforms. Having Chromebooks in the classroom is revolutionary, whether the program is Google Classroom, Seesaw, or FastBridge.

Teachers emphasized the importance of ensuring active participation and real-time feedback through the use of clickers, which utilize QR codes for student responses. Additionally, platforms like Edpuzzle were highlighted for their role in incorporating questions and edits into videos, as noted by Teacher (G), "*Using clickers and Edpuzzle has completely changed the way I carry out exams. My teaching has become more dynamic with the use of QR codes to get real-time feedback. It takes more than merely grading pupils to quickly grasp how they think*." Teachers reported utilizing video and audio resources to enrich their lessons and incorporate auditory and visual learning experiences. Teachers stressed access to various programs, such as Boom Cards, provide interactive and customizable activities for students. According to Teacher (C), *"Boom Cards have made it possible for me to include engaging, adaptable activities in the classes I teach. Students can now actively connect with the topic, and I've observed a stronger knowledge of the subject matter. It's no longer simply about reading and writing"*.

Testing and Assessments

The teachers reported using platforms like Google Classroom, Google Forms, and checklists to streamline the assessment process. For example, Teacher (H) stressed that:

> Technology isn't simply a supplement in my classroom; it's a seamless part of our ongoing assessments. Google Forms and Classroom have grown to be essential resources. They provide students with a dynamic platform to demonstrate their comprehension in ways that traditional methods were unable to, in addition to streamlining the assessments process.

The teachers explained that digital assessments through platforms like Seesaw enable students to articulate their thinking and provide explanations for their answers, fostering deeper understanding. In the words of Teacher (B):

> When it comes to assessments, Seesaw has changed everything. Allowing pupils to express their ideas via writing is just as important as assessing their understanding. When pupils can explain their responses, I've seen a noticeable increase in the depth of comprehension. It's similar to providing them with a forum on which to articulate their understanding.

Teachers mentioned embracing diverse assessment formats depending on the subject and context. For instance, in subjects like science, students are encouraged to capture pictures or videos to demonstrate how something works. For example, Teacher (C) stated *"...these days, science tests aren't just written. Students are encouraged to use pictures or movies to show how they understand something. Audio files that help them explain what they understand add another layer*". Similarly, teachers emphasized that the use of technology also enables self-graded assessments, relieving teachers of some of the grading burden. Teachers mentioned that they use Platforms like Lookit which offers gamified assessment options where teachers can customize questions for math, ELA, science, and social studies. For example, Teacher (D) stated:

> Tech has made things more efficient. Self-graded tests, particularly those given on sites like Lookit, save time and give students feedback right away. It's nice that the grades are now fairer, and the game-like features keep the students interested. They can see how their numbers change over time and keep track of their growth.

Additionally, teachers reported using QR codes for quick assessments, allowing them to efficiently identify each student and capture their responses, particularly when time is

limited. Teacher (G) noted "*….and then I can put a question on the board and scan it with my phone. And then I can tell which student is which number, and which QR code. And then that's just an easy way to assess since I have such a short amount of time with them."*

Providing Timely and Effective Feedback to Students.

The findings from the study suggest that teachers employ technology strategies to provide timely and effective feedback to students, fostering growth, and supporting their learning journey. These strategies leverage interactive platforms and game-like experiences to deliver immediate feedback and encourage students to monitor their progress. It was observed that one tool utilized by teachers is Lookit, a game-based platform that offers subject-specific questions in math, ELA, science, and social studies. Teachers stressed that the platform provides a class average and individual percentage scores, allowing students to gauge their performance and understand their proficiency level in the specific skill being assessed. For example, Teacher (C) mentioned, "*When introducing fractions, teachers administer an assessment knowing that students may not initially perform well. However, by revisiting the same assessment later, students can witness their improvement and track their progress over time".*

In addition to game-based platforms, teachers also reported utilizing other methods to provide feedback to students. They send out hints, like playing a game online, or provide hints to the entire class to serve as valuable cues for students, encouraging them to pay attention and providing support when needed. For example, Teacher (B) noted *"…. I think that giving students small clues—whether through an online game or in front of the entire class—sparks their curiosity and keeps them engaged in the learning process."* Similarly, Teacher (E) stated that *"...hints serve as cues, directing students to pay attention in addition to helping them find the*

correct answer." Assuring that no one is left behind and providing assistance when needed, it functions like a soft prod."

During the conversation about technology-enabled feedback, teachers reported using Lookit to provide hints to students to enable them to take ownership of their learning and monitor their progress. Teacher (D) mentioned, *"We can give feedback almost instantly with platforms like Lookit. When combined with helpful recommendations, this provides a setting where students are empowered to take control of their learning and get immediate support."* Moreover, teachers highlighted that immediate feedback helps students understand their strengths and areas for improvement, fostering a sense of accomplishment and driving their motivation to strive for continuous growth. For example, Teacher (A) said, *"It's a game-changer when pupils identify their areas of strength and growth right away. It increases their desire to pursue ongoing improvement and gives them a feeling of success."*

Facilitate the Creation and Review of Student Activities.

Talking with teachers made it clearer that technology has a major influence on how students engage in their studies. Teacher (B) said*, "…We're using a variety of approaches to both design and assess student work. Technology makes a dynamic approach possible, increasing the interaction and interest level of the learning process."* The importance of multimedia components in enhancing the learning process was emphasized by teachers. *"…We incorporate slides, music, and visual elements when designing activities,"* Teacher (D) said. Teacher (D) further stressed that *"…It takes more than merely imparting knowledge to help students envision ideas and make connections between disparate bits of knowledge. Instead, an immersive learning environment must be developed."* Technology plays a critical part in creating interesting

materials because it enables teachers to use approaches other than the ones that are customary. For example, Teacher A noted, *"...We can create products that are not limited by technology. We use multimedia components and interactive technologies to hold students' interest and encourage a better comprehension of the materials."*

Teachers stressed that they utilize interactive platforms and tools that enable students to actively participate in the review process. For example, Teacher B remarked, *"On the smart board, students can compose music or analyze different rhythms"*. This hands-on approach not only reinforces their understanding of musical concepts but also encourages critical thinking and problem-solving skills. Teacher B noted:

> We use music, presentations, and visuals when creating events. Creating an immersive experience that aids students in visualizing ideas and making connections between disparate bits of information is more important than just delivering facts.

From the interview, it was highlighted by the teachers that technology helps them in their assessment practices, allowing them to research, analyze, and evaluate educational activities. Teacher F, an experienced educator, emphasized the significance of technology in assessing outcomes beyond traditional teaching methods. Teacher F stated:

> I use technology to evaluate the results and answers to the activities we do on a regular basis as teachers. I am able to learn a great deal about the performance and comprehension of our students thanks to technology. It's important to assess how well our pupils are learning the material in addition to merely teaching.

Challenges Teachers in Rural Schools Face Using Technology for Classroom Assessments.

Teachers face various challenges when it comes to the reliability and effectiveness of technology in the classroom. Coded references from interview data showed these challenges to

include: (1) Reliability and effectiveness of technology in the classroom (2) Poor internet connectivity and unreliable service (3) Difficulties in providing effective feedback to students (4) Varying skill levels of students in utilizing technology (5) Lack of student concentration and focus (6) Lack of computer and other hardware resources (7) Lack of opportunity and time constraints (8) Lack of integration among various digital tools and platforms (9) Prevalence of outdated technology (10) Lack of Teacher training and support in the use of Technology (11) High turnover of technology used.

Effectiveness of Technology in the Classroom

Despite the potential benefits of technology, teachers reported that they face hurdles related to the effectiveness of technology in the classroom. These challenges as mentioned by the teachers encompass selecting appropriate resources, ensuring accurate assessment results, and navigating the appropriateness of standardized tests. One challenge is selecting appropriate sources and programs that go beyond being mere timewasters. As teacher B expressed, *"Sometimes it can be hard to know what a good source would be to use or a good program that does more than is a time-waster."* Effectiveness at measuring student achievement can also be a concern. The use of technology in assessments may introduce issues with fine motor skills and result in inaccurate data. Teacher C shared an example, stating:

> I've watched them put the mouse, the arrow, on the right answer. And then they go to click it, and their fine motor skills aren’t there, and it moves, and it clicks the one next to it. So, then you're just like, you had it right, but you got it wrong.

Furthermore, teachers pointed out that they encounter difficulties with standardized tests administered through technology. As remarked by the teachers, these tests may not align with the developmental appropriateness of the students' skills or the format in which they have learned.

As teacher D pointed out, *"the actual standardized assessments assessing kids that way...I don't think are appropriate."* Another teacher, teacher F emphasized the challenge of finding trustworthy and effective sources, saying, *"I struggle with making sure that I find a good source or good site that I could really trust and buy into...making sure that I'm using something that is appropriate and actually helps the students learn is my biggest challenge."*

Poor Internet Connectivity and Bandwidth Issues

When using technology in the classroom, teachers mentioned the challenge of poor internet connectivity and unreliable service. As pointed out by the teachers, this issue manifests in various ways and hampers the smooth integration of technology into classroom assessments. As teacher B highlighted, *"The internet going down or touchpads not working on the chrome books are two of the problems I face when integrating technology into my classroom assessments."* It was observed from the interview that many teachers have experienced numerous instances of poor or no internet connection, leading to disruptions in instructional activities. The unreliable nature of internet service poses a significant obstacle to the effective use of technology in the classroom. As teacher G expressed, *"We deal with Internet speeds, it not working properly."* In addition, Teacher G noted that, "*The reliance on an unstable internet connection can hinder lesson delivery, student engagement, and the overall effectiveness of technology integration*".

Teachers noted that when everyone is utilizing the internet simultaneously, it can lead to slow and unreliable connectivity. As a result, instructional activities may be hampered, and the desired level of technology integration may not be achievable. However, teachers appreciate the

efforts made to rectify the situation, as teacher A mentioned, *"When the Internet goes down for a whole day, which thankfully doesn't happen too often, they've kind of got it sorted out."*

Difficulties in Providing Effective Feedback to Students

As reported by the teachers, providing effective feedback to students is a challenge that teachers face when using technology in the classroom. One concern is the lack of transparency in certain programs regarding how scores are generated. As teacher A expressed, *"Sometimes it's hard to know what the score means, right? There's not a lot of transparency in some of the programs about how they're generating the score."* This lack of clarity can lower teachers' confidence in the assessment process and make it difficult to interpret and analyze students' performance accurately.

Another challenge expressed by the teachers is determining the underlying factors behind students' scores. Teachers questioned the basis of the score and the items that students may have missed. They contemplated whether a learning deficiency or other factors led to the mistakes. As one teacher reflected, *"What are they basing that score on? If I don't know the items that the student missed and...what probably happened there? Was this a learning deficiency, or did they make a mistake because of some other factor?"*

It was evident from the conversation that teachers find it difficult to ensure that students actively read and respond to the feedback. Encouraging students to buy into the feedback and take it seriously requires verbal reminders and active involvement. As teacher C mentioned, *"Getting the kids to buy in to go look at whatever feedback has been given to them...they're very hesitant or they just blow it off."* However, the ability to send messages and keep students on task through technology tools is seen as a helpful feature.

Varying Skill Levels of Students in Utilizing Technology

Teachers expressed concerns about the varying skill levels of students in utilizing technology. At the beginning of each year, getting all students to the same basic skill level becomes a daunting task. As teacher H noted, *"To begin the year, getting all students at the same basic skill level to move ahead is challenging."* This discrepancy in technological proficiency stems from the differing emphasis on digital tools among teachers at lower grades, resulting in a significant gap that teachers must bridge to ensure all students can successfully navigate the various tools used in the classroom.

Teachers further stressed that the cognitive rigor of technological tasks also poses challenges, particularly in the primary grades. The level of familiarity with technology plays a role in assessing students' abilities. As teacher F observed, *"Students who are very facile with the technology, that's a layer that doesn't interfere. But for students who are unfamiliar, just the layer of technology can get in the way of what we're assessing."* This discrepancy in technological proficiency affects the speed and efficiency with which students can complete computerized assessments, highlighting the need for differentiated support based on individual students' technology skills.

Some teachers in fourth grade, mentioned that some students have extensive experience with technology tools like Google Classroom, while others are still learning the basics of logging in and using digital platforms. As teacher A acknowledged, *"So I sometimes have to teach kids how to log into Google Classroom, and other kids have already used Google Classroom and Google Forms and Google Slides and all the tools."* The lack of set expectations for each grade level regarding technological competencies adds to the complexity of addressing these diverse skill levels.

Lack of Student Concentration and Focus

The results from the conversation with teachers point out that teachers encounter significant challenges in maintaining student concentration and focus when utilizing technology in the classroom. Students, when engaged with technology, often struggle to sustain focus and may not invest their full effort in assigned tasks. Teacher D highlighted this issue, noting that "*students have a hard time focusing or believing that anyone is reading it, so they often fly through it without putting their entire effort into it*." In addition, teacher B noted that *"When students are on tech, they have a hard time focusing or believing that anyone is reading it, so they often fly through it without putting their entire effort into it."* This lack of concentration can hinder students' ability to fully engage with the learning materials and may impact their overall performance and understanding.

Teachers posited that the absence of annotation and highlighting features on a digital platform for reading activities is a significant obstacle, since it hinders students' capacity to actively interact with the material. Teacher F placed significant emphasis on this particular issue, articulating that "*Anything that has to do with reading on a computer where students can't have a printout to annotate or highlight can be a challenge."* The absence of physical interaction with the text can diminish students' comprehension and their ability to actively engage with the content.

Teachers stated that younger learners, in particular, face difficulties in accessing and using technology correctly. Kindergarten students, for example, may struggle with basic computer skills and can make errors when interacting with digital assessments. As teacher B observed, *"I've seen kindergartners on it as well as kindergartners taking a classroom-based assessment and watching them click the wrong answer or click the correct answer or the mouse*

moving and then post the wrong answer." These challenges highlight the need for explicit instruction and ongoing support to ensure that students can effectively utilize technology tools and navigate digital environments.

In addition, teachers emphasized the issue of student distractions when using technology. Teachers stressed that maintaining student focus on the specific tasks and materials intended for instruction can be a constant struggle. As teacher A noted, *"Sometimes making sure that the kids are only using the stuff that you're wanting them to use on the technology piece...they'll still find ways to get distracted because they are using the Internet."*

Lack of Opportunity and Time Constraints

From the findings of the study, teachers expressed concerns on the lack of opportunity to incorporate technology into daily instruction. As K-4 intervention teacher B noted, "*Being a K-4 intervention teacher, there is not a lot of opportunity to use technology*." The limited time or availability to integrate technology can restrict the range of digital tools and resources that teachers can utilize to enhance learning experiences for their students.

One of the significant concerns teachers expressed in using technology in the classroom is the time constraints they encounter. As teacher B highlighted, *"The time limit, how much time I have with kids... it's going to take me like three weeks to do because I don't see them for very long."* Limited instructional time can hinder the implementation of technology-rich activities and projects that require multiple sessions. Additionally, the need to assist students with logging in and managing multiple logins adds to the time constraints. As teacher G mentioned, *"They have got 27 logins, and you can't use the same password and combination with some of them."* Such

logistical issues can consume valuable instructional time and pose a challenge to effectively utilizing technology in the classroom.

Another challenge teachers expressed is the inconsistency in the availability of technology resources. As teacher A mentioned, *"Inconsistency is probably the best answer. Okay. So sometimes yes, sometimes no, and it has changed radically over the years."* The inconsistent access to technology and fluctuations in availability pose challenges for teachers in terms of implementing technology-related activities and establishing effective systems for technology integration. Without consistent access to technology, teachers face difficulties in planning and executing technology-driven lessons, hindering the smooth implementation of technology in the classroom.

On a personal level, some teachers express concerns about overreliance on technology and the balance between digital and non-digital activities. As one teacher shared, *"The only challenge that I have is, am I using it too much...sometimes I wonder, is this too much technology for the kids, are they getting this at home too."* Striking a balance between utilizing technology as a tool for enhancing instruction and ensuring a well-rounded learning experience becomes a consideration for teachers, as they aim to provide a balanced blend of digital and traditional activities that meet the diverse needs of their students.

Lack of Integration Among Various Digital Tools and Platforms

From the conversation with the teachers, teachers mentioned the lack of integration among various digital tools and platforms as a major challenge when it comes to technology integration. As teacher D explained, *"There's all these tools and they're great but there's just like slight tweaks... if all those things are in one it would be so amazing because I'm like, I use all*

those tools and they have purposes and different things." The fragmentation of tools and the need to navigate different platforms with unique features and functionalities can create inefficiencies and complications in lesson planning and implementation. Teachers often desire a more seamless integration of tools that combine the best features of multiple platforms to enhance their instructional practices.

Moreover, the issue of multiple logins and passwords further exacerbates the lack of integration. As another teacher mentioned, *"we're gonna have clever next year but they've got 27 logins... that's time-consuming in and of itself."* The necessity for students and teachers to remember and manage numerous logins and passwords for different applications adds an additional layer of complexity and consumes valuable instructional time. Streamlining the login process and ensuring compatibility across various tools would alleviate the burden of multiple logins and promote a more integrated and efficient use of technology in the classroom.

Prevalence Of Outdated Technology

Teachers reported that when using technology in the classroom assessment is the prevalence of outdated technology. As e teacher B expressed, *"Our technology is often outdated."* Outdated technology can pose various obstacles to effective teaching and learning experiences. It may lack essential features and functionalities, making it difficult to leverage the full potential of technology in instructional practices. Additionally, outdated technology may be incompatible with newer software and applications, limiting the range of digital resources and tools that can be utilized in the classroom.

Lack of Teacher Training and Support in the Use of Technology

One of the significant challenges teachers face in using technology in the classroom is the Teachers pointed out that lack of training and support is a significant challenge when it comes to technology integration in classroom assessments. As teacher C shared, *"Teaching myself how to make materials and assessments on the computer and iPad for them."* The absence of comprehensive training programs can leave teachers feeling ill-equipped to effectively integrate technology into their instructional practices. The responsibility of self-learning and adapting to new technologies can be overwhelming and time-consuming, taking away valuable time that could be dedicated to teaching.

High Turnover of Technologies Used

One of the challenges teachers face in using technology in the classroom is the high turnover of technologies used, which can hinder their ability to use them confidently. Teachers acknowledged turnover of technology use as a challenge when integrating technology in their classroom assessments. As teacher D expressed, *"The turnover in the kinds and types of assessments we're using... detracts from our ability to use them confidently."* The frequent changes in technology tools and platforms can create a sense of uncertainty and make it difficult for teachers to become proficient and comfortable with using them effectively. Constantly adapting to new technologies and assessment methods can be time-consuming and may require additional training and support.

CHAPTER FIVE

DISCUSSION AND CONCLUSION

Introduction

School districts have purchased and installed the types of equipment required for successful instructional applications and classroom assessments for rural schoolteachers' technology integration (Baser et.al., 2017). Nevertheless, despite infrastructural improvements and requests for teachers to use technology for classroom assessments, many schools nationwide are using instructional devices for assessment sparingly (Morel, 2022).

Blackwell et al. (2013) assert how long teachers spent using technology in classroom assessments is relatively not known. According to Lynch and Redpath (2014), technology-based assessments are seldom used by rural teachers. Lynch and Redpath (2014) stressed that research on technology-based assessment in rural classrooms is relatively low. According to Hooker (2017), school assessment approaches study suggests that teachers use technology sparingly to collect data rather than in classroom assessment, assessments, or student learning reporting. This requires investigating rural teachers' attitudes toward technology in classroom assessments.

Discussion of Results.

Based on the data provided, several findings can be discussed in relation to the research questions on the use of technology in classroom assessments in rural schools. These are as follows:

1. What are Rural Teachers' Attitudes Toward Using Technology in Classroom Assessments?

The results suggest a positive attitude among teachers towards the use of technology in their classroom assessments. Teachers expressed their willingness to integrate technology tools such as Google Classroom, digital assessments like Seesaw, and various online platforms into their teaching practices. This aligns with previous studies that have shown a growing acceptance and enthusiasm among teachers for incorporating technology in the classroom, as it offers new opportunities for engagement, collaboration, and personalized learning experiences (Pittman & Gaines, 2015; Ozdemir, 2017; Petko et al., 2018).

The findings indicate that teachers are leveraging a wide range of technology tools to create engaging and interactive learning experiences for their students. These tools enhance instruction, support formative assessment, facilitate communication, and provide individualized support for diverse learners. The integration of technology in the classroom demonstrates the commitment of teachers to adapt their teaching practices to meet the evolving needs of their students in a digital age (Hart & Laher, 2015; Lucariello et al., 2016; Li et al., (2018)).

2. To What Extent and Frequencies Do Teachers Use Technology in Their Classroom Assessments in Rural Schools?

The results indicate that teachers in rural schools are using technology for classroom assessments daily for various classroom assessments. They mentioned the use of technology tools such as Google Classroom, forms, checklists, digital assessments, and online quizzes for gathering evidence of student learning, providing feedback, monitoring progress, and facilitating self-assessment. This finding is consistent with previous studies that have highlighted the increasing reliance on technology for formative and summative assessments, allowing teachers to

gather real-time data, provide timely feedback, and track student performance more effectively (Pittman & Gaines, 2015).

Overall, the findings report that teachers are utilizing technology to varying extents and frequencies for different purposes in the classroom. While there is a notable emphasis on leveraging technology for activities such as providing descriptive feedback, supporting self-assessment, enabling revision, and facilitating collaborative feedback, there may be room for increased use of technology for real-time evidence gathering and targeted instruction.

3. How Do Teachers Use Technology in Classroom Assessments in Rural Schools?

Teachers reported employing a range of strategies to leverage technology for classroom assessments. These strategies include using digital assessments like Seesaw and Lookit for student explanations and progress tracking, utilizing online platforms such as Kahoot and Quizzes for interactive quizzes and games, and integrating technology tools like Nearpod and Google Classroom for instructional purposes.

These findings align and are supported by previous studies that have emphasized the diverse ways in which technology can enhance assessment practices, offering opportunities for student engagement, self-reflection, and differentiated instruction (Al-Zaidiyeen, 2010; de Aldama and Pozo, 2016). The findings are also in line with studies that have highlighted the effectiveness of technology in providing feedback to students and enhancing engagement and collaboration (An & Reigeluth, 2011; de Aldama and Pozo, 2016; Close, 2017; Sarvary & Gifford, 2017)

By integrating technology into these activities, teachers create an interactive and dynamic learning environment that supports student thinking. Students are encouraged to engage deeply

with the content, consider different perspectives, and articulate their thoughts effectively. These strategies foster critical thinking, analysis, and reflection, empowering students to develop their cognitive abilities and become active participants in their learning journey (Herman, 2013; Johns, 2015).

Overall, technology-supported strategies allow students to explain their thinking, engage in comprehension activities, and practice cognitive skills. By leveraging technology platforms teachers create a space for students to express their thoughts, analyze texts, and receive timely feedback. Through these practices, students develop their thinking skills, enhance their metacognitive abilities, and become more confident and effective thinkers (Elmahdi et. al., 2018; Gikandi and Morrow, 2016).

4. What Are the Challenges Teachers in Rural Schools Face When Integrating Technology into Classroom Assessments?

The results from the qualitative data revealed several challenges faced by teachers in rural schools when using technology in their classroom assessments. These challenges include unreliable internet connectivity and bandwidth, lack of access to updated hardware, lack of training for teachers in effectively using technology tools, inconsistency in the availability and reliability of technology resources, and varying levels of technological skills among students.

These findings resonate with previous research highlighting the unique challenges faced by teachers in rural settings, such as limited resources, infrastructure constraints, and inadequate training and support for technology integration (Beaumont-Bates, 2017; Zhan and So, 2017; Varberg and Platt, 2018; Nelson et al., 2019; Welch, 2019; Francom, 2020).

5. How Do the Quantitative Data Regarding Technology Usage and Attitudes Align with the Qualitative Insights About Teachers' Motivations, Challenges, Practical Usage, and Recommendations Related to Technology in Classroom Assessment? (Mixed Methods Question)

The amalgamation of quantitative and qualitative data in this study not only contributes to a comprehensive explanation of rural teachers' perspectives on technology integration in classroom assessment but also aligns with the existing literature emphasizing the need for a holistic understanding of technology's role in education. This mixed methods approach goes beyond mere statistical trends, enriching the analysis with underlying motivations, challenges, and practical applications influencing teachers in rural settings.

Moreover, the quantitative analysis, in concordance with previous research trends, indicates a positive overall trend in rural teachers' attitudes toward technology in assessment. The prevalence of specific tools, usage frequencies, and varying degrees of adoption revealed through quantitative data aligns with broader educational discussions on the increasing reliance on technology for formative and summative assessments (Pittman & Gaines, 2015). This quantitative layer sets the stage for a more in-depth explanation, providing a foundation for the subsequent qualitative analysis. The qualitative insights dive into the motivations shaping teachers' attitudes, aligning with the literature's emphasis on pedagogical motivations underlying technology choices (Pittman & Gaines, 2015). The commitment to student engagement, desire for interactive learning experiences, and recognition of technology as a tool to address diverse learning needs resonate with broader discussions on the transformative potential of technology in education.

The challenges identified through qualitative data, such as limited internet access, outdated hardware, and insufficient training, echo existing research highlighting infrastructural

deficits and inadequate support mechanisms in rural educational settings (Beaumont-Bates, 2017; Welch, 2019). This qualitative layer enriches the understanding of challenges, providing a more nuanced perspective that complements the quantitative findings. Integrated themes underscore positive attitudes with varied adoption rates among teachers, aligning with literature that recognizes the complexity of technology adoption in diverse educational settings. The integration of motivations for integration identified qualitatively with the quantitative findings, that teachers have a positive attitude towards technology-based assessments and generally use technology-based assessments daily, emphasizes a shared motivation among teachers to enhance instructional practices through technology, adding depth to statistical trends.

Challenges identified in both data sets, such as unreliable internet connectivity and inadequate training, form a consistent pattern, deepening the understanding of their impact on daily teaching practices. This aligns with broader discussions on the need for targeted interventions and support mechanisms in technology integration efforts (Varberg and Platt, 2018; Nelson et al., 2019). The Practical strategies for technology use, emerging from both data sets, showcase specific tools quantitatively and detail their real-world applications qualitatively. This integration of practical strategies aligns with literature emphasizing the importance of dynamic approaches to technology integration in education (Al-Zaidiyeen, 2010). The implications and recommendations drawn from integrated findings align with existing literature, emphasizing the importance of tailored professional development programs and flexible implementation strategies (Beaumont-Bates, 2017; Pittman & Gaines, 2015). Policymakers can utilize this information to create customized support structures, fostering a more inclusive and sustainable integration of technology in rural classrooms.

Teachers' attitudes toward technology are mostly favorable, as shown by the quantitative data. The mean scores, ranging from 3.57 to 3.89 (Table 1), support this observation. Teachers' narratives highlight the qualitative motives for their positive attitude towards technology, highlighting the pleasure, excitement, and perceived significance of technology in improving their teaching abilities. These results are consistent with the existing body of research that supports the idea that there is a direct relationship between teachers' attitudes and the effective integration of technology in education. The quantitative mean scores shown in Table 2 demonstrate that, on average, teachers did not have intense negative feelings associated with the use of technology. The mean scores for comments indicating discomfort and annoyance were relatively low. Qualitative analysis reveals certain difficulties, such as a lack of advanced technological infrastructure, that might lead to diverse sentiments among teachers. Tackling these obstacles is essential to guarantee a more uniformly favorable encounter with technology.

The results presented in Table 3 indicate that technology is used to a significant degree and with regularity for a variety of assessment purposes. Teachers use technology to collect data in real-time, provide detailed feedback, and tailor lessons to address areas of learning deficiency. Qualitative insights provide a more comprehensive analysis, highlighting tools such as Lookit, Edpuzzle, and Chromebooks that contribute to the stated degree and frequency. This alignment indicates that instructors are actively integrating technology into many elements of their assessment procedures. Based on qualitative data, teachers' recommendations highlight the need for professional development, enhanced technological infrastructure, and solutions to tackle obstacles. These suggestions are in line with the wider implications for policy and practice, indicating that focused interventions in these areas may improve the integration of technology

and assist teachers in effectively using its advantages. This research enhances the current body of knowledge by conducting a thorough analysis of teachers' perspectives and behaviors toward technology in assessments conducted in rural classrooms. The favorable results emphasize the possibility of effectively incorporating technology into various educational environments. In summary, the combination of quantitative and qualitative data has resulted in a nuanced comprehension of teachers' viewpoints on technology in assessments conducted in rural classrooms. The study's findings highlight the favorable attitudes and useful implementations that enhance the ongoing discussion on the successful use of technology in education. This study has not only yielded significant insights into the present condition of technology integration but has also emphasized the significance of context-specific factors and teacher assistance in promoting favorable attitudes and successful practices.

Summary of Findings.

This study sought to examine the attitude of rural schoolteachers regarding the incorporation of technology into their classroom assessments. Specifically, it aimed to ascertain the degree and regularity with which technology is employed in classroom assessments, as well as the methodologies employed by teachers to integrate technology into these assessments. Furthermore, the study sought to identify the obstacles encountered by teachers in rural educational settings.

The results of the study indicate that teachers in rural schools generally exhibit a favorable disposition towards incorporating technology within the classroom assessments. They demonstrate a willingness to utilize various technological tools, such as Google Classroom and online platforms, to augment their instructional practices. Teachers effectively employ

technological tools to facilitate a diverse range of assessments within the classroom setting. These assessments encompass both formative assessments, which aid in gauging student progress and understanding throughout the learning process, as well as summative assessments, which provide a comprehensive measure of student achievement at the conclusion of a unit or course.

Moreover, technology is utilized to furnish students with valuable feedback, enabling them to refine their understanding and performance. Additionally, students are encouraged to engage in self-assessment, leveraging technology to reflect upon their own learning and progress. A variety of strategies are utilized, including digital assessments, interactive questionnaires, and instructional aids such as Nearpod. These pedagogical approaches facilitate the development of critical thinking skills and active participation, enabling students to proficiently express their ideas.

Nonetheless, rural schools encounter a multitude of challenges that impede their educational endeavors. These challenges encompass a range of issues, such as the unreliability of internet connectivity, the presence of outdated hardware, insufficient training opportunities, inconsistent availability of technological resources, and the diverse range of technological skills possessed by students.

Conclusion.

In conclusion, the results of this study highlight the favorable reception of technology among teachers in rural classroom assessments, which is consistent with the wider pattern of technology acceptance and enthusiasm observed among teachers. The incorporation of technological tools within the realm of assessments facilitates the cultivation of dynamic learning

environments, thereby empowering students to interact with educational material actively and profoundly and enhance their cognitive abilities. The implementation of techniques such as digital assessments and interactive platforms has been found to significantly contribute to the improvement of student thinking abilities and metacognitive development.

However, the challenges that have been identified, such as connectivity issues and resource constraints, serve to underscore the distinct and specific difficulties encountered by teachers operating within rural environments. The resolution of these challenges holds paramount importance in guaranteeing equitable access to high-quality education that is augmented by technological advancements. The facilitation of effective technology integration can be achieved through the provision of sufficient training for teachers, enhancement of infrastructure, and the development of strategies to address connectivity challenges. Through the successful navigation of these challenges, teachers in rural areas can persist in utilizing technology to deliver compelling and consequential educational encounters for their students.

Implications of the Findings

The optimistic disposition exhibited by teachers towards the incorporation of technology within educational settings presents a hopeful indication for the forthcoming trajectory of pedagogy. This perspective exemplifies a readiness to modify pedagogical approaches in response to the evolving educational milieu and harness technological advancements to augment the quality of learning encounters. The integration of technology within educational settings has the potential to enhance the learning process by enabling a wide range of diverse experiences, fostering collaborative efforts, and offering personalized opportunities for students. Teachers possess the capacity to furnish personalized feedback, monitor the advancement of students, and

deliver focused instruction, thereby accommodating diverse learning modalities and rates of comprehension. The utilization of data-driven instruction empowers teachers with timely and relevant data, facilitating informed decision-making regarding pedagogical approaches, interventions, and curriculum modifications. The utilization of innovative assessment strategies, such as interactive quizzes, student explanations, and online platforms, serves as a testament to the potential of technology in the realm of assessment practices. The utilization of technology-supported strategies places a significant emphasis on the active involvement of students, the cultivation of critical thinking abilities, and the facilitation of self-expression, thereby promoting the advancement of cognitive skills at higher levels.

Nonetheless, teachers in rural educational institutions encounter a range of obstacles, encompassing difficulties pertaining to internet connectivity, insufficiency in training opportunities, and limited access to up-to-date hardware resources. To effectively tackle these challenges, it is imperative to provide specific assistance and allocate adequate resources to ensure the equitable integration of technology in all educational environments. The significance of professional development for teachers cannot be overstated, as it plays a pivotal role in addressing the disparities in technology integration and promoting equitable access. This is of utmost importance to ensure that all students have equal opportunities to benefit from enhanced learning through the utilization of technology. The implications of these findings can be leveraged by policymakers and educational institutions to formulate well-informed policies and strategies aimed at facilitating the integration of technology within classroom settings. Through the identification and subsequent resolution of these formidable obstacles, as well as the judicious utilization of technological prospects, teachers and policymakers can diligently strive

towards the establishment of learning environments that are characterized by fairness, interactivity, and efficacy, thereby benefiting all students.

Limitations

The present investigation on the attitudes and practices of teachers concerning the incorporation of technology into classroom assessments is subject to various constraints that warrant consideration. These limitations encompass potential sampling bias, limitations in generalizing findings, susceptibility to self-report bias, inherent subjectivity in qualitative data analysis, temporal context, insufficient exploration of negative attitudes, inadequate examination of student outcomes, homogeneity of rural settings, potential response bias, dearth of longitudinal data, and the influence of cultural and contextual factors. The constraints pose challenges in terms of extrapolating the outcomes to a more extensive cohort of teachers, specifically those operating within urban or technologically sophisticated contexts. Moreover, the present investigation heavily relies on self-reported data, thereby introducing the potential for social desirability bias and subjectivity in the analysis of qualitative data.

The temporal context of the study's findings raises a valid concern, given the rapid evolution of technology and educational practices. It is important to acknowledge that attitudes and challenges described in the study may be subject to change over time. The design of the study may elicit greater interest from teachers who possess a higher level of technological proficiency or exhibit a greater enthusiasm toward technology. Consequently, this could result in an overrepresentation of participants who hold positive attitudes and engage in favorable practices towards technology. A longitudinal methodology, which systematically observes and analyzes alterations in attitudes and practices over an extended period, has the potential to yield a

deeper understanding of the sustainability and progression of endeavors aimed at integrating technology.

Furthermore, the present study lacks a comprehensive examination of the cultural and contextual variables that may exert an influence on attitudes and practices. It is worth noting that teachers' beliefs, values, and local educational policies can play a substantial role in shaping the way technology is incorporated into their instructional practices. Recognizing these constraints is imperative for a well-rounded analysis of the study's results and for directing future investigations in this field.

Recommendations for Future Research

Based on the findings and limitations, it is possible to derive several recommendations for future research and practice that pertain to the four objectives at hand. These recommendations are as follows:

1. Investigate how cultural and contextual variables affect teachers' attitudes toward technology since these factors might have a big impact on how ready they are to integrate technology.
2. Analyze the effects of specialized teacher training initiatives that aim to improve teachers' knowledge of and comfort by utilizing a range of technological resources for teaching.
3. Examine the use of certain technology integration models in the classroom (such as the SAMR model) and how it affects the efficiency of assessments that are assisted by technology.
4. Conduct longitudinal research to monitor the evolution of teachers' attitudes toward technology integration over time. This will assist in comprehending how attitudes change as technology continues to advance.

5. Investigate how technology can be used to facilitate differentiated instruction, meeting the diverse learning requirements of students, and improve overall learning outcomes.

6. Investigate the correlation between assessment techniques facilitated by technology and different pedagogical approaches, such as inquiry-based learning and project-based learning, to identify the most effective areas of integration.

Recommendations for Practice

1. This study advocates for the enhancement of internet connection and technology infrastructure in rural schools to address the issues arising from intermittent internet access and obsolete hardware.

2. Design and implement professional development initiatives that are customized to address the unique obstacles encountered by teachers in rural regions, with a particular emphasis on enhancing their aptitude and approaches in integrating technology into their teaching practices.

3. Create collaborative networks and online communities specifically designed for teachers in rural schools. These platforms will serve as a platform for teachers to exchange best practices, resources, and ideas that may effectively address the issues associated with technology integration in their respective contexts.

4. Collaborate with policymakers to formulate policies aimed at mitigating the technological gaps prevalent in rural and urban educational institutions. These policies should prioritize the provision of equitable access to technological resources and training opportunities for all students.

REFERENCES CITED

Agyei, D. D., & Voogt, J. M. (2011). Exploring the potential of the will, skill, tool model in Ghana: Predicting prospective and practicing teachers' use of technology. *Computers & Education, 56*(1), 91-100.

Aldhafeeri, F., Palaiologou, I., & Folorunsho, A. (2016). Integration of digital technologies into play-based pedagogy in Kuwaiti early childhood education: Teachers' views, attitudes, and aptitudes. *International Journal of Early Years Education, 24*(3), 342-360.

Aldunate, R., & Nussbaum, M. (2013). Teacher adoption of technology. *Computers in Human Behavior, 29*(3), 519-524.

Aldunate, R., & Nussbaum, M. (2013). Teacher adoption of technology. *Computers in Human Behavior, 29*(3), 519-524.

Aldunate, R., & Nussbaum, M. (2013). Teacher adoption of technology. *Computers in Human Behavior, 29*(3), 519-524.

Al-Zaidiyeen, N. J., Mei, L. L., & Fook, F. S. (2010). Teachers' Attitudes and Levels of Technology Use in Classrooms: The Case of Jordan Schools. *International education studies, 3*(2), 211-218.

Al-Zaidiyeen, N. J., Mei, L. L., & Fook, F. S. (2010). Teachers' Attitudes and Levels of Technology Use in Classrooms: The Case of Jordan Schools. *International education studies, 3*(2), 211-218.

An, Y. J., & Reigeluth, C. (2011). Creating technology-enhanced, learner-centered classrooms: K–12 teachers' beliefs, perceptions, barriers, and support needs. *Journal of Digital Learning in Teacher Education, 28*(2), 54-62.

Beatty, I. D., & Gerace, W. J. (2009). Technology-enhanced formative assessment: A research-based pedagogy for teaching science with classroom response technology. *Journal of Science Education and Technology, 18*(2), 146-162.

Beaumont-Bates, J. R. (2017). E-Portfolios: Supporting collaborative partnerships in an early childhood center in Aotearoa/New Zealand. *New Zealand Journal of Educational Studies, 52*(2), 347-362.

Berson, I. R., & Berson, M. J. (Eds.). (2010). *High-tech tots: Childhood in a digital world*. IAP.

Bichelmeyer, B., & Molenda, M. (2006). Issues and trends in instructional technology: Gradual growth atop tectonic shifts. *Educational media and technology yearbook, 31*, 3-32.

Black, P., & Harrison, C. (2001). Self-and peer-assessment and taking responsibility: The science student's role in formative assessment. *School Science Review, 82*, 43-50.

Blackwell, C. K. (2015). *Technology use in early childhood education: Investigating teacher access and attitudes toward technology and the effect of iPads on student achievement* (Doctoral dissertation, Northwestern University).

Brantley-Dias, L., Calandra, B., Harmon, S. W., & Shoffner, M. B. (2006). An analysis of collaboration between colleges of education and arts & sciences in PT3. *TechTrends*, *50*(3), 32.

Brewer, J., & Hunter, A. (1989). *Multimethod research: A synthesis of styles*. Sage Publications, Inc.

Brown, G. T. (2004). Teachers' conceptions of assessment: Implications for policy and professional development. *Assessment in Education: Principles, Policy & Practice*, *11*(3), 301-318.

Brown, H. D. (2004). *Language assessment: Principles and classroom practices*. NY: Pearson Education.

Chappuis, J. (2009). *Seven strategies of assessment for learning*. Boston, MA: Pearson.

Chikasanda, V., Otrel-Cass, K., Williams, J., & Jones, A. (2013). Enhancing teachers' technological pedagogical knowledge and practices: A professional development model for technology teachers in Malawi. International Journal of Technology & Design Education, 23(3), 597-622.

Clarke-Midura, J., & Dede, C. (2010). Assessment, technology, and change. *Journal of Research on Technology in Education*, *42*(3), 309-328.

Close, B. (2017). Faculty perception of formative assessment and implementation practices in pre-clinical medical education: A Q method study (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No.10270501)

Coombs, A., DeLuca, C., LaPointe-McEwan, D., & Chalas, A. (2018). Changing approaches to classroom assessment: An empirical study across teacher career stages. Teaching and Teacher Education, 71, 134–144.

Creswell, J. W. (2009). Mapping the field of mixed methods research. *Journal of mixed methods research*, *3*(2), 95-108.

Creswell, J. W. (2013). Steps in conducting a scholarly mixed methods study.

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Creswell, J. W., Hanson, W. E., Clark Plano, V. L., & Morales, A. (2007). Qualitative research designs: Selection and implementation. *The counseling psychologist*, *35*(2), 236-264.

Data, Q. E. Report. (2004). 2004–2005 technology purchasing forecast. *New York: Scholastic Company. knowledge: Teachers initial foray into podcasting in economics. Journal of Research on Technology in Education*, *44*(1), 75-98.

Davis, N. (2017). *Digital technologies and change in education: The arena framework*. Routledge.

De Aldama, C., & Pozo, J. I. (2016). How is ICT used in the classroom? A study of teachers' beliefs and uses. *Electronic Journal of Research in Educational Psychology*, *14*(2), 253-286.

DeLuca, C., & Johnson, S. (2017). Developing assessment-capable teachers in this age of accountability. *Assessment in Education: Principles, Policy & Practice*, *24*(2), 121-126.

DeLuca, C., Coombs, A., & LaPointe-McEwan, D. (2019). Assessment mindset: Exploring the relationship between teacher mindset and approaches to classroom assessment. *Studies in Educational Assessments*, *61*, 159-169.

Earl, K. (2013). Student views on short-text assignment formats in fully online courses. *Distance Education*, *34*(2), 161-174.

Ellis, T. J., & Levy, Y. (2009). Towards a Guide for Novice Researchers on Research Methodology: Review and Proposed Methods. *Issues in Informing Science & Information Technology*, *6*, 323–337.

Elmahdi, I., Al-Hattami, A., & Fawzi, H. (2018). Using Technology for Formative Assessment to Improve Students' Learning. *Turkish Online Journal of Educational Technology-TOJET*, *17*(2), 182-188.

Elmahdi, I., Al-Hattami, A., & Fawzi, H. (2018). Using Technology for Formative Assessment to Improve Students' Learning. *Turkish Online Journal of Educational Technology-TOJET*, *17*(2), 182-188.

Ertmer, P., & Ottenbreit-Leftwich, A. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. Journal of Research on Technology in Education, 42, 255-284. doi:10.1080/15391523.2010.10782551

Etherington, D. (2013). Apple has sold over 8M iPads direct to education worldwide, with more than 1B iTunes U downloads. *Retrieved September 8*, 2014.

Francom, G. M. (2020). Barriers to technology integration: A time-series survey study. *Journal of Research on Technology in Education*, *52*(1), 1-16.

Fuller, J. S., & Dawson, K. M. (2017). Student response systems for formative assessment: Literature-based strategies and findings from a middle school implementation. *Contemporary Educational Technology*, *8*(4), 370-389.

Gibson, D. C., Webb, M., & Ifenthaler, D. (2015). Challenges of Big Data in Educational Assessment. *International Association for Development of the Information Society*.

Gikandi, J. W., & Morrow, D. (2016). Designing and implementing peer formative feedback within online learning environments. *Technology, Pedagogy and Education*, *25*(2), 153-170.

Gilakjani, A. P., & Lai-Mei, L. (2012). EFL teacher's attitudes toward using computer technology in English language teaching. Theory & Practice in Language Studies, 2(3), 630.

Goggin, S. E. (2018) A qualitative study of the implementation of formative assessment strategies in the classroom (Doctoral dissertation). Retrieved from Ohio LINK.

Gullo, D. F., & Hughes, K. (2011). Reclaiming kindergarten: Part I. Questions about theory and practice. *Early Childhood Education Journal*, *38*(5), 323-328.

Hargreaves, A., & Goodson, I. (2006). Educational change over time? The sustainability and non-sustainability of three decades of secondary school change and continuity. *Educational administration quarterly*, *42*(1), 3-41.

Hart, S. A., & Laher, S. (2015). Perceived usefulness and culture as predictors of teachers' attitudes towards educational technology in South Africa. *South African Journal of Education*, *35*(4).

Hooker, T. (2017). Transforming teachers' formative assessment practices through portfolios. *Teaching and Teacher Education*, *67*, 440-453.

Hooker, T. (2017). Transforming teachers' formative assessment practices through ePortfolios. *Teaching and Teacher Education*, *67*, 440-453.

Hourigan, M., Leavy, A. M., & Carroll, C. (2016). 'Come in with an open mind': Changing attitudes towards mathematics in primary teacher education. *Educational Research*, *58*(3), 319-346.

Hwang, G. J., & Chang, H. F. (2011). A formative assessment-based mobile learning approach to improving the learning attitudes and achievements of students. *Computers & Education*, *56*(4), 1023-1031.

Johns, K. (2015). Engaging and Assessing Students with Technology: A Review of Kahoot! *Delta Kappa Gamma Bulletin, 81(*4), 89–91

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational researcher*, *33*(7), 14-26.

Joshi, M., & Babacan, A. (2012). Developing a framework for the effective use of blogs in formative assessment. *Turkish Online Journal of Distance Education*, *13*(3), 21-32.

Kale, U., & Goh, D. (2014). Teaching style, ICT experience and teachers' attitudes toward teaching with Web 2.0. *Education and Information Technologies*, *19*(1), 41-60.

Kayler, M. A., & Sullivan, L. (2011). Integrating learner-centered theory and technology to create an engaging pedagogy for k-12 students and teachers. Journal of Technology Integration in the Classroom, 3(1), 99-103.

Kibble, J. D. (2017). Best practices in summative assessment. *Advances in physiology education*, *41*(1), 110-119.

Kormos, E. M. (2018). The unseen digital divide: Urban, suburban, and rural teacher use and perceptions of web-based classroom technologies. *Computers in the Schools*, *35*(1), 19-31.

Li, Z., Zhou, M., & Teo, T. (2018). Mobile technology in dance education: A case study of three Canadian high school dance programs. *Research in Dance Education*, *19*(2), 183-196.

Lucariello, J. M., Nastasi, B. K., Anderman, E. M., Dwyer, C., Ormiston, H., & Skiba, R. (2016). Science supports education: The behavioral research base for psychology's top 20 principles for enhancing teaching and learning. *Mind, Brain, and Education*, *10*(1), 55-67.

Lynch, J., & Redpath, T. (2014). 'Smart' technologies in early years literacy education: A meta-narrative of paradigmatic tensions in iPad use in an Australian preparatory classroom. *Journal of early childhood literacy*, *14*(2), 147-174.

Marsh, J. (2004). The techno-literacy practices of young children. *Journal of early childhood research*, *2*(1), 51-66.

McMillan, J. H., Venable, J. C., & Varier, D. (2013). Studies of the Effect of Formative Assessment on Student Achievement: So Much More Is Needed. *Practical Assessment, Research & Assessments*, *18*(2), n2.

McMillan, J., Hellsten, L., & Klinger, D. (2010). *Classroom assessment: Principles and practice for effective standards-based instruction* (1st Canadian ed.). Pearson Allyn & Bacon

McNair, S., Bhargava, A., Adams, L., Edgerton, S., & Kypros, B. (2003). Teachers speak out on assessment practices. *Early Childhood Education Journal*, *31*(1), 23-31.

Miller, E., & Almon, J. (2009). Crisis in the kindergarten: Why children need to play in school. *Alliance for Childhood (NJ3a)*.

Mueller, C., Lim, J., & Watson, S. L. (2017). First principles of attitudinal change: A review of principles, methods, and strategies. *TechTrends*, *61*(6), 560-569.

National Research Council. (2001). *Classroom assessment and the national science education standards*. National Academies Press.

Nelson, M. J., Voithofer, R., & Cheng, S. L. (2019). Mediating factors that influence the technology integration practices of teacher teachers. *Computers & Education*, *128*, 330-344.

Oliver, K., & Townsend, L. (2013). Preparing Teachers for Technology Integration: Programs, Competencies, and Factors from Literature. *Online Submission*, *6*(3), 41-60.

Özdemir, S. (2017). Teacher views on barriers to the integration of information and communication technologies (ICT) in Turkish teaching.

Pallant, J. (2010). *SPSS Survival Manual: A Step-by-Step Guide to Data Analysis Using SPSS* (4th ed.). New York, NY: McGraw Hill.

Petko, D., Prasse, D., & Cantieni, A. (2018). The interplay of school readiness and teacher readiness for educational technology integration: A structural equation model. *Computers in the Schools*, *35*(1), 1-18.

Pittman, T., & Gaines, T. (2015). Technology integration in third, fourth and fifth grade classrooms in a Florida school district. *Educational Technology Research and Development*, *63*(4), 539-554.

Poggio, J., & McJunkin, L. (2012). History, current practice, perspectives and what the future holds for computer-based assessment in K-12 education. *Computers and their impact on state assessments*, 25-53.

Pyle, A., & DeLuca, C. (2017). Assessment in play-based kindergarten classrooms: An empirical study of teacher perspectives and practices. *The Journal of Educational Research*, *110*(5), 457-466.

Rallis, S. F., & Rossman, G. B. (2012). *The research journey: Introduction to inquiry*. Guilford Press.

Ramsey, B., Duffy, A. (2016). *Formative assessment in the classroom: Findings from three districts*. Michael and Susan Dell Foundation and Education, *1*. Retrieved from https://education-first.com/wpcontent/uploads/2016/05/MSDF-Formative-Assessment-Study-Final-Report.pdf

Reimer, K., & Moyer, P. S. (2005). Third graders learn about fractions using virtual manipulatives: A classroom study. *Journal of Computers in Mathematics and Science Teaching*, *24*(1), 5-25.

Roach, A. T., McGrath, D., Wixson, C., & Talapatra, D. (2010). Aligning an early childhood assessment to state kindergarten content standards: Application of a nationally recognized alignment framework. *Educational Measurement: Issues and Practice*, *29*(1), 25-37.

Sarvary, M. A., & Gifford, K. M. (2017). The benefits of a real-time web-based response system for enhancing engaged learning in classrooms and public science events. *Journal of Undergraduate Neuroscience Education*, *15*(2), E13.

Shin, W. S. (2015). Teachers' use of technology and its influencing factors in Korean elementary schools. *Technology, Pedagogy, and Education*, *24*(4), 461-476.

Shirley, M. L., Irving, K. E., Sanalan, V. A., Pape, S. J., & Owens, D. T. (2009). Implementation of connected classroom technology in mathematics and science classrooms. In *Association of Science Teacher Teachers Annual Conference, Hartford, CT*.

Snodgrass, D. (2010). FAST handbook. Paper presented at the Cleveland State University, Cleveland, OH.

Vareberg, K., & Platt, C. A. (2018). Little Tech on the Prairie: Understanding Teachers' Adoption of and Resistance to Technology in the Rural Classroom. *Journal of the Communication, Speech & Theatre Association of North Dakota*, *31*, 27.

Vygotsky, L. (1978). Interaction between learning and development. *Readings on the development of children*, *23*(3), 34-41.

Welch, S. (2019). An Assessments of Macmillan education's Launchpads as a textbook technology supplement when teaching introductory psychology. *Scholarship of Teaching and Learning in Psychology, 5*(3), 236-246. doi:10.1037/stl0000162

Zhan, Y., & So, W. W. M. (2017). Views and practices from the chalkface: Development of a formative assessment multimedia learning environment. *Technology, Pedagogy and Education*, *26*(4), 501-515.

APPENDICES

APPENDIX A

PERMISSION LETTER

105 Grant Chamberlain Drive 2A,

Montana State University,

Bozeman-Montana.

03/10/2023.

The District Superintendent

Belgrade School District

Dear Sir,

PERMISSION LETTER

My name is Samuel Boateng. I am studying for a master's degree in Curriculum and instruction (Researcher Option) in the Department of Education at Montana State University. I also serve as the field supervisor with the After-school program (Tech Club). I am conducting research on rural school teachers' attitudes toward the use of technology in classroom assessment. I am seeking permission to administer my survey in schools within the Belgrade school district. The research will entail collecting data from teachers in your school.

I request permission to get access to the teachers in your district for me to administer my survey. The responses from the teachers will be treated confidentially, and identities will be anonymous unless otherwise expressly indicated. Individual privacy will be maintained in all published and written data from the study.

The results will be communicated in my thesis, which is required for me to graduate.

The research participants will not be advantaged or disadvantaged in any way. They will be reassured that they can withdraw their permission during this project without penalty. There are no foreseeable risks in participating in this study. The minimal risk associated with them is the time teachers would use to complete the survey. The participants will not be paid for this study. I request permission in writing to conduct my research at your organization. Please let me know if you require any further information. I look forward to receiving your response as soon as is convenient.

Yours sincerely,

Samuel Boateng

406-219-6812

J45m983@msu.montana.edu.

Supervisor's name

Dr. Gilbert Kalonde

Kalonde@montana.edu.

APPENDIX B

CONSENT FORM

Title: Teacher Attitudes Towards the Use of Technology in Classroom Assessments in Rural Schools.

Purpose of study: The purpose of this study is to assess teacher attitudes toward the use of technology in classroom assessments in rural schools. The focus of the study would be on the extent to which teachers use technology in classroom assessments, how it is used, and the challenges being faced by teachers who integrate technology in their classroom assessments.

Survey methods: I value your opinion and thoughts on this matter and invite you to complete this survey. This study survey is being offered to teachers in the Bozeman school district who use technology in classroom instructions and will take approximately 15 minutes to complete. The survey consists of a mix of open and closed-response questions exploring the extent and frequencies teachers use technology in classroom assessments, how teachers use technology in classroom assessments in rural schools, and the challenges teachers when they integrate technology in classroom assessments.

Benefits: After completing the survey, you will be eligible to get a gift card for $5.00 to Amazon.com.

Confidentiality: Your personal information will be kept secret, will under no circumstances be correlated with your test replies, and will only be used for the purposes of communication.

Risk: There are no known risks or discomforts associated with this study.

Withdrawal from the study: You are encouraged to participate honestly in this study. Participation in this survey is voluntary and choosing not to complete the survey will have no negative impact on your work as a teacher. You may opt out at any time by simply not completing the survey when it is offered.

Use of information: The information collected during this study will be used to better understand how teachers in rural schools incorporate technology in classroom assessments. The survey results will be stored in a password-protected, cloud-based file. The results of this study will be shared in my master's thesis to fulfill the requirements for the Curriculum and Instruction Master's degree from MSU. You are encouraged to participate honestly in this study.

The persons who may be contacted about the research are:

Principal investigator: Samuel Kwaku Basoah Boateng , Samuelbasoah2021@gmail.com or j45m983@msu.montana.edu

Faculty Advisor- Dr. Gilbert Kalonde Kalonde@montana.edu

MSU Bozeman Institutional Review Board Compliance Office, irb@montana.edu

The information that my informant provides will be held in the highest regard by me, the principal investigator, I, Samuel Kwaku Basoah Boateng will not use it for anything other than what has been described.

Sign: _____Date: _____

APPENDIX C

TEACHER TECHNOLOGY IN ASSESSMENTS SURVEY

EDUCATIONAL TECHNOLOGIES AND THE NUMBER OF TIMES YOU INTEGRATE THEM INTO TEACHING? Choose the appropriate response on a scale of 1 – 5, where: Regularly (Daily) = 5 Frequently (Weekly) = 4 Occasionally (Monthly) = 3 Rarely (1- 2 Times A Semester) = 2 Do not use = 1 EDUCATIONAL TECHNOLOGIES 5

1. I use technology to gather real-time evidence of student learning simultaneously from all my students with quick check techniques like clickers, ABC cards, whiteboards, and/or thumbs-ups.

A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use.

2. I use technology to provide descriptive feedback to my students about their performance.

A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use.

3. I use technology to help my students monitor their learning over time, using record-keeping techniques.

A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use.

4. I use technology to provide my students with the opportunity to self-assess and set goals.

A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use.

5. I use technology to post learning targets for what I am currently teaching.

A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use.

6. I use technology to give my students time to revise their work based on the feedback they receive.

A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use.

7. I use technology to provide my students with checklists and/or rubrics that are teacher or commercially made.

A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use.

8. I use technology to help my students develop checklists and/or rubrics.

A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use.

9. I use technology to target my instruction to learning gaps, misconceptions, or other incomplete understandings identified through formative feedback

A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use.

10. I use technology to help my students to provide each other with descriptive feedback.

A. Daily B. Once or Twice a Week C. Monthly D. Every semester E. Do not use.

11. Briefly describe any other strategies and tools through which you integrate technology into your classroom assessments…….

…….

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12. Briefly describe some of the challenges you face when you integrate technology into your classroom assessments……

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APPENDIX D

TEACHER TECHNOLOGY ATTITUDES QUESTIONNAIRE

Part 1

Instructions: Select one level of agreement for each statement to indicate how you feel.

Choose the appropriate response on a of 1 – 5, where: Strongly Agree = 5 Agree = 4 Uncertain = 3 Disagree = 2 Strongly Disagree = 1

1.	I think that working with technology for classroom assessment is enjoyable and stimulating. (186)	SD	D	U	A	SA
2.	I want to learn a lot about technology for classroom assessment03)	SD	D	U	A	SA
3.	The challenge of learning about technology for classroom assessment is exciting.11)	SD	D	U	A	SA
4.	Learning about technology-based assessment is boring to me.180)	SD	D	U	A	SA
5.	I like teaching with technology-based classroom assessments181)	SD	D	U	A	SA
6.	I enjoy lessons when I integrate technology-based assessments.10)	SD	D	U	A	SA
7.	I can learn many things when I use computer-based assessments.9)	SD	D	U	A	SA
8.	I believe that mastery of technology-based assessment is important for me to learn how to use a					

	Technology for my classroom assessments.2)	SD	D	U	A	SA
9.	A job using technology would be very interesting. (101)	SD	D	U	A	SA
10.	The people who give me the best ideas for improving teaching also tend to know a lot about technology.	SD	D	U	A	SA
11.	I concentrate on a computer when I use one.(4)	SD	D	U	A	SA
12.	I believe that I am a better teacher with technology.	SD	D	U	A	SA

Part 2

Instructions: Select one level of agreement for each statement to indicate how you feel.

Choose the appropriate response on a scale of 1 – 5, where: Strongly Agree = 5 Agree = 4 Uncertain = 3 Disagree = 2 Strongly Disagree = 1

1.	I get a sinking feeling when I think of trying to use technology-based assessments. (263)	SD	D	U	A	SA
2.	Working with technology-based assessments makes me feel tense and uncomfortable. (230)	SD	D	U	A	SA
3.	Working with technology-based classroom assessments makes me nervous. (17)	SD	D	U	A	SA
4.	Using technology-based assessments intimidates me. (227)	SD	D	U	A	SA
5.	Using technology-based assessments is very frustrating. (18)	SD	D	U	A	SA
6.	I feel comfortable working with technology-based assessments.	SD	D	U	A	SA
7.	Technology-based assessments are difficult to use. (20)	SD	D	U	A	SA
8.	I think that technology-based assessments are very easy to use. (13)	SD	D	U	A	SA
9.	I have a lot of self-confidence when working with technology-based assessments 88)	SD	D	U	A	SA
10.	Technology-based assessments are hard to figure out how to use.	SD	D	U	A	SA

APPENDIX E

FOCUS GROUP INTERVIEW GUIDE FOR TEACHERS

Phase 2: Qualitative Focus group Interview for Teachers.

What is your view on incorporating educational technology into classroom assessments?

How often do you integrate educational technology into your classroom assessments?

What specific educational technology devices do you usually integrate into your classroom assessments?

Which activities do you employ these technologies to perform in your teaching and assessments?

What challenges do you encounter in your quest to integrate the identified educational technologies into your classroom assessments?

Since you started working in the institution, have you had any training in educational technology? If yes, how many times and in which specific area?

Do you think you would need further training in educational technology?

How has the integration of educational technologies in teaching helped your teaching?