January 2022

Mathematics Teachers' Practices of Authentic E-Assessment During Covid-19 Pandemic

Christofer C. Coron
Philippine Normal University

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

MATHEMATICS TEACHERS' PRACTICES OF AUTHENTIC E-ASSESSMENT DURING COVID-19 PANDEMIC

A Thesis
Presented to
the Faculty College of Graduate Studies
and Teacher Education Research
Philippine Normal University
Manila

In Partial Fulfillment
of the Requirements for the Degree
Masters of Arts
in Educational Assessment
and Evaluation

CHRISTOFER C. CORONADO
January 2022

APPROVAL SHEET

This thesis entitled "**MATHEMATICS TEACHERS' PRACTICES OF AUTHENTIC E-ASSESSMENT DURING COVID-19 PANDEMIC"** prepared and submitted by **CHRISTOFER C. CORONADO** in partial fulfillment of the requirements for the degree of **Master of Arts in Educational Assessment and Evaluation**, is hereby recommended for approval and acceptance.

ROSIE L. CONDE, Ph.D.
Adviser

Approved in partial fulfillment of the requirements for the degree **Master of Arts in Education** by the Oral Examination Committee.

ARLYNE C. MARASIGAN, Ph.D.
Chairperson

ADONIS P. DAVID, Ph.D.
Member

EDNA LUZ R. ABULON, Ph.D.
Member

BRANDO C. PALOMAR, Ph.D.
Member

Accepted in partial fulfillment of the requirements for the degree **Master of Arts in Education**.

February 10, 2022
Date

MARILYN U. BALAGTAS, Ph. D.
Dean,
College of Graduate Studies and
Teacher Education Research

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DEDICATION

"The real value of setting goals is not the recognition or reward, it's the person we become by finding the discipline, courage and commitment to achieve them."

The researcher would like to dedicate this fruit of labor to Almighty God, wife and family, Educational Assessment and Evaluation family, Philippine Normal University professors, friends, and colleagues, to the community and loved ones for their unconditional assistance and as inspiration at times that the researcher feel disheartened.

All the people who have been part of this.

The researcher is very grateful for giving inspiration and support in the pursuit of this study.

C.C.C.

ACKNOWLEDGEMENT

The researcher would like to thank Almighty God for all the blessings. He has showed for the fulfillment of this study.

The researcher also heartily acknowledged the following for their invaluable contributions in the completion of this thesis:

Ms. Emiel Kristel A. Coronado, researcher's wife, for her moral and emotional support and continuous care. Thank you for being an inspiration and I'm really grateful for you.

Family and Colleagues, for their spiritual and moral support towards achieving this milestone.

Dr. Rosie L. Conde, for her untiring support and educated thoughts as adviser of this study. Dr. Conde's guidance and insights significantly contributed in making the study possible.

Private Education Assistance Committee (PEAC), for the organization's financial assistance/ scholarship grant for this master's thesis through RSITE program. The program's noble advocacy aided the researcher a lot in his expenses. The researcher was grateful and privileged for the opportunity. Warmest thanks.

Dr. Arlyne C. Marasigan, Dr Adonis P. David, Dr. Edna Luz R. Abulon, Dr. Brando C. Palomar, for their scholarly thoughts and constructive suggestions for the improvement and approval of this thesis.

Prof. Antonio G. Dacanay, Prof. Romelie Anne B. Calapardo, Prof. Hanzen M. Reyes, Dr. Aris R. Trazona, for sharing their expertise in validating the content of the questionnaires and guidance towards the improvement of the study.

Mr. Oscar O. De Liva and Ms. Rejoyce R. Tan, for sharing their knowledge and time in evaluating the teacher-participants' authentic e-assessments.

Ms. Nancy G. Ignacio and Family, directress of Holy Redeemer School of Cabuyao, Laguna Inc., for her immeasurable support in helping the researcher with school-work schedule arrangement and financial provisions.

Dr. Hereberto Jose D. Miranda CESO VI, schools division superintendent of Cabuyao City, **Dr. Manuela S. Tolentino, CESO V**, schools division superintendent of Santa Rosa City, **Dr. Susan DL Oribiana**, schools division superintendent of Calamba City, for allowing the researcher to conduct the study in their division schools.

All the secondary mathematics teacher-respondents, for their participation and cooperation;

Thanks a million!

C.C.C.

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ABSTRACT

Title:	Mathematics Teachers' Practices of Authentic E-Assessment During COVID-19 Pandemic
Name:	Christofer C. Coronado
Degree:	Master of Arts
Specialization:	Educational Assessment and Evaluation
Key Concepts:	Authentic E-Assessments
	Performance E-Assessment
	Project E-Assessment
	E-portfolio Assessment
	Conceptions on Authentic E-Assessment
	Practices on Authentic E-Assessment
	Challenges on Authentic E-Assessment
	Teacher Support Program on Authentic E-Assessment
Adviser:	Dr. Rosie L. Conde

This multiple case study explored the conceptions and practices of secondary mathematics teachers on authentic e-assessment, particularly on performance, project, and e-portfolio. Ten teachers in Laguna teaching in schools with science curriculum, STEP section-regular curriculum, and regular curriculum participated in the study. Results of perception on authentic e-assessment instrument, artifacts validation, and immediate superior recommendation were used to identify the teacher-respondents. Likewise, school curriculums. where teachers are employed, served as the basis in assigning them in cases 1, 2 and 3. Interviews, online observation, focus group discussions, and artifacts validations were utilized to gather data. Instruments used underwent Lawshe's content validation of 5 experts. Furthermore, data were analyzed using the holistic multiple three cases within-case and across-case analysis. To ensure internal validity of results, triangulation of data sources, member checking, and peer examination were employed. The results revealed that teachers' high level of authenticity in practices of authentic e-assessment were directly influenced by their high level of authenticity concepts. Moreover, challenges are linked with teachers' limited familiarity of e-assessment tools and insufficient skills in developing and implementing authentic e-assessments. In addition, it was observed that teachers are truthful in their commitment to deliver quality education that is why they are thriving and showing resilience in their online classes. Finally, the researcher drafted a support program, based from the findings of this study, which he believes will help teachers to improve their authentic e-assessment practices.

Chapter 1

The Problem and Literature Review

Background of the Study

Assessment has always been an indicator of success. Since then, assessment provides the measuring tools that show the effectiveness of the learning system. Moreover, through assessment, students' learning difficulties and challenges were identified and which provides necessary data in improving the quality of learning. Over the past decades, types of assessments progress from a simple pen and paper test into a more performance-based and product-based, and now technology-based assessment (Perrotta, 2013). Such development was done to be able to adapt with the current needs of the students and the demand of the developing society. With varying forms of assessment, educators were enlightened to a broader perspective of student learning.

With the current global health crisis due to the COVID-19 pandemic, where approximately 87% of world's students population have been affected (UNESCO, 2020), the need for teachers and students to adapt the "new normal" in education is given an emphasis to ensure that learning and training will be uninterrupted (Isseyev, 2020). This situation demands a change from a traditional face-to-face teaching and learning into digitized and virtual teaching and learning experience such as video-lecture recording, online simulations and use of electronic assessments. Traditional methods of teaching, during physical classes, should be modified in order to become effective in virtual classes.

Along with the "new normal" in education, new challenges have also emerged. According to Azevedo et al. (2017) and Alruwais et al. (2018), students and teachers might encounter technical difficulties such as using computers in the conduct of online discussion and assessments; Accessibility of computer or gadgets and internet; Unfamiliarity of teachers in technology-based web tools, softwares and assessments; Assessing differentiated instructions is also challenging during online classes; Virtual cheating and plagiarism (Kocdar & Karadeniz, 2018).

Although this recent milestone in education posed negative reactions from teachers, students, and other stakeholders, its advantages should also be given a greater emphasis. According to Sadeghi (2019), shifting from classroom to distance learning, students develop 21st century skills such as critical thinking, creativity, problem solving, communication, and sense of responsibility or independence which are integral components of life-long learning. Gilbert (2015) also states that significant savings in money, flexibility, and saving of time are sub-advantages of online or distance learning.

With this shifting of teaching platforms online, educators and various stakeholders must ensure that the learning given to students is with quality, essence and meaning and not just to say that education continues. Due to this reason, assessment plays a crucial component in online teaching and learning (Shaw, 2019). Appropriate type of assessment online could determine students' learning strengths, weaknesses, and challenges as they complete the objectives of their learning course. Choosing or developing the right assessment contributes to the success of online classes.

The need for embedding assessment into the teaching and learning process is identifiable globally (Fan & Zhu, 2008). In the 21st Century, where learners were expected to be effective communicators and collaborators, creative thinkers, innovators and problem solvers, the use of an authentic type of assessment is essentially needed (Kone, 2015) and (Saefurrohman & Balinas, 2016). According to Sari et al. (2018), authentic assessment was the assessment of the 2013 curriculum. This assessment required students to perform or produce an output that is similar to real-life context. Performance, portfolio, project, are some authentic assessments used in teaching and learning process. These authentic assessments equip learners with skill-related activities that are vital in the 21st century workplace.

Without the physical interactions in the current situation, the need of providing relevant authentic assessment has become more challenging (Moore, 2013). With limited facilities and equipment, educators found it difficult to give authentic assessments online. Ghaviferk and Rosdy (2015) emphasized the role of integrating Information, Communication, and Technology (ICT) in assisting teachers in nowadays global requirement of replacing traditional teaching with technology-based instructions, use of web tools, learning applications, and facilitating virtual classrooms.

Moreover, the integration of electronic based authentic assessments, also known as authentic e-assessments, was crucial in giving timely feedback and in improving the learning outcomes of the students (Crisp, 2009; Crisp et al., 2016). According to Espinosa et al. (2013) and Chinda (2014), students become more active and motivated whenever they were doing varied-authentic tasks. Fallon et al. (2003) and Qutaishat and Bataineh (2014) concluded that authentic assessments improve overall students' achievement. Making students perform authentic activities online, that were significant in their lives, is the major challenge that educators wanted to solve in this time of pandemic.

Mathematics, being one of the most challenging subjects, is often being taught in the traditional way. One of the reasons, according to Fauziah et al. (2017), was that this subject contained abstractions, especially in advanced topics, and which required pure mental understanding and computation skills before one could apply in real life. Also, mathematics' teachers often have hard times choosing or developing appropriate authentic assessments which led them to simply use the traditional pen and paper test. With this hasty shift to digitizing assessments in the country, mathematics assessment becomes more challenging. Moreover, studies exploring the intricacies in developing and implementing authentic e-assessments were highly needed.

Regarding this matter, the researcher wanted to know secondary mathematics' teachers' conceptions and practices of authentic e-assessments during pandemic. Moreover, this study wanted to explore the challenges in the development and implementation of authentic e-assessment and to know the level of authenticity of the developed authentic e-assessments, on performance, project, and e-portfolio, of secondary mathematics teachers. The results of these would be the basis for a teacher support program on the conduct of authentic e-assessment.

Literature Review

Assessment in Education

Assessment was commonly known as a series of measures performed to know a person's or group's special attributes (Yambi, 2018). Its significance could be observed in any sector of society like business, health, social, political, education, etc. Through assessment, we were able to understand and make meaning of things around us. The process used different testing methods to gather and interpret information related to one's level of attainment based on pre-set standards. Moreover, assessment was used in identifying strengths and weaknesses of an activity, program, service, etc. and which provided information to be used as feedback to modify or alter activities, programs (Brown et al., 2009).

Marimuthu and Ramraj (2019) stated that assessment is an integral part to ensure whether an academic program has attained its learning outcomes. Without functional and systematic assessment, stakeholders would find it difficult to know how much a program has achieved in comparison with standards. Furthermore, assessment played an essential role in providing the evidence needed for pursuing and maintaining certification from authorities. Assessment was also utilized as a tool in gathering results that were needed as a basis for making decisions whether to pursue or accredit education programs.

In education, assessment was generally recognized as a continuing process (done before, during and after instruction) intended to understand and improve student learning (Yambi, Secolsky, and Denison, 2018). Its primary concern was to compare and transfer expected outcomes or objectives into results or performances. Multiple methods were also used in collecting data of the attributes of students. Some of the most common forms were testing, interviewing, observations, and answering questionnaires. Examples of classroom assessments were having students answer mathematics questions, asking students to write on a certain topic, collecting information through observation, and assigning marks on a task students performed.

Assessment, in the context of higher education, was described as a variety of continuing formal and informal assessment procedures that focused on activities of teaching and learning to improve students' learning outcomes (Marimuthu & Ramraj, 2019). Furthermore, according to

Brown (1990), as cited by Yambi (2018), there were four basic components of assessment. First, the process involved measuring learner's improvement over time. Second, the process included motivating learners to study. Third, the process involved evaluating the methods of teaching. Lastly, the process included ranking the learners' capabilities in relation to the results of the group. Furthermore, assessment has three main functions namely: (1) Assessment of learning also known as summative assessment, (2) Assessment for learning also known as formative assessment, and (3) Assessment as learning (Silarova et al., 2017).

Assessment of learning, also known as summative assessment, was mostly done at the end of academic instruction, learning task, unit of work, etc. It was used to know how much a student had learned or acquired at the end of academic instruction, learning task, unit of work, etc. It also provided extrinsic motivations for students, like grades, certifications, promotions, or diplomas whether in the classroom or in other school related contexts (Earl & Katz, 2006). Furthermore, such assessments were used in identifying what students have gained and are the competencies they are lacking or needs to be developed. On the other hand, assessment for learning, also known as formative assessment, was done to frequently monitor students' progress and to provide relevant feedback to guide them to improve performance and to achieve the learning goals (Woodworth, n.d). According to Earl and Katz (2006), the key to make assessment for learning successful was to provide numerous descriptive feedback. With immediate descriptive feedback, students were able to understand right away the things they did right and the things they needed to modify or alter and which resulted in improved learning outcomes. Lastly, when students were able to monitor and practice self-regulation on their own learning experience, assessment as learning occurs (Silarova et al., 2017). This approach of assessment helped students to become responsible for their own learning and which would make them self-regulated in their future studies. Self and peer assessments were its common practices. Moreover, this assessment approach would lead students to life-long learning.

Authentic Assessment

According to Gulikers et al. (2004), authenticity was one of the most important elements of nowadays assessment methods. In the 21st Century, where learners were expected to be effective communicators and collaborators, creative thinkers, innovators and problem solvers, the use of an authentic type of assessment was essentially needed (Kone, 2015 & Saefurrohman & Balinas, 2016). Authentic assessment allows students to perform real-world tasks or activities to demonstrate knowledge and skills through meaningful applications (Sridharan & Mustard, 2015). These types of assessment made use of students' cognitive, affective, and psychomotor domains. Furthermore, doing such assessments allow students to effectively express themselves which makes learning more meaningful.

Authentic assessment was the assessment of the 2013 curriculum educational system (Sari et al., 2018). Its goal was to improve the learning process and to aid students in acquiring essential knowledge and skills while doing real-world activities. Likewise, authentic assessments allow students to show what they were capable of doing without the anxiety of failing just what they experienced in high-stake examinations.

This assessment required students to perform or produce an output that was similar to real-life context and it was designed by the teacher to measure students' understanding of a concept, process, or materials (Edutopia, 2008). Journal, demonstrations/performance, portfolio, project, were some authentic assessments used in teaching and learning process. These authentic assessments equipped learners with skill-related activities that were vital in the 21st century workplace. This study was anchored in authentic learning instructional approach. Authentic learning allowed learners to self-direct, explore, and meaningfully construct concepts based on real-world problems and make projects that were significant to the learner. This 21st century instructional approach prepared students not just to be efficient in school but also to real-world workplace.

Performance Assessment

According to Perie (2020) and Bland and Gareis (2018), performance assessments or performance-based assessments refers to an assessment that involves action to demonstrate the competency set by the teacher. This assessment should have the capability to allow students to demonstrate their acquired knowledge and skills, including the process by which they solve problems pertinent to real-life. Likewise, Ark, T. (2013) stated that performance tasks should be properly planned for it to be meaningful and engaging to students. Most of the time, students are given steps or procedures to be accomplished but sometimes they are free to do what they think is the best and convenient. Moreover, ASCD (2011) stated that the main purpose of performance assessment is to improve student learning. This learning is achieved when students demonstrate their understanding and communicates that understanding. Lastly, students should be provided equal opportunities to engage and make their performance task meaningful (Mohan, R, 2016).

Project Assessment

A type of authentic assessment that focuses on the end or final output made by students is called a project. Project provides a clear picture on how much the students have learned in the process. Personal attributes of students could also be seen in their generated products and thus, provides a more comprehensive learning character of the student. According to Sambeka et.al (2017), project-based learning should allow students to work in groups to solve challenging problems that are authentic, curriculum-based, and interdisciplinary. Moreover, project-based learning is a learning model that is based on the paradigm of student-centered learning. Eickholt et al. (2019) mentioned that project-based learning often centers learning experiences around projects and is characterized by the application of knowledge, management of resources, and self-directed learning. However, the cost to facilitate communication, classroom interaction and active learning spaces can be prohibitive.

Portfolio Assessment

On the other hand, portfolio is a type of assessment that deals with collection of artifacts or evidence made by students; this assessment is done formatively to track the progress of students. It aims to identify competencies students acquired. Wiggins (2000) stated that portfolios are generally a representative collection of students' work. However, Mueller and Bair (2018) stated that e-portfolio is not a mere collection of students' works. E-portfolios should allow students to reflect on, synthesize, and present different kinds of evidence that represent their learning. According to Bungalan and Jipona (2020), e-portfolio is an electronic format for learners to record their work, their achievements and their goals and also to reflect on their learning. More than a repository of students' outputs and artifacts, e-portfolio is a means for students to make connections between concepts, and experiences in and out of the classroom (Callahan et al., 2021).

Although authentic assessments pose lots of benefits, there were also lots of challenges in the development and implementation of this assessment. Azis et al. (2020), identified five challenges faced by teachers in preparing for authentic assessment. First, school administrators and parents lack support in the preparation and implementation of authentic assessments. In addition, authentic assessment was viewed as a waste of time, effort, and materials that's why the school administrators and parents did not support this kind of assessment. Moreover, the unfamiliarity of parents to this kind of assessment, compared with the usual pen and paper, make the parents give less attention to this kind of assessment. Second, authentic assessment involves overwhelming documentation. Some teachers said that development of authentic assessment calls for a tantamount of paperwork which gives them excessive stress. Third, teachers find authentic assessment planning as burdening teaching hours. Due to lots of teaching loads and paperwork, teachers stated that they don't have time anymore for planning and implementing such authentic assessments. Fourth, authentic assessment is challenging on the part of teachers because there are too many school activities conducted. Teachers allocate only a few hours in preparing for authentic assessment and which sometimes lead to unfinished authentic assessment plans. Fifth, teachers lack training and seminars in developing authentic assessment. Teachers stated that they have insufficient skills and that they need more training and seminars, whether free or commissioned, on different approaches of assessment, particularly authentic assessment.

Online Assessment / Electronic Assessment

One of the most widely-used terms during this time of pandemic is the term “new normal.” The new normal in education refers to the increased usage of online learning tools (such as software, online platforms, electronic assessments, etc.) to cater the needs of the students for continuing education (Gautam, 2020). However, a similar term “e-learning” also known as online learning can be traced back to the year 1999. Elliott Masie coined the term "e-Learning" (Gutierrez, 2014). E-learning was described as a distance learning process where students are able to access learning materials and accomplish school-related tasks or activities in the safety of their homes. This kind of learning occurs before due to special reasons where students didn’t have the capability to go to physical classes (i.e., student has physical disability, etc.).

According to Crisp et al. (2016), technology encouraged changes in our understanding of how education programs can be designed and delivered. Nowadays, online learning environments could be classified into three: synchronous, asynchronous and hybrid learning environments (Perveen, 2016). Moreover, the K to 12 Basic Education Curriculum philosophy of assessment emphasized that role of assessment in assuring quality tools that will stimulate progress among students. Even with the “new normal” education, digitalizing authentic assessments should encourage students to self-reflect and make them accountable for their learning growth. Their achievement in authentic tasks would serve as grounds for students’ profiling

Synchronous learning environment refers to a learning process that happens real-time. Student-teacher interactions and collaborations is a major component of this e-learning environment. Moreover, students could directly engage with the lessons and a key assessment feature was that feedback is instant. Likewise, according to Hrastinski (2008), in the cognitive and personal dimensions of E-learning, synchronous E-learning purpose was to make students be motivated and participate in a virtual environment.

On the other hand, an asynchronous learning environment refers to a self-directed learning process that is not time bound. Students were given e-learning materials, printed or soft copy, and their task was to accomplish the given activities in time that they decide. Hrastinski (2008) stated that the main purpose of this learning was to improve cognitive participation of students – to increase reflection and enhance ability to process information. Lastly, the third classification learning environment is called hybrid because it blends synchronous and asynchronous processes. Hybrid E-learning allows students to improve both cognitive and personal attributes by doing independent activities at the same time interacting with other students in virtual platform.

Ghaviferk and Rosdy (2015) emphasized the role of integrating Information, Communication, and Technology (ICT) in assisting teachers in nowadays global requirement of replacing traditional teaching with technology-based instructions, use of web tools, learning applications, and facilitating virtual classrooms. With the help of ICT, teachers could still continue their mission to educate students in a platform where students were familiar and motivated and at the same time offer safety in their own homes.

Along with the "new normal" in education, new challenges also have emerged. According to Azevedo et al. (2017) and Alruwais et al. (2018), students and teachers might encounter technical difficulties such as using computers in the conduct of online discussion and assessments; Accessibility of computer or gadgets and internet; Unfamiliarity of teachers in technology-based web tools, softwares and assessments; Assessing differentiated instructions is also challenging during online classes; Virtual cheating and plagiarism (Kocdar & Karadeniz, 2018).

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With this shifting of teaching platforms online, educators and various stakeholders must ensure that the learning given to students is with quality, essence and meaning and not just to say that education continues. Due to this reason, assessment plays a crucial component in online teaching and learning (Shaw, 2019). Appropriate type of assessment online could determine students' learning strengths, weaknesses, and challenges as they complete the objectives of their learning course. Choosing or developing the right assessment contributes to the success of online classes.

According to Ojose (2009), numerous studies have reported that integrating technology in mathematics and science poses positive results in the education system. Mathematics and Science, which were naturally accurate and precise, were fit with technology integration and which encourage better academic results among students. Web tools could provide accurate measures, precise procedures, comprehensive visual models, etc. which enhanced students' critical thinking and problem-solving skills. Furthermore, based on studies, students who use computers mainly for higher-order thinking activities accomplish better than those who were using it in other activities.

Marimuthu and Ramraj (2019) stated that a major element of any e-learning strategy was e-assessment. In the digital era, the education system should be encouraged to re-model different forms of assessment so that it would fit with the requirement of effective e-learning. Likewise, the integration of electronic based authentic assessments, also known as authentic e-assessments, was crucial in giving timely feedback and improving the learning outcomes of the students (Crisp, 2009).

Statement of Purpose

The main purpose of this study is to conduct an in-depth analysis of secondary mathematics teachers' conceptions and practices of authentic e-assessment, on performance, project, and e-portfolio, during the COVID-19 pandemic. Specifically, the study sought to:

1. Identify the conceptions of secondary mathematics teachers in developing authentic e-assessment particularly,
   1.1 Performance
   1.2 Project
   1.3 E-Portfolio
2. Identify the practices of secondary mathematics teachers in developing authentic e-assessment particularly,
   2.1 Performance
   2.2 Project
   2.3 E-Portfolio
3. Identify challenges that teachers encounter in the development and implementation of authentic e-assessment particularly,

3.1 Performance

3.2 Project

3.3 E-Portfolio

4. Determine the level of authenticity of teacher-made authentic e-assessment on

    4.1 Performance

    4.2 Project

    4.3 E-Portfolio

5. Propose a teacher support program for the development and implementation of authentic e-assessment.

Conceptual Framework

The most important element of any e-learning strategy was e-assessment. In the digital era, the education system should be encouraged to re-model different forms of assessment so that it would fit with the context of online learning. Likewise, to produce output that was effective in an e-learning environment. Although previous researches often mention the integration of ICT, and its role in assisting teachers in facilitating online assessment, teachers' conceptions and practices in using such should also be given an emphasis. This was to know the challenges teachers experienced as they use technology in assessment and to ensure that the effectiveness of online tools and assessments are being maximized.

These challenges could be linked with the familiarity of teachers with the principles of high-quality assessment such as: clarity of learning targets, appropriateness of assessment method, validity, reliability, balance, fairness, positive consequences, practicality and efficiency, and ethics. Moreover, with the seven principles of effective e-assessment, training, familiarity with software, administrative and other stakeholders support, time allocation, and other external factors. Furthermore, through evaluating the authenticity of teacher-made authentic e-assessment, the challenges identified would be validated.

Figure 1

Seven (7) Principles of Effective E-Assessment.

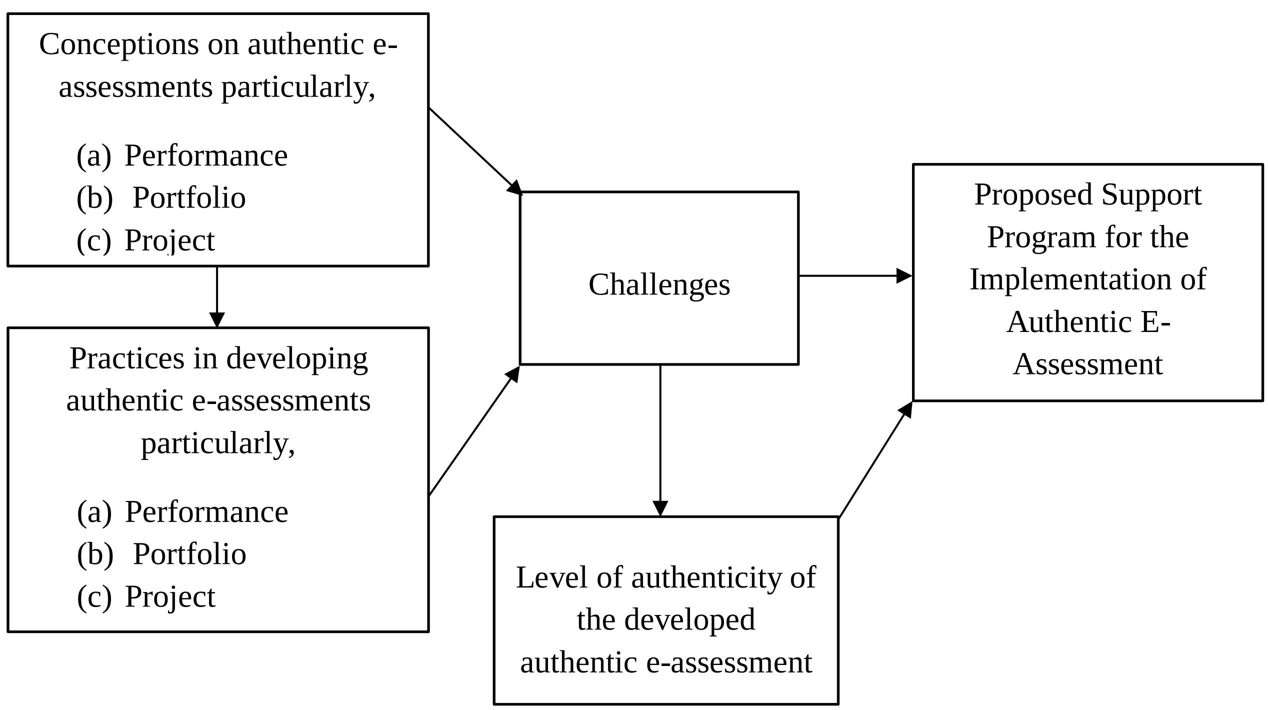
Adapted from: De Villiers, Larke, and Scott-Kennel 2016.

Note. This figure shows De Villier, Larke, and Scott-Kennel (2016), proposed framework for effective E-Assessment. This included seven principles namely accreditation, accountability, articulation, alignment, affordance, authenticity, and adaptation.

Accreditation ensures that e-assessment allows for reliable and valid evaluation of a variety of levels of performance to fairly accredit the students. Meanwhile, Accountability is manifested when the responsibility of students and authority before, during and after the e-assessment is clear. Articulation is achieved when the e-assessment clearly articulates the when/what/why/how of the expected deliverables and dialogues between respondents. Alignment is when the e-assessment is aligned with the pre-planned learning outcomes. Affordance refers to the wider benefit in comparison with the traditional methods. While, Authenticity refers to the transferability of the task in the real-world situation. Lastly, Adaptation is the characteristic of e-assessment to be adjusted in different context, learning outcomes, and respondents. Having essential knowledge and understanding on the following principles would better guide an educator in giving electronic assessment and thus, leads to a greater student achievement even through online.

Figure 2

Conceptual Framework



Note. The conceptual framework shown in Figure 2 explains the relationship between variables of the study.

The graphical representation suggested that teachers' concepts, ideas and beliefs, are important elements in determining their practices. According to Clark and Bates (2003), teachers' conceptions played a significant role in their effectiveness when developing instructional and assessment materials. With this, practices of teachers in developing authentic e-assessment are directly influenced by what they know and understand regarding authentic e-assessments. Likewise, teachers develop and implement authentic e-assessment based on their experiences and prior understanding of the principles of high-quality assessment and seven principles of effective e-assessments. However, there are instances where teachers used their instruction and assessment methods in face-to-face learning into virtual classrooms. This is where challenges arise. Instruction and assessment methods should be aligned with the learning environment to achieve success. Teachers should be equipped with the necessary knowledge in order to demonstrate "correct practices" in teaching and in assessment (Talis, 2009). Moreover, externally influenced challenges, due to sudden shift to virtual learning, may cause difficulty to teachers.

These challenges teachers encountered in the development and implementation of authentic e-assessment would be verified through the researcher-made level of authenticity of the authentic e-assessment instrument. The instrument is based on the principles of high-quality assessment and seven principles of effective e-assessments. The more challenges experienced by the teachers, the lower is the expected level of authenticity of their e-assessments. The level of authenticity of teachers developed authentic e-assessments is inversely related to the challenges they encountered. Lastly, teachers' identified challenges and results of authentic e-assessment evaluation will be the basis for the proposed teacher support program for the development and implementation of authentic e-assessment on performance, project, and e-portfolio. Challenges related to misconceptions, wrong practices, other internal and external factors will be identified and addressed in the support program. Furthermore, guidelines on the proper development and implementation will be given focus in the teacher support program.

Significance of the Study

The significance of this study lied in the importance of PNU and in the Assessment and Evaluation status of the Philippines.

First, it is significant because PNU, as NCTE, was mandated to be a pioneer in research in terms of educational assessment and practice. In this regard, this research was one of the pioneering researches that look and explore the intricacies of authentic e-assessment in the Philippines since it was the current trend in the “new normal” education. Moreover, study was connected to one of the themes of PNU research agenda. It was a response for local studies. With the current situation, only few studies show the contextualization of authentic e-assessments in the field, there was really a need to conduct the study.

Second, it was important because this study contributed to the current status of assessment and evaluation in the Philippines. This study identified possible challenges teachers encounter as they develop authentic electronic-based assessments.

Third, the findings, conclusions, and recommendations of the study gave significant information about the authentic e-assessment status in the City Schools Division of Calamba City, Schools Division Office of Santa Rosa City, and City Schools Division of Cabuyao. Thus, interventions could be done to improve the practices of authentic e-assessment in the three divisions. The recommendations might bring opportunity for future partnerships to schools in order to give better learning service.

Lastly, this research would serve as a baseline data in further studying authentic e-assessments in the Philippines.

Definition of Terms

The researcher used the following terms, which were defined conceptually.

Assessment – It is a systematic process of gathering, interpreting, and discussing information from diverse and multiple sources in order to refine programs and improve student learning. In education, assessment pertains to range of methods or tools used by educators to measure, and evaluate students' learning progress.

Authentic Assessment – It refers to alternative assessment that uses creative learning experiences to test students' skills and knowledge in realistic situations. Authentic assessment allows students to showcase their factual knowledge, higher-order thinking, and 21st Century skills.

Authentic E-Assessment – It is a type of alternative assessment that employs realistic practices with the use of Information and Communication Technology (ICT). These are skill-based and output-based assessment utilizing information technology.

Challenges – conflicts or hindrances experienced by the secondary mathematics teachers when developing and implementing authentic e-assessments.

Conceptions – It refers to a person's ideas and beliefs concerning something, in this study on authentic e-assessment.

Electronic Portfolio *(e-portfolio)* – It is a type of e-authentic assessment that refers to the collection of students' works using an online platform to show progress over a period of time.

Information and Communication Technology (ICT) - refers to all communication technologies, including the use of computers, internet, web tools, video-conferencing, and other media applications. Teachers use ICT in the teaching and learning process nowadays.

Online Assessment/ Electronic Assessment (E-Assessment) – It refers to assessment that can be done using available web technologies or ICT.

Performance – It is a type of authentic assessment that requires students to perform a task or an activity following a specific rules or procedures

Portfolio – It is a type of authentic assessment that refers to the collection of students' works to show progress over a period of time.

Practices – It refers to customary or habitual performance of teachers when doing a task or work. In the study, it refers to teacher's routine in developing and implementing authentic e-assessments.

Project – It is a type of authentic assessment which allows students to engage with their learning in more concrete ways. In this assessment, students will be asked to make an output based on what they have learned

Chapter 2

Methodology

This chapter presents the procedures and methodology that the researcher employed in gathering and analyzing the data in the research study. This chapter includes the following: qualitative design and methodology, research site, selection criteria and participants, data collection, role of the researcher, methods of validation, and ethical considerations.

Qualitative Design and Method

The study employed qualitative research method, specifically, descriptive-multiple case study of the participants by examining pertinent data about the conceptions and practices of secondary mathematics teachers in developing an authentic e-assessment particularly performance, e-portfolio, and project. Based on these data, the researcher identified challenges in the development and practice of authentic e-assessment. These were the bases in the creation of a proposed support program for the implementation of authentic e-assessment.

According to Creswell (2009), case study was an in-depth exploration of an activity, process, program, etc. involving one or more individuals or groups of individuals. A case was defined or bounded by time and event. Having two or more cases implies a multiple case research study. Moreover, data in this research design came from multiple sources and would require multiple collection procedures that were performed over a period of time.

To carry out this method, the researcher first, bracket out presuppositions/ preconceived beliefs about the possible challenges teachers experience when developing authentic e-assessment particularly performance, e-portfolio, and project.

Second, the researcher identified the cases or groups of participants of the study. Selection of participants was based on perception on authentic e-assessment questionnaires, immediate superior recommendation and artifacts validation. Perceptions on authentic e-assessment questionnaires underwent content validation by experts. Cases or groups were divided into three depending on the curriculum category of the school teacher-participants were teaching. The schools' curricula were categorized into three namely: science curriculum, STEP (*Science and Technology, Engineering Program*) section- regular curriculum, and regular curriculum.

Third, through online observations, interviews, and self-reflection instrument, the researcher defined and described the conceptions and practices of teachers who utilized authentic e-assessments in teaching. Likewise, challenges were also identified. Interview questions were patterned with the principles of high-quality assessment and seven principles of effective e-assessment. This instrument underwent content validation by experts.

Fourth, all collected data were analyzed qualitatively. Specifically, holistic within-case and cross-case data analysis was utilized. Based from the results, the researcher identified themes by analyzing the similarities and differences in the conceptions and practices of secondary mathematics teachers from the Science curriculum, STEP section, and regular curriculum. Furthermore, challenges experienced by participants, as they develop and practice authentic e-assessments were determined.

Fifth, the researcher described and reported the conceptions and practices of secondary mathematics teachers on authentic e-assessments.

Sixth, the researcher, together with experts specialized in assessment, assessed the level of authenticity of teacher-made authentic e-assessment using the level of authenticity of the e-assessment instrument. The scale used was anchored on the principles of high-quality assessment and seven principles of effective e-assessments. The instruments underwent content validation by experts. Furthermore, the results of the instrument were utilized to triangulate the results in online observations, interviews, and self-reflection instrument about the conceptions and practices on authentic e-assessment.

Lastly, based on findings of the study, the researcher proposed a teacher support program for the implementation of authentic e-assessment.

Research Site

The research study was conducted in three city schools division of Laguna Province. Among 24 municipalities and 6 cities, three city schools divisions participated in the research study namely: City Schools Division of Cabuyao, Schools Division of Calamba City, and Schools Division Office of Santa Rosa City.

The researcher purposefully chose the three divisions because of the categories of curriculum of the schools in the respective divisions and their favorable location to the researcher. The Schools Division of Calamba City and the Schools Division Office of Santa Rosa City have schools with science curriculum. Meanwhile, the City Schools Division of Cabuyao has a school with a science and technology, engineering program (STEP) section. Schools with a regular curriculum were found among the three divisions.

Selection Criteria and Participants

The participants of this study were composed of ten (10) secondary mathematics teachers who are employing authentic e-assessments in teaching for school year 2020 – 2021. Participants came from different schools in the City Schools Division of Cabuyao, Schools Division of Calamba City, and Schools Division Office of Santa Rosa City, in the province of Laguna. Purposive sampling technique was employed to determine the participating schools based on the category of schools' curriculum namely: (1) science curriculum, (2) Science and technology, engineering program (STEP) section – regular curriculum, and (3) regular curriculum. All secondary mathematics teachers who participated in this qualitative methodology research were chosen due to common qualities they shared (Creswell, 2013).

Initially, the researcher sent a letter of intent to conduct research studies addressed to the three DepEd Division offices (Appendix A). After the endorsement letters from the schools' division superintendents were issued, the researcher forwarded these documents together with the letter of intents to respective principals and officer-in-charge of the schools who qualified with the three schools' curriculum criteria: Science curriculum, STEP section – regular curriculum, and regular curriculum (Appendix B).

Upon approval of the schools' principals and officers-in-charge, the researcher then asked for recommendations of prospective teachers who were conducting authentic e-assessments in teaching. Prospect participants, identified by the principals and subject coordinators, were invited for further validation. After formal endorsement, the researcher sent a letter of consent to each participant (Appendix C), welcoming them to take an interest in the research study. Prospect participants who volunteered to participate were asked to accomplish the perception on authentic e-assessment questionnaires and to submit sample/s of authentic e-assessment they used, or their student-outputs. This was to verify the credibility of the selected participants. From the individuals who agreed and accomplished the instrument, ten research participants were selected and categorized into three cases: These were the following: Case 1) Two secondary mathematics teachers who were conducting authentic e-assessments under a school with science curriculum, Case 2) Two secondary mathematics teachers who were conducting authentic e-assessments under a school with science and technology, engineering program (STEP) section – regular curriculum, and Case 3) Six secondary mathematics teachers who were conducting authentic e-assessments under a regular curriculum. Table A showed the distribution of participants in the study.

Table 1

Distribution of Participants

Case Number and Category	DepEd School Division	Schools	Teacher Number Assignment	Grade Level Handled
Case 1: Secondary mathematics teachers in Science Curriculum	Schools Division of Calamba City	Calamba City Science Integrated School	Teacher 1	Grade 10
			Teacher 2	Grade 7
Case 2: Secondary mathematics teachers in *science and technology, engineering program* (STEP) section – regular curriculum	City Schools Division of Cabuyao	Cabuyao Integrated National High School	Teacher 3	Grade 10
			Teacher 4	Grade 7

Case 3: Secondary mathematics teachers in regular curriculum	Schools Division of Calamba City	Makiling Integrated School	Teacher 5	Grade 10
	City Schools Division of Cabuyao	Gulod National High School	Teacher 6	Grade 10
			Teacher 7	Grade 9
			Teacher 8	Grade 9
	Schools Division Office of Santa Rosa City	Southville IV National High School	Teacher 9	Grade 8
			Teacher 10	Grade 10

Note. Table 1 shows the distribution of teachers based on their case number and school curriculum category, DepEd school division, schools, teacher number assignment, and grade level they handled.

Research Instrument

The research instruments utilized for a comprehensive assessment of mathematics teachers' conceptions and practices of authentic e-assessment were as follows: (1) Level of Authenticity of Authentic E-Assessment Instrument for Performance, Project, and E-Portfolio (Appendix D), (2) Perception on Authentic E-Assessment Questionnaire (Appendix E), (3) Researcher-made interview questions aligned with the principles of high quality assessment and seven principles of effective e-assessments (Appendix F), and (4) Self-reflection instrument in the development of authentic e-assessment (Appendix G).

The level of authenticity of authentic e-assessment instrument was utilized to assess the authenticity level of the teacher-developed authentic e-assessment. It was composed of thirteen (13) statements or criteria written in Likert scale format. The statements were aligned with the principles of high-quality assessments namely: clarity of learning targets, appropriateness of assessment method, validity, reliability, balance, fairness, positive consequences, practicality and efficiency, and ethics. Moreover, with the seven principles of effective e-assessment namely: accountability, articulation, alignment, affordance, authenticity, adaptation, and accreditation. To validate the content of the instrument, Lawshe's Content Validity Index (CVI) was utilized. The CVI is the mean Content Validity Ratio (CVR) of all question-items in the instrument (Gilbert & Prion, 2016). The closer the CVI value to 1.00, the higher the overall content validity of the instrument. According to Ayre and Sally (2013), the CVR method was used to check each question-item of the instrument concerning its essentiality according to a number of experts. The decision to reject, revise, or retain each question of the instrument relies on the majority of the validators deciding that the content per item is essential. Panel size of 7 and below should have CVR critical value of 1.00 to be valid. According to Lawshe (1975), CVR is 1.00 if all validators choose an item as "essential". The equation to calculate Lawshe's Content Validity Ratio was shown below.

$$CVR = \frac{n_e - \frac{N}{2}}{\frac{N}{2}}$$

where: n_e is the number of validators identifying an item as "essential".

N is the total number of validators.

$\frac{N}{2}$ is half the total number of validators.

Five experts validated the level of authenticity of authentic e-assessment instrument and the critical CVI value for this number of expert validators was 1.00. After a series of revisions as pointed out by the researcher's adviser and expert validators, the researcher finally drafted the instrument. Appendix H showed the validation of the level of authenticity of authentic e-assessment instrument.

Perception on authentic e-assessment questionnaire was utilized for the purpose of identifying secondary mathematics teachers who are employing authentic e-assessments in teaching. Moreover, participants' beliefs, ideas, experiences, and practices of performance, e-portfolio and project were identified. It was composed of one closed question (Yes or No) and 3 open-ended questions. In the study, four experts validated the perception on authentic e-assessment questionnaire and the critical CVI value for this number of expert validators was 1.00. After a series of revisions as pointed out by the researcher's adviser and expert validators, the researcher finally drafted the instrument. Appendix I showed the content validation of perception on authentic e-assessment questionnaire.

Researcher-made short interview questions were utilized for the purpose of identifying secondary mathematics teachers' conceptions and practices of authentic e-assessments in teaching. The instrument was aligned with the principles of high-quality assessments namely: clarity of learning targets, appropriateness of assessment method, validity, reliability, balance, fairness, positive consequences, practicality and efficiency, and ethics. Moreover, with the seven principles of effective e-assessment namely: accountability, articulation, alignment, affordance, authenticity, adaptation, and accreditation. It was composed of four open-ended questions. Lawshe's Content Validity Index (CVI) was also utilized to validate this instrument. In the study four experts validated the short interview questionnaire and the critical CVI value for this number of expert validators was 1.00. After a series of revisions as pointed out by the researcher's adviser and expert validators, the researcher finally drafted the instrument. Appendix J showed the content validation of the researcher-made interview questionnaire.

Lastly, the self-reflection instrument was a free response questionnaire that enabled the teacher-respondents to reflect on their developed authentic e-assessment. Moreover, the instrument aimed to determine secondary mathematics teachers' self-perceived practices and challenges participants encountered in the conduct of authentic e-assessments. This instrument also served as an avenue for the participants to give suggestions or recommendations to improve or strengthen the practice of authentic e-assessment. It was composed of three open-ended questions. Lawshe's Content Validity Index (CVI) was also utilized to validate this instrument. Four experts validated the researcher-made self-reflection instrument and the critical CVI value for this number of expert validators was 1.00. After a series of revisions as pointed out by the researcher's adviser and expert validators, the researcher finally drafted the instrument. Appendix K showed the content validation of the self-reflection instrument.

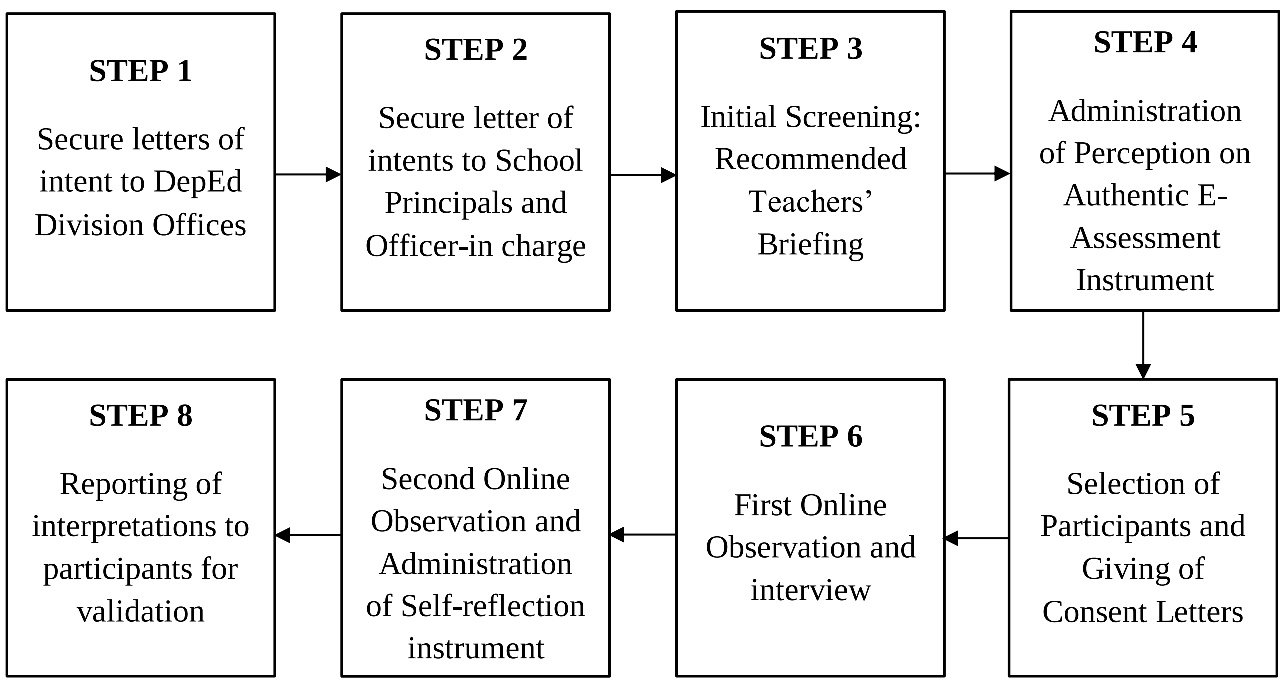
Data Collection

According to Yin (2003), as cited by Brante (2018), researchers in case studies relied on multiple sources of evidence. This part incorporated the advancement of rigorous data collection protocol including securing of legal documents, administration of instruments, conduct of interviews, online observations, and records keeping.

Data was collected from April through July 2021. This included two online observations while the participants were conducting authentic e-assessments, 10-20 minutes online interviews on conceptions, practices, and challenges participants encountered while conducting authentic e-assessment. Likewise, gathering of documents such as assessment plans and sample outputs on authentic e-assessment. Figure 3 showed the Eight steps flow of data collection the researcher used in the study.

Figure 3

Eight Steps Flow of Data Collection



Note. Figure 3 shows the 8-steps flow followed by the researcher during data collection. Detailed discussion of each step was presented below.

Prior to researcher data collection and investigation, the researcher secured letters of intents addressed to the superintendents of the City Schools Division of Cabuyao, Schools Division of Calamba City, and Schools Division Office of Santa Rosa City. The letters were sent through official e-mails of the respective DepEd division offices. Upon receipt of the endorsement letters, the researcher proceeded to the target schools.

Second, the researcher purposely selected the schools based on the category of schools' curriculum namely: (1) science curriculum, (2) Science and technology, engineering program (STEP) section – regular curriculum, and (3) regular curriculum. Letters of intent and the endorsement letter from the three division offices were sent to respective school principals and officer-in-charge through e-mails and messenger accounts. After given the permission, the researcher initially collected information about the schools' curriculum and asked for recommended secondary mathematics teachers who were conducting authentic e-assessment in class. Prospect teachers, recommended by principals and subject coordinators, were invited to a short research briefing.

Third, after a formal endorsement of prospective teachers, the researcher conducted a short virtual briefing, which lasted 10-15 minutes, about the nature of the study and the flow of data collection for the research. Schedules of virtual briefing were based on the availability of teachers in respective schools as given by the subject coordinators. Moreover, queries of the teachers about availability and schedules during the briefing were addressed by the researcher.

Fourth, upon agreement of the prospective teachers to voluntarily partake in the study, the researcher explained and administered the perception on authentic e-assessment instrument. The instrument was sent in Google form format through e-mail and messenger accounts. The prospect teachers accomplished the instrument at their available time within two weeks. Upon seeing the responses of participants and validation of their submitted authentic e-assessments, ten secondary mathematics teachers qualified to participate in the research study. Pseudo names were assigned to each teacher to ensure privacy and confidentiality.

Fifth, the researcher in this study used one of the kinds of purposive sampling methods in determining the cases for an investigation called theoretical sampling. Secondary mathematics teachers who have online classes and conduct authentic e-assessment were qualified to participate in the research study. Selection was finalized after seeing the responses of the prospect teachers in the perception of authentic e-assessment instrument and through examining the submitted authentic e-assessment documents. The researcher further welcomed the participants by sending letters of consent through emails and messenger accounts. The researcher assured the teacher-participants that the entire research was guided by R.A. 10173 or the Data Privacy Act of 2012. Any personal information that was shared was kept with confidentiality. Teachers who have provided their consents to partake in the research study were asked initial information, like the curriculum category the school was following and grade level they handled for S.Y. 2020-2021.

Sixth, the researcher scheduled the first online observation upon suggestions of the teachers considering their available date and time. The observation focused on how teachers explained and practiced authentic e-assessments in class. Due to hectic schedules and unforeseen activities of four teachers, an alternative recorded video, while the teachers were conducting or giving instructions for authentic e-assessment, were sent to the researcher. teachers, who gave their permission were observed and interviewed after the class.

The interview focused on the conceptions, practices, and challenges teachers encountered in the conduct of authentic e-assessments. The interview lasted 15-20 minutes. Three teachers were interviewed individually; five preferred to be interviewed in groups, together with the other teachers in the same school; and two teachers submitted written answers to the interview questions through email and messenger account. After the short interview, the researcher asked the teachers about their preferred schedule for the second online observation.

Seventh, the researcher scheduled the second online observation upon recommendations of the teachers. The second observation focused on validating the initial interpretation of the researcher on how teachers practiced authentic e-assessments in class. Additional conceptions, practices and challenges were identified during the second online observation. Similar to the first observation, four teachers, who had prior activities and tasks to accomplish in their schools, sent an alternative recorded video on their conduct of authentic e-assessments.

After the second online observation, the researcher explained and administered the self-reflection instrument. The instrument was composed of three open-ended questions which aimed to identify the challenges teachers encountered as they practice authentic e-assessments and their suggestions or recommendations, to improve the practice of authentic e-assessments. The instrument was sent via Google form through participants' email or messenger accounts. The teachers accomplished the instrument at their available time within two weeks. Follow-ups were also conducted by the researcher.

Lastly, after the first and second observations and interviews, the researcher relayed his interpretations of the teachers' direct quotes for further validations and to elaborate their experiences and practices. Upon agreement of the teachers to the interpretations, the researcher began the coding process.

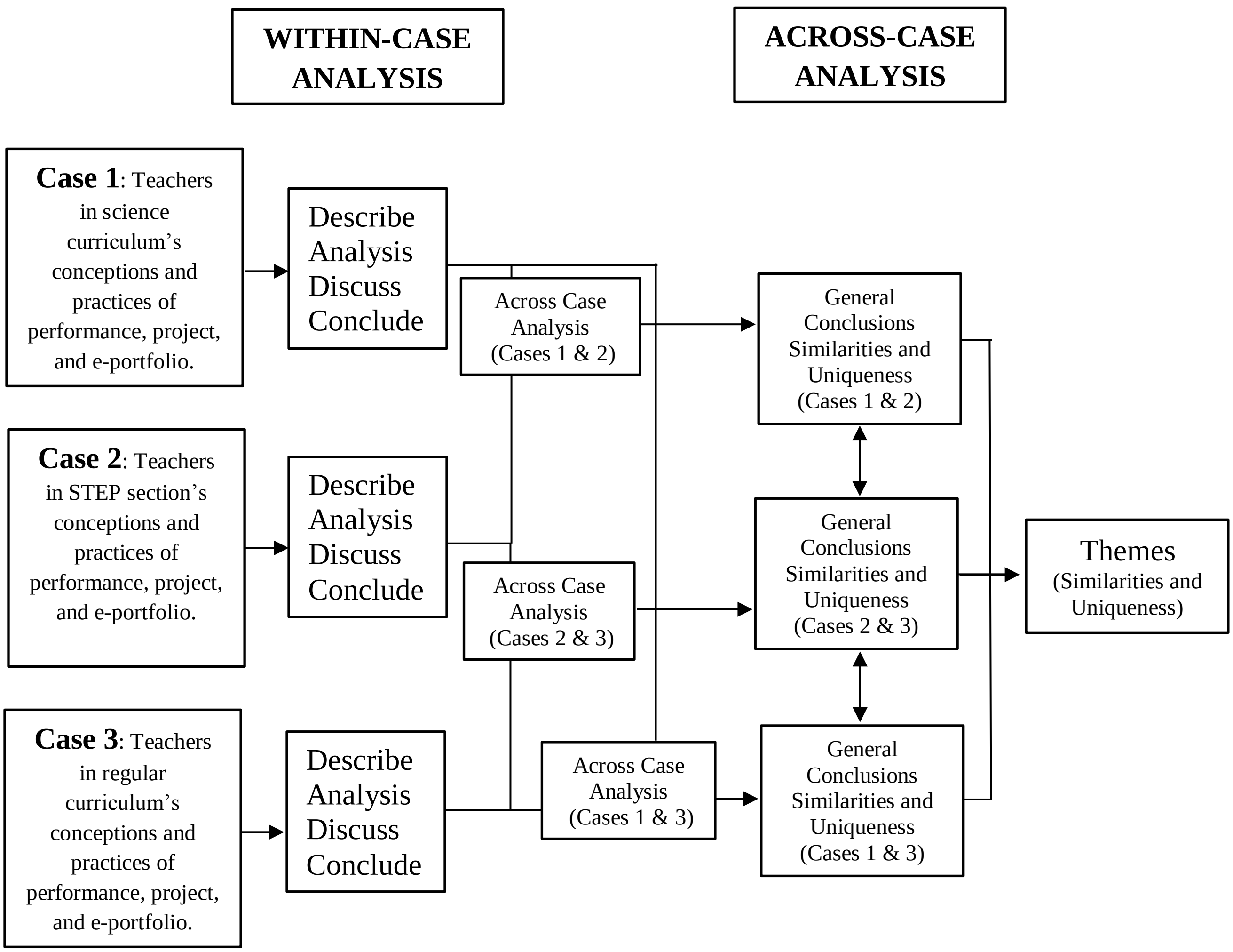
Moreover, all necessary documents and video recordings namely: (a) Letters of intent addressed to the superintendents of the three division offices, (b) Letters of intent addressed to respective school principals and officers-in-charge, (c) Responses to instruments administered in Google form, (d) Recorded participants' briefing – only those with permission, (e) Participants recorded classes while conducting authentic e-assessments, (f) Recorded focused group discussion and individual interviews, were kept in the researcher's personal Google drive as data repository. Folders were assigned to each participant in the study for ease of data retrieval. Pseudo names were assigned to each participant to ensure personal data privacy. The researcher assured the respondents that all data gathered and video recordings were kept privately and were treated with utmost confidentiality.

Data Analysis

Merriam (1988) and Marshall and Rossman (1989), as cited by Creswell (2013), stated that collection and analysis of data in qualitative research should be done simultaneously. Likewise, to analyze data in multiple case studies, within-case and across-case data analysis should be conducted (Stake, 2006). The figure below showed the holistic multiple three cases within-case and across-case data analysis of the study. The illustration was based on Dr. Mandeep Saini's simplified research methods of holistic three cases study analysis in 2020. Furthermore, the diagram aimed to show the similarities and the uniqueness among cases.

Figure 4

Holistic Multiple Three Cases Within-Case and Across-Case Analysis Diagram



Note. Figure 4 shows the holistic within-case and across-case data analysis of the study among the three cases.

Collected data from each case first underwent within-case analysis. The researcher underwent rigorous familiarization with the data before coding. Second, data coded underwent within-case analysis. The coded data in this part were described, analyzed, and discussed, to form general conclusions. Third, the researcher utilized across-case data analysis by determining similarities and uniqueness of conceptions and practices between cases 1 and 2, cases 2 and 3, and cases 1 and 3. All gathered conclusions were further analyzed to come up with final themes. The Final themes showed similarities and uniqueness of data among the three cases.

Role of Researcher

The researcher, as the primary data collection instrument, recalled all presuppositions, personal values and biases about the study. The researcher's perceptions and experiences to the research setting on authentic assessment were useful and positive rather than detrimental. The learning that the researcher accumulated since undergraduate until graduate studies broadened his perspective regarding various forms and procedures of assessments. Moreover, being a secondary Mathematics teacher for seven years, competition coach, and mathematics module writer allowed the researcher to understand deeper the purpose and function of different assessments. These helped the researcher build inclination about the study and in revealing the concepts from the data that were gathered, coded, and interpreted from online observations, interviews, recorded videos, instruments, and submitted authentic e-assessments of the participants.

Furthermore, the researcher had always practiced professionalism. Securing permissions from respective offices and respecting participants' work schedules, conceptions, and practices towards authentic e-assessment. Participants' data, personal or contextual, and collected documents and recordings in the conduct of the research study were treated and kept confidentially.

The researcher believed that the mentioned understanding of the context and role enhanced his sensitivity, and awareness to the possible challenges encountered by the teacher-respondents and assisted him in dealing with the study. Because of personal experiences of the researcher in developing authentic e-assessments, he brought certain biases to this study. Although every effort was made to ensure objectivity, these biases contributed to the way the researcher viewed and understood the data collected and the way these data were interpreted. Nevertheless, the researcher exercised data validation by participants' affirmation about his interpretations of the data gathered.

Methods of Validation

Internal validity of the study was ensured by establishing triangulation of data sources, member checking, and peer examination.

First, the researcher ensured triangulation of data. Sources of data were collected using multiple methods. Interviews, online observations, and documentation analysis were conducted to know the conceptions, practices, and identify challenges secondary mathematics teachers encountered in developing and conducting authentic e-assessment, specifically performance, portfolio, and project.

Second, validity method used was member checking. The participants served as co-checkers or co-researchers throughout the study. Continuous dialogue between the researcher and the participants were observed in making interpretations of the teacher's reality and meanings. Through this, truthfulness and accuracy of the data was ensured.

Third is to conduct peer examinations. The researcher together with evaluators, composed of two MA-students specialized in educational assessment and evaluation that passed their comprehensive examinations, were asked to evaluate the degree of authenticity of the participants' developed authentic e-assessments. This was done to ensure that the result of the evaluation on participant's authentic e-assessments was free of any researcher's bias. Furthermore, the two external evaluators were recognized as contributors in this research study (Appendix C).

Ethical Considerations

On Sensitive Issues

This study aimed to conduct an in-depth analysis on secondary mathematics teachers' conceptions and practices on authentic e-assessment during the COVID-19 pandemic. It does not contain any inclusion of sensitive issues on gender, religion, age discrimination and the like.

On Protection of Respondents and Suitability of Research Site

The researcher strictly followed the health and safety protocols stipulated in division offices endorsement letters. There was no physical interaction between the researcher and the participants of the study. The researcher utilized online platforms in the conduct of data gathering. Interviews and observations were facilitated by online meeting applications particularly Zoom and Google meet. Submission and retrieval of necessary documents were done through email and participants' messenger accounts with their permission. Likewise, instruments were placed in Google form and sent through emails or messenger accounts. All gathered data and interview recordings were placed in the researcher's personal drive for record keeping.

Furthermore, the researcher, throughout the study, was guided by Republic Act No. 10173, also known as, Data Privacy act of 2012. Personal data of participants and research sites were kept confidential. Pseudo names were assigned to each participant. Cases were assigned to a group of participants from different schools based on the classification of the curriculum they used.

Debriefing of Plan

The researcher conducted a participants' briefing, facilitated by online meeting application Google meet, in which the complete information of the nature and purpose before, during, and after the study were discussed. Moreover, during the briefing, the researcher assured the participants that their personal profile and responses to research instruments and interviews were kept with confidentiality following Republic Act 10173.

Chapter 3

Results and Discussion

This chapter presents the findings, discussions, and implications of the study. The arrangement of each section of this chapter was based on the sequence of answering the statement of the problem of this study. The first part discussed the conceptions of secondary mathematics teachers from science curriculum, STEP section, and regular curriculum, in developing authentic e-assessment particularly performance, project, and e-portfolio. The second part identified the practices of secondary mathematics teachers from science curriculum, STEP section, and regular curriculum, in developing authentic e-assessment on performance, project, and e-portfolio. The third part identified the challenges that secondary teachers encounter in the development of authentic e-assessment particularly on performance, project, and e-portfolio. Fourth part presented the level of authenticity of the teacher-made authentic e-assessments particularly on performance, project, and e-portfolio. The fifth part showed a matrix for the teacher support program for the development and implementation of authentic e-assessment.

1. Identify the conceptions of secondary mathematics teachers in developing authentic e-assessment particularly on performance, project, and e-portfolio.

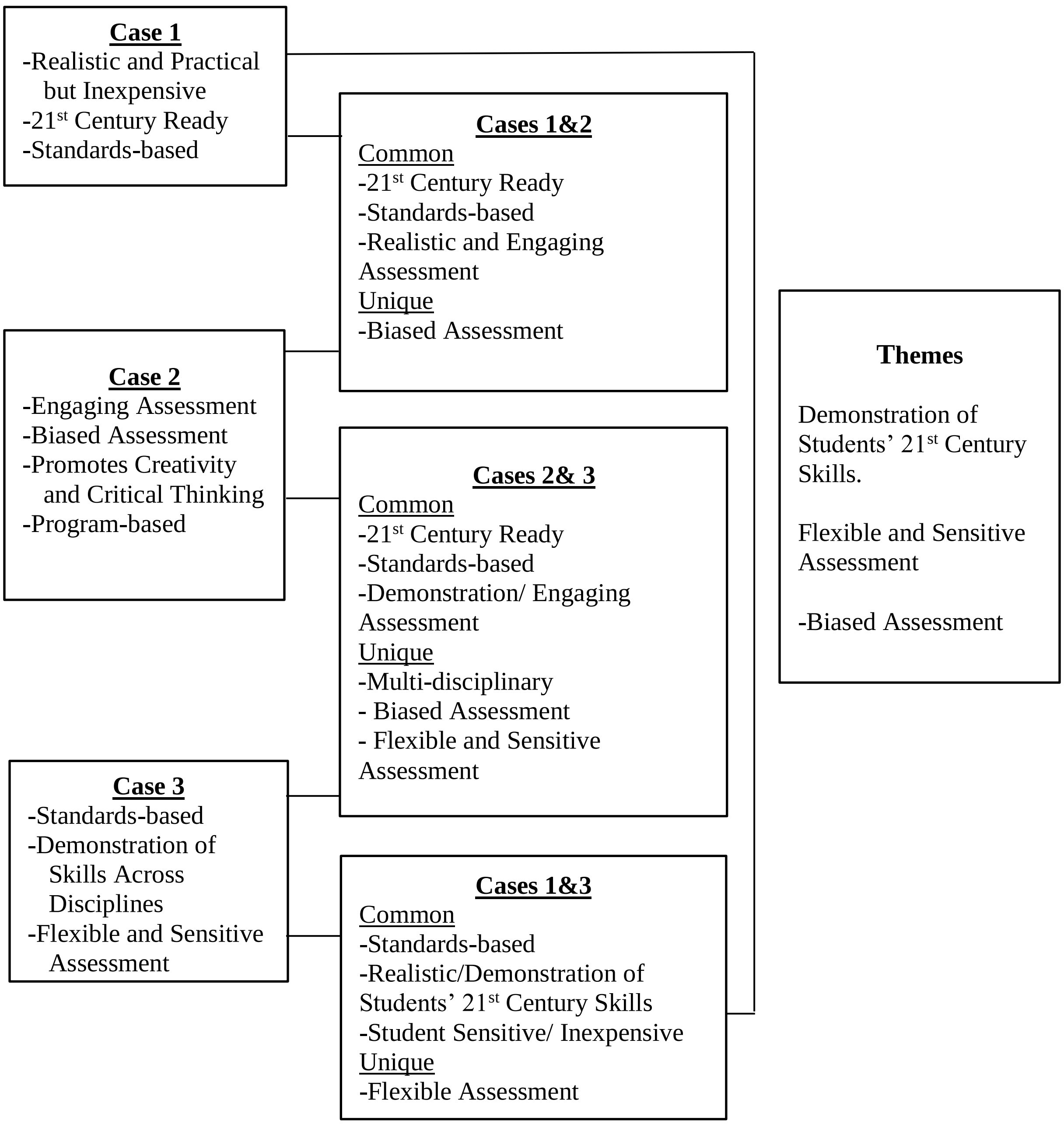
Teachers' conceptions played a significant role in their effectiveness when developing instructional and assessment materials (Clark & Bates, 2003). These conceptions were based on Teachers' understanding, beliefs, ideas, values, and experiences while developing and authentic e-assessments on performance, project, and e-portfolio. With this, teachers should be equipped with the necessary knowledge in order to demonstrate "correct practices" in teaching and in assessment

(Talis, 2009). Teachers' formal trainings, webinars, and conferences should be conducted in order to contribute and update teachers' conceptions of authentic e-assessments.

Based on the data gathered, figure 5 summarizes the conceptions of secondary mathematics teachers in developing authentic e-assessment particularly on performance, project, and e-portfolio.

Figure 5

Within-Case and Across-Case Analysis of Secondary Mathematics Teachers' Conceptions on Performance E-Assessment



Note. Figure 5 shows the secondary mathematics teachers' conceptions on performance e-assessment.

1.1.Performance

Like Saini (2020), the researcher utilized the holistic multiple three cases within-case and across-case data analysis in analyzing secondary mathematics teachers' conceptions on performance authentic e-assessment. The method was inspired by Robert Stake's within-case and across-case data analysis in 2006. This method advocates to identify the conceptions of secondary mathematics teachers by describing, analyzing, and discussing their ideas and beliefs in developing authentic e-assessment on performance. After identifying the conceptions of teachers on performance e-assessment in each case, across-case analysis was utilized, similarities and differences was determined between cases 1 and 2, cases 2 and 3, and cases 1 and 3. Lastly, findings from within-case and across-case analysis were collated to form themes. According to Ayres et al. (2003), themes are key elements in the data of qualitative analysis. Themes may vary as they are manifested across individuals or might apply in the same way to all members of the sample, depending on both the data and the method. Stake (1995) stated that data are recontextualized as they are reintegrated into themes. These themes were combined units of similar meaning taken from each case accounts of multiple respondents. These recontextualized data create a reduced data set drawn from across all cases.

Within-Case Analysis

Secondary mathematics teachers, teaching in science curriculum, perceived performance e-assessment as applied demonstration of students' skills in realistic situations. However, teachers emphasized that demonstration or application should be affordable to every student to ensure that everyone can accomplish the assessment. This concept was supported by Perie (2020) and Bland and Gareis (2018), that performance assessments or performance-based assessments should have the capability to allow students to demonstrate their acquired knowledge and skills, including the process by which they solve problems pertinent to real-life. This idea was in accordance with the principles: appropriateness of assessment method and tools, alignment, practicality and efficiency, affordance, and authenticity. Moreover, teachers stated that performance e-assessment should be based on standards set by the Department of Education. Marimuthu and Ramraj (2016) stated that functional assessments should be compared with standards to know if the goals and objectives of the program were achieved. In this case, teachers followed the curriculum guide used before the pandemic. This concept was anchored on: clarity of learning targets, articulation, and validity. Using the curriculum guide, learning targets can be clearly identified and thus, provide ideas to teachers on what suitable performance task to develop. Likewise, performance e-assessments stipulated in the students' learning modules were adopted and given to students. Lastly, teachers believed that performance e-assessments should be 21st century ready. The 21st century skills are generally understood to encompass a range of competencies, such as problem solving, creativity, digital and technology literacy, critical thinking, collaboration, meta-cognition, global awareness, and civic responsibility (Kim et al., 2019). According to Lapek (2018), acquiring this skillset have been related to student's success in 21st century society and workplaces. This concept was in accordance with the principles: articulation, alignment, validity, balance, positive consequences, and authenticity. This explained that performance e-assessment should yield qualities of great worth and significance to students' academics and future.

Meanwhile, secondary mathematics teachers, teaching in science and technology, engineering mathematics program (STEP) section- regular curriculum, perceived performance e-assessment as an authentic assessment that highly engages students. According to Ark (2013), performance tasks should be properly planned for it to be meaningful and engaging to students.

This idea was in accordance with the principles: balance, positive consequences, and authenticity. This suggests that performance e-assessment must target multiple intelligence domains and should yield engaging real-world tasks that have great worth and significance to students. Likewise, STEP section teachers stated that performance e-assessment is a biased assessment. Teachers observed that performance e-assessment were only advantageous to students who have available devices and internet connection while for students who haven't, it becomes a challenge. This statement from the teachers was supported by Azevedo et al. (2017) and Alruwais et al. (2018) stating that teachers and students may encounter challenges pertaining to accessibility of gadgets and internet. However, this opposes the principles of fairness and affordance. Performance e-assessment must avoid biases based on students' economic status. Teachers should make sure that performance e-assessments they give provide equal opportunities to students. Furthermore, secondary mathematics teachers believe that performance e-assessment must enhance students' creativity and critical thinking. Creativity and critical thinking are 21st century skills that students are expected to acquire to be able to achieve success in the 21st century society (Kim et al., 2019). This idea was anchored on the principles: articulation, validity, balance, positive consequences, and authenticity. Being able to develop and enhance these skills will serve as an advantage to students as they prepare for their future careers. Lastly, STEP-section teachers perceived performance e-assessment as an authentic assessment that is program-based. Teachers assure that performance e-assessments they give are in line with their program-science and technology and engineering mathematics and department of education's curriculum guide. This concept was aligned with: clarity of learning targets, articulation, validity, balance, adaptation, authenticity and accreditation. With program guidelines and curriculum guide, learning targets can be clearly identified and thus, provide ideas to teachers on suitable performance task they need to develop and if the program was successful in achieving the standards (Marimuthu & Ramraj, 2016). Likewise, performance e-assessments stipulated in the students' learning modules were modified, to be aligned with STEP, and given to students.

Secondary mathematics teachers, teaching in regular curriculum, perceived performance e-assessment as an assessment that is based on standards set by the Department of Education. The most essential learning competencies (MELC) was followed by teachers for this school year. This concept was aligned with: clarity of learning targets, articulation, and validity. Using the most essential learning competencies for mathematics, learning targets can be clearly identified. With this, development of appropriate performance e-assessment will be guided. Performance e-assessments stipulated in the students' learning modules were adopted and used by teachers. Furthermore, secondary mathematics teachers perceived performance authentic e-assessment as a demonstration of students' skills across disciplines. With limited time and resources in online classes, teachers maximized their time by harmonizing or collaborating their performance e-assessment with other subjects. Through this, students were able to understand that performance activities are not independent but rather encompassing across disciplines. This idea was anchored in the principles: alignment, validity, balance, positive consequences, practicality and efficiency, affordance, authenticity and adaptation. Lastly, secondary mathematics teachers viewed performance authentic e-assessment as flexible and sensitive assessment. Developing performance e-assessment is a crucial stage in assessment (Earl & Katz, 2006). Students' capabilities, beliefs, values, and economic status should be considered to ensure that every student can perform and do their best in the assessment. These ideas were aligned with the principles: fairness, practicality and efficiency, affordance, and ethics.

Across-Case Analysis

Secondary mathematics teachers teaching in science curriculum and STEP section regular curriculum agreed that performance e-assessment must engage students into realistic application of their learning even during online learning. Moreover, teachers stated that performance e-assessment must hone students' 21^{st} century skills to be able to be ready with the demands of the 21^{st} century workplace and society. This concept was supported by Kone (2015) and Saefurroman and Balinas (2016) that assessments must be 21^{st} century ready. Furthermore, performance authentic e-assessment should be aligned with the standards set by the Department of Education and with the science and technology, engineering mathematics program implemented by the school. However, it is only the teachers in STEP section regular curriculum who viewed performance e-assessment as biased to those students with available devices. Teachers reiterated that limited accessibility of gadgets and internet connection poses a major threat to students in accomplishing their assessments.

Meanwhile, secondary mathematics teachers teaching in STEP section regular curriculum and regular curriculum perceived performance e-assessment as an engaging demonstration of students' acquired skills. These skills must be anchored with the 21^{st} century skills needed to prepare students with the demands in 21^{st} century workplace and society. Furthermore, performance authentic e-assessment should be aligned with the standards set by the Department of Education and with the science and technology, engineering mathematics program implemented by the school. However, teachers in STEP section regular curriculum viewed performance e-assessment as biased to those students with available devices. Students with available devices, capability to buy resources, and internet connectivity have an advantage in doing performance tasks. In contrary, teachers in regular curriculum believed that performance e-assessment should be flexible and sensitive to students' capabilities, beliefs, values, and economic status. This is to ensure that every student will be given equal opportunities to do the performance task. Lastly, teachers in regular curriculum believed that performance e-assessment must encompass with other related discipline or subject to lessen students' activities and need for resources and thus, maximize their productivity.

Secondary mathematics teachers teaching in science curriculum and regular curriculum stated that performance e-assessment must be a demonstration of students acquired 21st century skills into real-life situations. Moreover, the performance authentic e-assessment should be aligned with the standards set by the Department of Education. In the case of teachers in science curriculum, they followed the curriculum guide while for teachers in the regular curriculum, the most essential learning competencies (MELC) were used. Likewise, teachers stated that performance e-assessment should be sensitive to students' capabilities, beliefs, values, and economic status. Furthermore, resources to be utilized should be accessible to everyone so that no student will be left behind or discriminated.

Based on the analysis, teachers from science curriculum, STEP section, and regular curriculum perceived authentic e-assessment as demonstration of students acquired 21st century skills. This concept was supported by Perie (2020) and Bland & Gareis (2018), that performance assessments or performance-based assessments should have the capability to allow students to demonstrate their acquired knowledge and skills, including the process by which they solve problems pertinent to real-life and the demand of the 21st century workplace and society. Likewise, ASCD (2011) stated that the main purpose of performance assessment is to improve student learning. This learning is achieved when students demonstrate their understanding and communicates that understanding. However, it is unique that STEP section teachers viewed performance assessment as biased and only advantageous to students who have available resources and devices. This statement contradicts one of the purposes of assessment to provide equal opportunities to students to engage and make performance task meaningful (Association for Supervision and Curriculum Development [ASCD], 2011; Mohan, 2016). Lastly, teachers teaching in schools with regular curriculum perceived performance e-assessment as multi-disciplinary and can be harmonized with other subjects to reduce students' preparation for activities and lessen their need for resources and thus, maximize their productivity.

Below are the detailed accounts on conceptions of secondary mathematics teachers in developing performance authentic e-assessments.

1.1.1 Science Curriculum

Realistic and Practical but Inexpensive. Secondary mathematics teachers of science curriculum assured that the e-assessments they give were relevant to practice in real-life and at the same time do not require too many resources for students. They believed that performance e-assessments should showcase students' knowledge and skills even in a virtual platform. Moreover, the e-performance task should be sensitive to the financial status of the students since we are in a pandemic situation.

The following statements were evident in the conceptions of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on performance.

"*Performance authentic e-assessment is the application of students' knowledge and skills in a learning area in a realistic and practical manner*." (Teacher 1)

"This kind of assessment is not merely about students' learning specific subject area's content and concept but they must see the applications and importance of it in real life. Likewise, e-performance should not be expensive, especially right now that we are in a pandemic." (Teacher 2)

"Since we are in a pandemic, the performance tasks that we are giving are related to ICT works and documents which students can still encounter in real workplace. We also consider the financial capabilities and technical skills of our students when developing authentic e-assessments." (Teacher 2)

21st Century Ready. Secondary mathematics teachers of science curriculum conceived performance e-assessment as a training to prepare students for the 21st century workplace. The e-assessment should possess 21st century lifelong skills which were in high demand in any workplace in the world. These skills involve critical thinking and problem solving, creativity and innovation, collaboration and communication, cross-cultural understanding, communication, computing technology, and career learning. Furthermore, integration of information communication and technology or ICT should be manifested in the performances of students in authentic e-assessments.

The following statements were evident in the conceptions of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on performance.

"Performance e-assessment should be aligned with the skills expected to 21st century learners, such as problem solving, critical thinking, creativity, etc.; so that we can assure that they will be competitive in the real-life workplace." (Teacher 2)

"Even in virtual platform, performance assessment should enhance essential skills of student that they can use in their future jobs. It is also an opportunity to enhance our students' skills in computer or ICT." (Teacher 1)

Standards-based. Performance authentic e-assessments, according to teacher-participants, were assessments aligned with the content standards and performance standards set by the Department of Education. Moreover, expected learning outcomes were based on K-12 Curriculum Guide since teacher participants followed the curriculum guide when preparing their learning plans for online classes.

The following statements were evident in the conceptions of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on performance.

"Performance-authentic assessments I used in my online class are always based on the content and performance standards written in the curriculum guide. I also make sure that the objectives in my lesson plan and the expected performance of my students are aligned with those." (Teacher 2)

"For this online learning, performance assessments should still possess the essential tools to meet the K-12 desired learning outcomes so we make sure that it is aligned with the curriculum guide of DepEd." (Teacher 1)

1.1.2 STEP (*Science and Technology, Engineering Program*) Section

Engaging Assessment. Teachers in the STEP program believed that performance e-assessments were highly engaging because students would be given tasks where they excel most – utilizing gadgets. Likewise, students would be curious and challenged to the new approaches of performance tasks in various virtual platforms or softwares.

The following statements were evident on the conceptions of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on performance.

"For me, this kind of assessment can engage students in different ways. Students become more curious and excited because the assessments will be facilitated in different platforms where they are interested at." (Teacher 3)

"I always make sure that my performance e-assessment will not only test certain skills but will also ignite students' interest so that they will perform at their bests." (Teacher 4)

Biased Assessment. Teacher participants conceived performance-authentic e-assessment as a favorable assessment for students who have and are familiar with gadgets and capable of buying it. On the other hand, this assessment was disadvantageous for students who were borrowing or without personal gadgets.

The following statements were evident on the conceptions of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on performance.

"I think this e-assessment has an advantage for those students who are exposed in gadgets. It has a disadvantage for those who have no gadgets." (Teacher 3)

"Although performance authentic assessment has a lot of benefits to students, I think it only favors students with available devices and discriminates those who have no personal devices." (Teacher 4)

Promotes Creativity and Critical Thinking. Teachers made sure that the performance assessment allowed the students to apply their knowledge and skills in creative ways. They believed that e-assessments should also enhance students' critical thinking and problem-solving skills.

The following statements were evident on the conceptions of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on performance.

"I considered how the students apply their knowledge and how to make them be creative in their works. I also provide tasks that enhance their critical thinking and problem-solving skills." (Teacher 4)

"Performance assessment online is an assessment that encourages students to become critical thinkers and problem solvers. Through computer tools, students become more personal and creative in their works. (Teacher 3)

Program-based. Secondary mathematics teachers ensured that the e-performance assessments that they were giving were aligned with the standards of the schools' science and technology, engineering program (STEP) and most essential learning competencies (MELC) set by the Department of Education. The performance tasks were carefully planned by the school's team consisting of mathematics teachers and subject head.

"The performance assessments that we are giving are based on the most essential learning competencies (MELC) and the objectives set by the school for the STEP program." (Teacher 3)

"The assessments that we are giving for the STEP section are assessments carefully planned by the school teachers and subject area head to meet the requirement of our Science and Technology, Engineering Mathematics program. It was plotted prior to the start of the school year." (Teacher 4)

1.1.3 Regular Curriculum

Standards-based. According to teacher-participants, performance authentic e-assessments should be aligned with the content standards and performance standards set by the Department of Education. Moreover, expected learning outcomes were based on the most essential learning competencies (MELC) intended for online classes.

The following statements were evident on the conceptions of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on performance.

"Performance authentic assessment is a kind of assessment measuring students' learning both for content and skills. It should be aligned with the content and performance standards stipulated in the most essential learning competencies." (Teacher 6)

"The objectives of the performance assessment should be aligned on the expected learning competencies stipulated in the most essential learning competencies (MELC)." (Teacher 7)

"This assessment considers the standards set by the DepEd thru the MELC." (Teacher 9)

"Performance assessments virtually are assessment methods that equip students with the necessary skills aligned with the standards and objectives of DepEd." (Teacher 5)

Demonstration of Skills Across Disciplines. Teacher-participants viewed performance authentic e-assessment as an application and demonstration of essential skills into different disciplines. Teachers believe that the main purpose of performance tasks is to develop the psychomotor skills of the students. Furthermore, it should be relevant to various disciplines for the students to choose their field of interest.

The following statements were evident on the conceptions of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on performance.

"It is an assessment which focuses more on the application of skills rather than merely remembering and understanding math competency. This application should be according must be varied and can cater different students' needs." (Teacher 6)

"Performance authentic e-assessment, conducted in online class, allows students to demonstrate their understanding of complex matters across a range of disciplines." (Teacher 9)

"In my point of view, it is an assessment which the learners are given assigned task to perform or demonstrate so that they can showcase their skill and knowledge in solving real life situation." (Teacher 10)

Flexible and Sensitive Assessment. Teacher-participants believed that performance e-assessments should be flexible and sensitive to students' diversity. Before developing a performance assessment, teachers planned the tasks considering the availability of materials needed for the assessment, capabilities of students, and the needs, interests, beliefs, and values of students. The performance assessment should also provide challenges to advanced learners and at the same time support developing learners.

The following statements were evident on the conceptions of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on performance.

"I viewed this assessment as an assessment that considers the availability of internet connection, the availability of instructional materials and the capabilities

of my students to accomplish an assessment that is intended for their learning that can be done in the comfort of their homes. (Teacher 5)

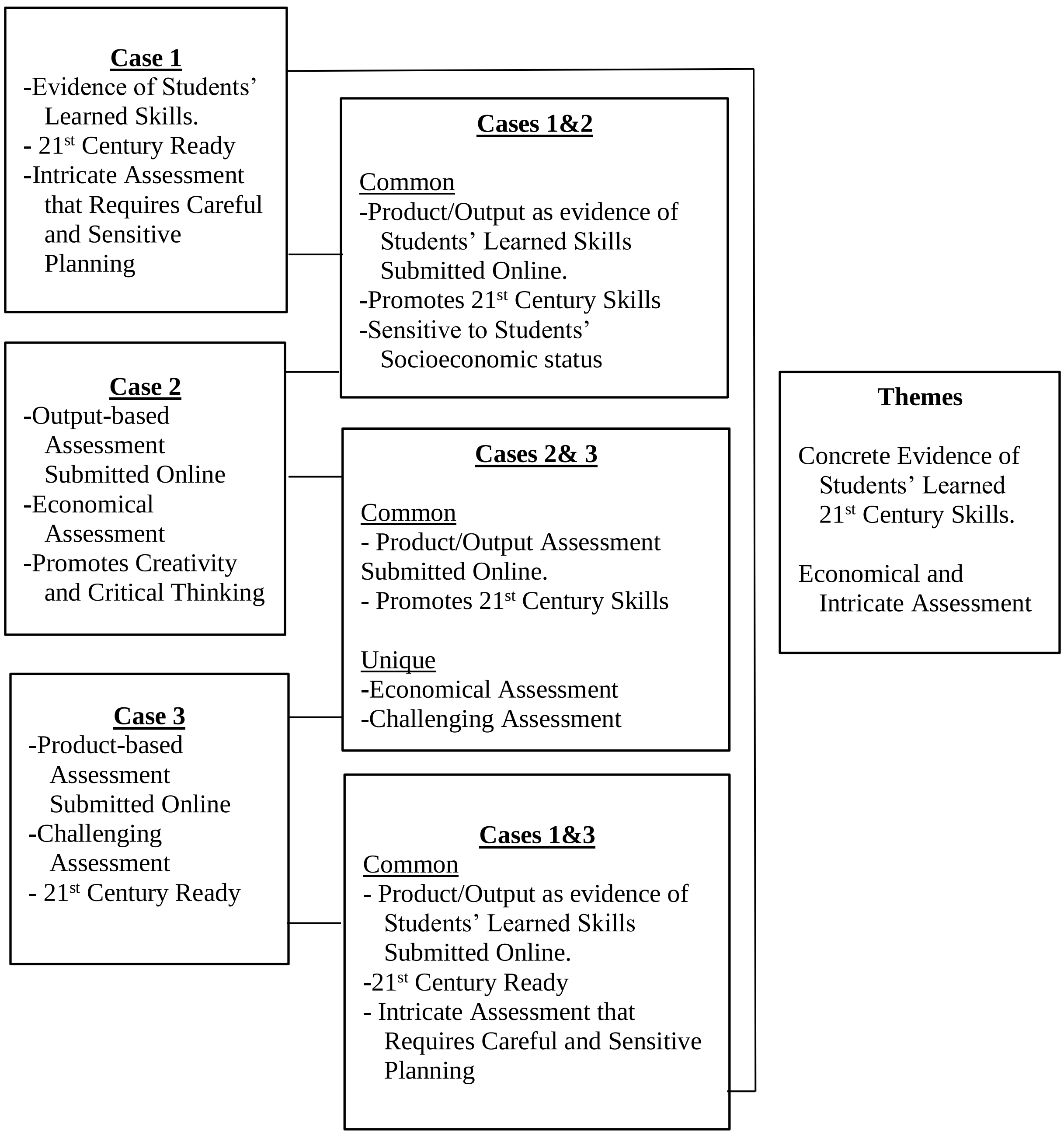
"These performance tasks consider the strengths and weaknesses of my students."

"Performance assessments consider learner's knowledge, skills, values, needs, and interest." (Teacher 6)

"Authentic e-assessments should provide flexible learning difficulty. I viewed it as an assessment that gives challenge to advance learners and provide supports or remediation to those students who are not capable of doing the task." (Teacher 9)

Figure 6

Within-Case and Across-Case Analysis of Secondary Mathematics Teachers' Conceptions on Project E-Assessment



Note. Figure 6 shows the secondary mathematics teachers' conceptions on project e-assessment.

1.2 Project

Secondary mathematics teachers' conceptions on project e-assessment were identified by describing, analyzing, and discussing teachers' ideas and beliefs in developing project authentic e-assessment. After identifying the conceptions of teachers in each case, across-case analysis was utilized, similarities and differences was determined between cases 1 and 2, cases 2 and 3, and cases 1 and 3. Lastly, findings from within-case and across-case analysis were collated to form themes.

Within-Case Analysis

Secondary mathematics teachers, teaching in science curriculum, perceived project e-assessment as a concrete evidence of students' learned skills. This suggests that project authentic e-assessment should enhance not only cognitive domain but also students' higher order thinking and psychomotor domain by applying learning into creating an output. According to Sambeka et al. (2017), project-based learning should allow students to work in groups to solve challenging problems that are authentic, curriculum-based, and interdisciplinary. This idea was in accordance with the principles: appropriateness of assessment method and tools, alignment, validity, balance, positive consequences, and authenticity. Students should have the freedom on how they will approach a problem and what activities to pursue (Eickholt et al., 2019). They gather information from a variety of sources and synthesize, analyze, and derive knowledge from it. Moreover, teachers stated that project e-assessment should prepare students to the 21st century society by developing 21st century skills among students. In this case, teachers stated that the project e-assessment must be based on real-life. Furthermore, teachers encouraged students to become innovative and creative when doing their projects. This concept was in accordance with the principles: articulation, alignment, validity, balance, positive consequences, and authenticity. According to Sambeka et al. (2017), project-based learning is a learning model that is based on the paradigm of student-centered learning. Student-centered learning provides opportunity for students to develop their 21st century skills and abilities needed to face the increasingly complex life and work environments in nowadays society. Lastly, teachers believed that project e-assessment is an intricate assessment that needs to be systematically planned. Teacher stated that projects should meet the standards set by the DepEd and the school's program. However, it must be sensitive to economic status and capabilities of students especially classes are done online during this time of pandemic. This concept was in accordance with the principles: clarity of learning targets, articulation, alignment, validity, balance, positive consequences, fairness, practicality and efficiency, affordance, and authenticity. Eickholt et al. (2019) mentioned that project-based learning often centers learning experiences around projects and is characterized by the application of knowledge, management of resources, and self-directed learning. However, the cost to facilitate communication, classroom interaction and active learning spaces can be prohibitive.

Meanwhile, secondary mathematics teachers, teaching in science and technology, engineering mathematics program (STEP) section- regular curriculum, perceived project e-assessment as a concrete output submitted online. Students' outputs were recorded or taken photos to be submitted in online platforms set by the teacher. According to Trach (2018), a project is a hands-on activity or output that asks students to apply what they've learned to an in-depth exploration of a topic. This idea was in accordance with the principles: appropriateness of balance, positive consequences, and authenticity. Likewise, STEP section teachers stated that project e-assessment they gave are cheap. Teachers understand that the pandemic situation affect negatively the economic status of students' families so to ensure that everyone can make a project, teachers carefully planned a project whose materials are cheap and easy to find. Teachers should make sure that performance e-assessments they give provide equal opportunities to students. This statement was anchored with the principles: fairness, positive consequences, practicality and efficiency, and affordance. Project e-assessment must provide equal opportunity to students regarding avoid biases based on students' economic status. Furthermore, secondary mathematics teachers believe that project e-assessment must promote and enhance students' creativity and critical thinking. Creativity and critical thinking are 21st century skills that students are expected to acquire to be able to achieve success in the 21st century society (Kim et al., 2019). This idea was anchored on the principles: articulation, validity, balance, positive consequences, and authenticity. Being able to develop and enhance these skills will serve as an advantage to students as they prepare for their future careers.

Secondary mathematics teachers, teaching in regular curriculum, perceived project e-assessment as products created by students and submitted online. Likewise, these projects are concrete evidences of what and how much students have achieved the competencies of the lessons. Projects allows students to demonstrate their capabilities and apply their while working for an output independently (Edutopia, 2007). This idea was in accordance with the principles: appropriateness of assessment method and tools, alignment, validity, balance, positive consequences, and authenticity. Furthermore, secondary mathematics teachers perceived project authentic e-assessment as a challenging assessment. Teachers emphasized that in developing project authentic e-assessment they considered the accessibility of materials for the project, time allotment, students' capability to do the project independently, mode of validation, and submission. This is to ensure that every student has equal opportunity in doing the project. This idea was anchored in the principles: appropriateness alignment, alignment, fairness, positive consequences, practicality and efficiency, affordance, and ethics. Lastly, secondary mathematics teachers believed that project authentic e-assessment must be relevant with the trend in the 21st century and must prepare students to be 21st century ready. Project assessment, even though online, must be designed to meet the competencies of topics at the same time enhance students' essential skills to be ready in real work. This idea was aligned with the principles: clarity of learning targets, articulation, appropriateness of assessment method and tools, alignment, validity, balance, and authenticity.

Across-Case Analysis

Secondary mathematics teachers teaching in science curriculum and STEP section regular curriculum agreed that project e-assessment can be a product or an output that serves as evidence to students' learned skills. Moreover, teachers stated that project e-assessment must hone students' 21st century skills to be able to be ready with the demands of the 21st century workplace and society. Furthermore, project authentic e-assessment should be sensitive to students' socioeconomic status and capabilities. According to Eickholt et al. (2019), the cost to facilitate communication, classroom interaction and active learning spaces can be prohibitive so teachers must be careful when developing project assessment. Teachers must ensure that every student will have equal opportunity to accomplish the project.

Meanwhile, secondary mathematics teachers teaching in STEP section and regular curriculum perceived project e-assessment as a product or an output that serves as evidence to students' learned skills. Project e-assessments must promote 21st century skills needed to cope up and be successful in 21st century workplace and society. However, teachers in STEP section regular curriculum viewed project authentic e-assessment as economical assessment. Teachers stated that the pandemic situation affected negatively the financial status of everyone so to ensure that every student can do the project, materials to be utilized must be cheap if not recyclable. Meanwhile, teachers in regular curriculum believed that project e-assessment is challenging since a lot of factors, such as accessibility of materials for the project, time allotment, students' capability to do the project independently, mode of validation, and submission, must be considered.

Secondary mathematics teachers teaching in science curriculum and regular curriculum stated that project e-assessment is a product or an output that serves as evidence to students' learned skills. Project e-assessments must be relevant to 21st century workplace and society so that students can easily cope up and be successful in their future workplace. Furthermore, teachers viewed project authentic e-assessment as an intricate assessment that requires careful and sensitive planning. Projects must be aligned with the competencies set by the department of education as well as students must be able to accomplish the project given limited resources of materials in this time of pandemic.

Based on the analysis, teachers in cases 1, 2, and 3 perceived project authentic e-assessment as concrete evidence of students learned 21st century skills. Moreover, projects must be significant and has the potential to prepare students to the future requirement of the society (Sambeka et al., 2017). Meanwhile, it is unique that STEP section teachers viewed project e-assessment as economical assessment that all students, regardless of their socioeconomic status, should have the chance to accomplish the project. This was supported by Eickholt et al. (2019) stating that educators must provide economical learning spaces to support students in project-based learning. Lastly, teachers teaching in schools with regular curriculum believed that project e-assessment is intricate assessment that needed systematic and careful planning. Teachers must consider to ensure standards alignment and status of students before developing a project assessment specially in online platform.

Below are the detailed accounts on conceptions of secondary mathematics teachers in developing project authentic e-assessments.

1.2.1 Science Curriculum

Evidence of Students' Learned Skills. Teacher-participants of science curriculum viewed project e-assessment as an assessment that aimed to produce a concrete output or product based on students' acquired skills of the topic. Likewise, according to participants, project e-assessments enhance students' higher order thinking and psychomotor domain.

The following statements were evident in the conceptions of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on projects.

"*My idea of a project-based e-assessment is that it is a process of creating an evidence or output based on students' learned skills on a specific topic.*" (Teacher 1)

"Projects are concrete outputs of student learning. Through project assessments, student's higher order thinking and psychomotor were developed." (Teacher 2)

21st Century Ready. Secondary mathematics teachers of science curriculum conceived project e-assessment as a product relevant to 21st century workplace. The e-assessment should be significant in the real-life work of today and in the future.

Teachers encouraged students to become innovative and creative when doing their projects. Likewise, integration of ICT was highly manifested in the e-projects of the students.

The following statements were evident in the conceptions of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on projects.

"I believe that online projects should be significant and parallel to what is expected to create in the 21st century work." (Teacher 2)

"Authentic e-assessment on project is an assessment, assisted by ICT, that aims to groom students to become innovators and creative thinkers when doing a product that has significance today and in the future." (Teacher 1)

Intricate Assessment that Requires Careful and Sensitive Planning. Secondary mathematics teachers stated that project e-assessments need to be carefully and sensitively planned. The assessment should meet the standards set by the DepEd and the school's program. However, it should not require students to buy materials, subscriptions, or equipment. Teacher participants reiterated that the projects made by their students are made up of reused and recycled materials.

The statement below was evident on the conceptions of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on project.

"Project assessment is a planned assessment considering student's financial capabilities in buying materials or equipment for the project. It should promote reusage and recycling of objects to come up with a project that is within the competencies of the topic." (Teacher 2)

1.2.2 STEP (*Science and Technology, Engineering Program*) Section

Output-based Assessment Submitted Online. Teachers in the STEP program stated that project e-assessments are assessments that were based on concrete output or product. These outputs were being recorded or taken photos in order to be submitted in online platforms like google drive, Facebook messengers, etc.

The following statements were evident on the conceptions of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on performance.

"Project assessments are concrete outputs made by students. Students send recorded videos or photos of their projects in google drive or Facebook messenger." (Teacher 3)

"These are outputs submitted by the students virtually." (Teachers 3 and 4)

Economical assessment. Secondary mathematics teachers stated that project assessment should be economical. The assessments given to the participants, if not free, were cheap since we were in a pandemic situation and everyone suffers from a financial crisis. Moreover, teachers believed many of the students would not be able to submit if the projects were expensive.

"I make sure that the projects I' am giving to my students are cheap or else only few of them will submit." (Teacher 3)

"Project assessment should not be costly since our students, and their families, are suffering financial difficulties because of the pandemic." (Teacher 4)

Promotes Creativity and Critical Thinking. Teachers viewed project assessment as an avenue to students to showcase their creativity and critical thinking in virtual platforms. According to them, projects should be evidence of student's learning applying their personal creativity.

The statement below was evident on the conceptions of secondary mathematics teacher, teaching STEP section, in developing authentic e-assessment on performance.

"This type of assessment should not only bring out the skills learned by our students but their critical thinking and creativity as well." (Teacher 3)

1.2.3 Regular Curriculum

Product-based Assessment Submitted Online. According to teacher-participants, project authentic e-assessments were assessments that focused on creating a product would serve as evidence to students' achievements.

The following statements were evident in the conceptions of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on performance.

"This assessment is to know how much students have attained or learned in a topic by creating a product about it." (Teacher 5)

"Project e-assessments are concrete products made by students about a particular topic. Students submit images or videos of their outputs in online platforms." (Teacher 6)

"These are output based or product-based activity." (Teachers 7 and 8)

"Project assessments in my opinion are products made by students online about specific competency. (Teacher 9)

"This is an output or a product that students can upload online." (Teacher 10)

Challenging Assessment. Secondary mathematics teachers stated that project e-assessments, especially for this school year, were really challenging. Teachers should consider the accessibility of materials for the project, time allotment, students' capability to do the project independently, mode of validation, and submission before giving an e-project.

The following statements were evident in the conceptions of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on project.

"Project authentic e-assessment, at this time of pandemic, seems to be very challenging for us teacher because we need to consider a lot of factors like the availability of materials intended for the project to our students, especially now

that we have community quarantines, willingness of students to do the project and to submit it, the manner of checking, and others." (Teacher 5)

"Although this e-project has a lot of benefits to students, this is still quite challenging to plan and execute since we are in transition from the face-to-face learning." (Teacher 9)

21st Century Ready. Participants stated that project e-assessments should be significant to 21st century workplace. This aimed to enhance students' essential skills and to become innovative when creating their projects. These projects should be designed to meet the competencies of the topic at the same time useful in real-life.

The following statements were evident in the conceptions of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on project.

"Authentic e-assessments on project are activities that are significant to real-life. It should be something that measures the competencies and something that can be used in real-world." (Teacher 6)

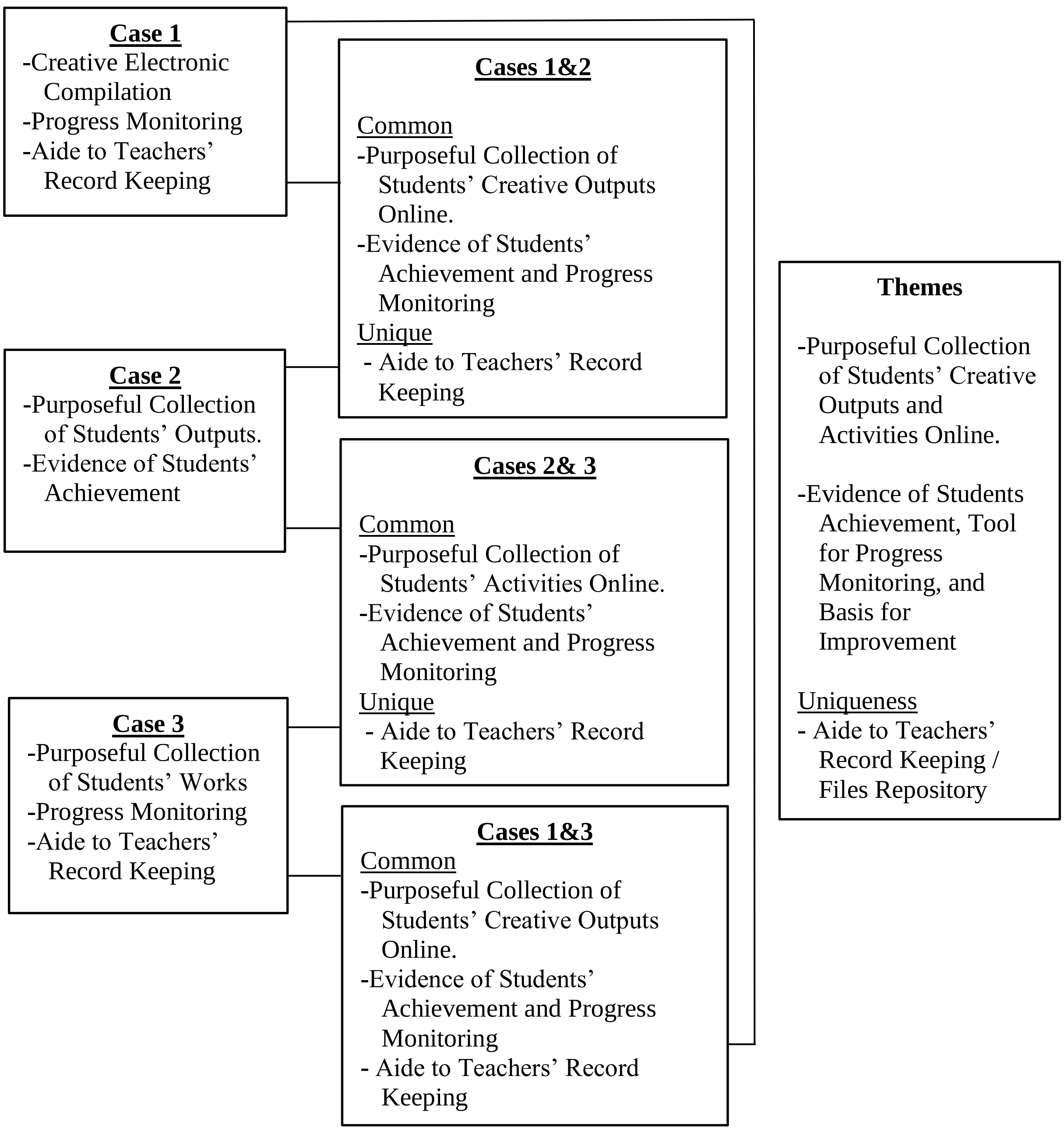
"These e-projects should embody the 21st century skills among learners and is innovative enough to be used in real-life setting." (Teacher 7)

"Project assessments should be applicable and useful to real-life." (Teacher 8)

"Expected skills learned by students should be manifested in the projects that they will be doing. These e-projects, although online, should still be significant into the real work. (Teacher 10)

Figure 7

Within-Case and Across-Case Analysis of Secondary Mathematics Teachers' Conceptions on E-portfolio



Note. Figure 7 shows the secondary mathematics teachers' conceptions on e-portfolio.

1.3 E – Portfolio

Secondary mathematics teachers' conceptions on e-portfolio were identified by describing, analyzing, and discussing teachers' ideas and beliefs in developing e-portfolio authentic e-assessment. After identifying the conceptions of teachers in each case, across-case analysis was utilized, similarities and differences were determined between cases 1 and 2, cases 2 and 3, and cases 1 and 3. Lastly, findings from within-case and across-case analysis were collated to form themes.

Within-Case Analysis

Secondary mathematics teachers, teaching in science curriculum, perceived e-portfolio as a creative electronic compilation of students' activities and outputs. Teachers believed that the e-portfolios of students are their personal achievement and must be presented in students' personal and creative designs. This idea was in accordance with the principles: accountability, positive consequences, and authenticity. Wiggins (2000) stated that portfolios are generally a representative collection of students' work. However, Mueller and Bair (2018) stated that e-portfolio is not a mere collection of students' works. E-portfolios should allow students to reflect on, synthesize, and present different kinds of evidence that represent their learning. More than a repository of students' outputs and artifacts, e-portfolio is a means for students to make connections between concepts, and experiences in and out of the classroom (Callahan et al., 2021). Likewise, teachers stated that e-portfolio is a great tool to monitor students' progress. Students' accomplishments and progress are viewed and reflected both by students and by teachers. This concept was anchored with the principles: clarity of learning targets, articulation, appropriateness of assessment method and tools, alignment, validity, fairness, ethics, authenticity, accreditation, and accountability.

Teachers utilized e-portfolio to monitor the development of students in their tasks. According to Bungalan and Jipona (2020), e-portfolio is an electronic format for learners to record their work, their achievements and their goals and also to reflect on their learning. Teachers also remind students to constantly update and reflect on their works in the e-portfolio. Lastly, secondary mathematics teachers perceived e-portfolio as a repository in aide to teachers' record keeping. Teachers stated that having students compile their outputs, through e-portfolios, benefited them in terms of checking and monitoring students' works. This concept was in accordance with the principles: positive consequences and accountability. This implies that students were able to positively develop sense of accountability in storing and organizing their works. Conversely, Callahan et al. (2021) reiterated that e-portfolio is more than a repository of outputs but rather a tool that bridge concepts and outputs in which students can reflect with their own learning.

Meanwhile, secondary mathematics teachers, teaching in science and technology, engineering mathematics program (STEP) section- regular curriculum, perceived e-portfolio as purposeful collection of students' outputs. Mathematics teachers stated that e-portfolios may contain students' artifacts and demonstrations and must be uploaded in online data storage for ease of retrieval. This idea was in accordance with the principles: accountability, positive consequences, and authenticity. It is a characteristic of portfolio to be a representative collection of students' works (Wiggins, 2000). But then, Mueller and Bair (2018) stated that e-portfolio is not a mere collection of students' works. E-portfolios should allow students to reflect on, synthesize, and present different kinds of evidence that represent their learning. Likewise, teachers viewed e-portfolio as a great tool to show evidences of students' achievements. Students' accomplishments and progress are viewed and reflected both by students and by teachers. This concept was anchored with the principles: clarity of learning targets, articulation, appropriateness of assessment method and tools, alignment, validity, fairness, ethics, authenticity, accreditation, and accountability. Secondary mathematics teachers utilized e-portfolio to monitor the development of students and provide evidences of their achievements in different tasks. According to Bungalan and Jipona (2020), e-portfolio is an electronic format for learners to record their work, their achievements and their goals and also to reflect on their learning.

Secondary mathematics teachers, teaching in regular curriculum, perceived e-portfolio as a purposeful collection of students' works. This includes written and performance or demonstration outputs of students. This idea was in accordance with the principles: accountability, positive consequences, and authenticity. However, Mueller and Bair (2018) stated that e-portfolio is not a mere collection of students' works. More than a storage or repository, e-portfolios must have the capability to make students to reflect on their works. Likewise, teachers stated that e-portfolio is a great tool to track or monitor students' progress. Since e-portfolio compares student's previous output to their new ones, students could personally reflect on their academic success. According to Arter and Spandel (1992), as cited by Birgin and Baki (2007), portfolios are a purposeful collection of student work that exhibits to the student, or others, to shows improvement and achievement in one or more areas. This concept was anchored with the principles: clarity of learning targets, articulation, appropriateness of assessment method and tools, alignment, validity, fairness, ethics, authenticity, accreditation, and accountability. Lastly, secondary mathematics teachers perceived e-portfolio as a repository in aide to teachers' record keeping. Secondary mathematics teachers pointed that e-portfolio of their students served as additional file storage for output verification and checking. This concept was in accordance with the principles: positive consequences and accountability. This implies that students were able to positively develop sense of accountability in storing and organizing their works. Although, Callahan et al. (2021) stated that e-portfolio is not a mere repository of outputs but a great tool that allows student to reflect on their progress and achievements.

Across-Case Analysis

Secondary mathematics teachers teaching in science curriculum and STEP section regular curriculum agreed that e-portfolios are purposeful collection of students' creative outputs that are submitted online. Moreover, teachers stated that an e-portfolio serves as evidence to students' achievements and a monitoring tool of students' their learning progress. Furthermore, secondary mathematics teachers of science curriculum schools perceived e-portfolio as an aide to teachers in keeping records of students' activities.

Meanwhile, secondary mathematics teachers teaching in STEP section regular curriculum and regular curriculum perceived e-portfolio as a purposeful collection of students' activities that are submitted online. Project e-assessments contain students' activities, video demonstrations, and photo or video of an actual output. Also, teachers added that e-portfolios serve as evidence to students' achievements and a monitoring tool of students' their learning progress. Meanwhile, teachers of science curriculum schools perceived e-portfolio as an aide to teachers in keeping records of students' activities.

Secondary mathematics teachers teaching in science curriculum and regular curriculum stated that e-portfolio is a purposeful collection of students' creative outputs that are submitted online. E-portfolios contain students' activities, video demonstrations, and photo or video of an actual output. Also, teachers added that e-portfolios serve as evidence to students' achievements and a monitoring tool of students' their learning progress. Furthermore, secondary mathematics teachers' utilized e-portfolio as a repository of students' files to aide them in keeping records of students' activities.

Based on the analysis, teachers from science curriculum, STEP section, and regular curriculum perceived e-portfolio authentic e-assessment as a purposeful collection of students' creative outputs and activities online. Moreover, e-portfolios are evidence of students' achievement and a great tool to monitor students' progress as basis for their improvement. Meanwhile, it is unique that STEP section teachers viewed project e-assessment as economical assessment that all students, regardless of their socioeconomic status, can accomplish the project. Lastly, teachers teaching in schools with science and regular curriculum believed that e-portfolios provide aide in keeping the records of students and as an additional file repository.

Below are the detailed accounts on conceptions of secondary mathematics teachers in developing e-portfolio authentic e-assessments.

1.3.1 Science Curriculum

Creative Electronic Compilation. Teacher-participants viewed e-portfolios as compilations of students' outputs online. Furthermore, the presentation of portfolios is expected to be personal – applying students' creativity.

The following statements were evident in the conceptions of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on e-portfolio.

"E-portfolios are compilations of students' work. Usually, it is in the form of PDF, Powerpoint, Photo, or video that students designed and placed in their Google drive." (Teacher 2)

"These are outputs submitted by the students virtually." (Teachers 1 and 2)

Progress Monitoring. According to secondary mathematics teachers, E-portfolios permit students to keep track of their submitted works. Moreover, students could also monitor their work and reflect on how they could improve their submitted outputs.

The statement below was evident in the conceptions of secondary mathematics teachers, teaching in science curriculum, in developing authentic e-assessment on e-portfolio.

"This form of assessment allows students to keep in track of their outputs and a basis as well on how they will improve their works the next time." (Teacher 2)

Aide to Teachers' Record Keeping. Teachers stated that having students compile their outputs, through e-portfolios, benefited the teachers in terms of checking and monitoring students' works. E-portfolios of students became their back-up storage of students' files.

The statement below was evident in the conceptions of secondary mathematics teachers, teaching Science curriculum, in developing authentic e-assessment on e-portfolio.

"For me, e-portfolios are good aide for teachers since it allows students to back-up their own files. We can ask them to submit outputs that we missed in checking" (Teacher 2)

1.3.2 STEP Section

Purposeful Collection of Students' Outputs. Secondary mathematics teachers viewed E-portfolios as a collection or gathering of students' personal outputs and submitting it in online platforms like Google drive.

The following statements were evident in the conceptions of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on e-portfolio.

"In our school, e-portfolios of students contain their previous submitted activities, outputs, and assessments." (Teacher 3)

"E-portfolios I believe are collection of students' artifacts and demonstrations uploaded in online data storage like Google drive." (Teacher 4)

Evidence of Students' Achievement. Teachers perceived e-portfolios as evidence of students' achievement. Through e-portfolios, the teachers could monitor the academic progress and success of their students.

The following statements were evident in the conceptions of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on e-portfolio.

"E-portfolio serves as evidence to what our students had achieved throughout this online learning process." (Teacher 3)

"This online portfolio showed the learning progress of students." (Teacher 4)

1.3.3 Regular Curriculum

Purposeful Collection of Students' Works. Secondary mathematics teachers viewed E-portfolio as an online collection or gathering of students' work. This might include written and performance or demonstration outputs.

The following statements were evident in the conceptions of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on e-portfolio.

"Electronic portfolios or e-portfolios are compilation of students' best works. It can be in the form of assignment, seatwork, performance activity, etc." (Teacher 7)

"It is an authentic assessment that aims to gather or collect students' outputs for the purpose of tracking their learning progress." (Teacher 8)

"Portfolios are collection of student's activities and assessments. It is used to assess how much our students have attained in the learning competencies of the subject." (Teacher 9)

"It is a compilation of students' outputs on different lessons. LEAP activities and homeworks are some of the contents of our students' e-portfolios." (Teacher 5)

"Students e-portfolio allows them to compile or gather their previous outputs in different topics and even other subjects." (Teacher 10)

Progress Monitoring. Teachers stated that e-portfolio was an assessment method that tracks or monitors student's learning progress. Furthermore, since e-portfolio compares student's previous output to their new ones, students could personally reflect on their academic success.

The following statements were evident in the conceptions of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on e-portfolio.

"It is an authentic assessment that aims to gather or collect students' outputs for the purpose of tracking their learning progress." (Teacher 8)

"Through this assessment, students themselves can reflect on their progress and achievements." (Teacher 7)

"Since every student has e-portfolios, they can easily know how much they have learned from the different topics being taught." (Teacher 5)

Aide to Teachers' Record Keeping. Secondary mathematics teachers pointed that e-portfolios of their students served as an additional file storage for output verification and checking. In cases of missing outputs, the teachers ask the students to show their e-portfolios to verify their submission.

The following statements were evident in the conceptions of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on e-portfolio.

"Portfolios of students are helpful because I can verify if they have an output on my task or none." (Teacher 7)

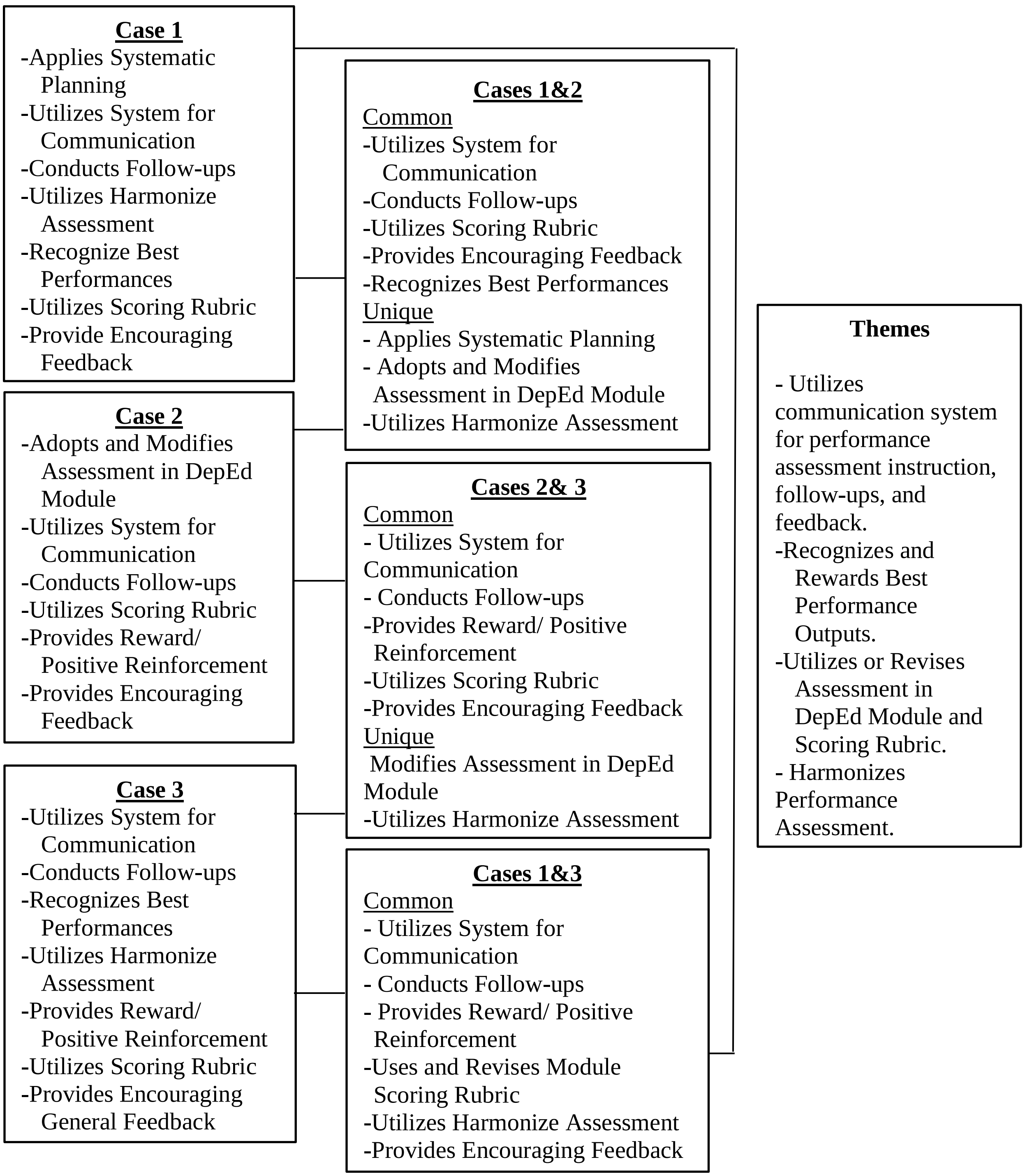
"Back up storage of students' work is also one good thing about e-portfolios." (Teacher 8)

"With a lot of paper works for online learning, e-portfolios of students are very helpful to me because it makes checking of files more convenient, since the outputs are already compiled." (Teacher 7)

2. Identify the practices of secondary mathematics teachers in developing authentic e-assessment particularly,

Figure 8

Within-Case and Across-Case Analysis of Secondary Mathematics Teachers' Practices on Performance E-Assessment



Note. Figure 8 shows the secondary mathematics teachers' practices on performance e-assessment.

2.1.Performance

In analyzing the practices of secondary mathematics teachers on performance e-assessment, the researcher utilized holistic multiple three cases within-case and across-case data analysis. This method advocates to identify the practices of secondary mathematics teachers by describing, analyzing, and discussing their actions in developing and implementing authentic e-assessment on performance. After identifying the practices of teachers on performance e-assessment in each case, across-case analysis will be utilized, similarities and differences was determined between cases 1 and 2, cases 2 and 3, and cases 1 and 3. Lastly, findings from within-case and across-case analysis were collated to form themes.

Within-Case Analysis

Secondary mathematics teachers, teaching in science curriculum, ensure that performance e-assessments that they gave are systematically planned. Teachers considered a lot of factors such as the content standards and performance standards stipulated in K-12 Curriculum Guide, availability of materials and devices needed, internet connection, relevance to real-life practice, capability of students to accomplish the task, time allotment, integration or alignment to other discipline, and the method of scoring, when developing performance authentic e-assessment. This practice was in accordance with the principles: clarity of learning targets, articulation, appropriateness of assessment method and tools, alignment, validity, reliability, balance, fairness, positive consequences, practicality and efficiency, affordance, authenticity, and accreditation. This practice was supported by Ark (2013), stating that performance tasks should be properly planned for it to be meaningful and engaging to students. Second, teachers utilized a good system of communication, to students, to ensure that the expected performance assessment instruction, expected deliverables, submission date, follow-ups, and scoring scheme were understood by students. Learning management system posting, and synchronous meetings were the methods used by the teachers to inform the students about performance assessment. According to Crisp et al. (2019), communication such as giving timely feedback is crucial in improving the learning outcomes of the students. This practice was in accordance with the principles: clarity of learning targets, articulation, accreditation, and accountability. Third, secondary mathematics teachers collaborated with other subject teachers to harmonize performance e-assessment. Teachers believed that when students could relate their learning to other subjects it becomes more meaningful and it increases students' engagements on the task. Likewise, this integrative practice saves resources and time in the part of students (Crisp, 2012). This practice was in accordance with the principles: validity, positive consequences, practicality and efficiency, adaptation, authenticity and adaptation. Fourth, teachers utilized standard scoring rubric and recognize best performance outputs of students. Teachers disseminated the rubric at the beginning of the quarter together with the performance task sheets to inform the students ahead on the expected deliverables of the authentic e-assessment. After checking the performance e-assessments of the students, teachers select and present best or exemplary performance outputs during synchronous class and class group page posting. This was done to encourage students to continue doing their best in making their performance authentic assessments. This was supported by Khattak and Ahmad (2018), stating that positive reinforcement has positive significant effect on students' academic performance. This practice was in accordance with the principles: accreditation, and positive consequences. Lastly, secondary mathematics teachers ensure that they were able to give constructive feedback to encourage students to their best in the next performance e-assessment. Secondary mathematics teachers believed that students' hard work in doing the performance task should be properly complimented and the points where the students could improve should also be constructively cited. The key to make successful assessments was to provide immediate descriptive feedback (Earl & Katz, 2016) This practice was in accordance with the principles: accreditation, and positive consequences.

Meanwhile, secondary mathematics teachers, teaching in science and technology, engineering mathematics program (STEP) section- regular curriculum, practiced performance e-assessment by adopting and modifying the performance assessment stipulated in the Department of Education student module. Mathematics teachers stated that they are using the module given by the DepEd and sometimes they modify the performance assessment to better fit with the needs of the students and the Science and Technology Engineering mathematics program implemented by the school. This practice was in accordance with the principles: clarity of learning targets, articulation, appropriateness of assessment method, alignment, validity, reliability, balance, fairness, positive consequences, practicality and efficiency, adaptation, authenticity, and accreditation. This suggests that since performance e-assessment was adopted from DepEd modules, it is assumed to be valid and possesses characteristics of a good performance e-assessment. Likewise, improvements done by STEP-section teachers targeted multiple intelligence domains and which yield better engaging real-world tasks aligned with the school's program. Second, teachers devised a system of communication to discuss performance assessment instructions, expected deliverables, submission date, follow-ups, and scoring scheme. Teachers used their synchronous classes to inform students on performance outputs needed. This practice was in accordance with the principles: clarity of learning targets, articulation, accreditation, and accountability. Third, secondary mathematics teachers utilized standard scoring rubric and provide rewards or positive reinforcement for outstanding performances. Teacher use and revise the performance rubric written in students' modules to be aligned with Science and Technology, Engineering mathematics program. Moreover, secondary mathematics teachers reward their students by stating and posting commendations during synchronous classes and in the class group chat. Furthermore, teachers gave additional points, to be added to other grading criteria, for students to feel that their efforts are appreciated by the teacher. According to Khattak and Ahmad (2018), positive reinforcement has significant effect in increasing students' academic performance. This practice was in accordance with the principles: accreditation, and positive consequences. Lastly, secondary mathematics teachers ensure that they were able to give constructive feedback to encourage students to their best in the next performance e-assessment. Secondary mathematics teachers gave general feedback rather than individual feedback. With lots of performance outputs submitted to teachers, they chose to take notes of all the general points for improvement and relay it to class in general. Crisp et al. (2016) reiterated that timely feedback was crucial in improving the learning of students. This practice was in accordance with the principles: accreditation, and positive consequences.

Secondary mathematics teachers, teaching in schools with regular curriculum, ensure that they utilized a good system to communicate with their students. Similar to teachers in case 1 and case 2, secondary mathematics teachers provide instructions and guidelines on the expected deliverables, submission date, follow-ups, and scoring scheme of the performance e-assessment. This practice was in accordance with the principles: clarity of learning targets, articulation, accreditation, and accountability. Second, secondary mathematics teachers, together with other subject teachers, collaborated to harmonize performance e-assessment. Students' performances were graded depending on the criteria set by subject teachers. Furthermore, this practice saves resources and time in the part of students. This was supported by Crisp (2012) stating that integrative assessment poses meaningful learning to students and saves resources. This idea was in accordance with the principles: validity, positive consequences, practicality and efficiency, adaptation, authenticity and adaptation. Third, mathematics teachers used standard scoring rubric and recognize outstanding performances of students. Secondary mathematics teachers stated that they use performance rubric, written in the learning modules of the students, for standard scoring. Some of the teachers revised the rubric for the performance task because they implement harmonized performance assessment. This practice was in accordance with the principles: accreditation, and positive consequences. Lastly, teachers give their general constructive feedback to encourage students to do better in the next performance e-assessment. The feedback included commending the outputs of the students, asking about the challenges they faced, points for improvement, and encouragement for the next performance assessment. This idea was in accordance with the principles: accreditation, and positive consequences.

Across-Case Analysis

Secondary mathematics teachers teaching in schools with science curriculum, STEP section, and regular curriculum used the Department of Education's performance assessment stipulated in students' learning modules. However, teachers sometimes revise these performance e-assessments to fit with the program the school is implementing. Likewise, revisions of performance e-assessments were done after teachers harmonize their e-assessments. Second, teachers, from cases 1,2, and 3, utilized a communication system to better inform the students on the performance e-assessment instruction, guidelines, follow-ups, scoring system, and feedback. Teachers used both their synchronous and asynchronous time to communicate the expected deliverables to students.

Despite setting 5pm as the end time to school matters, teachers still respond to students' queries past 5pm and during weekends. This showed that teachers, even during online, still have the heart to respond to students' needs. Third, secondary mathematics teachers explain and used scoring rubrics to score students' performances. Teachers gave the rubric together with the performance assessment sheet during module retrieval and LMS posting. Afterwards, they explain the rubric during synchronous classes.

Exemplary outputs of students were recognized and given merits like additional points or by giving simple tokens to students. Lastly, teachers gave their honest and constructive feedback to students' performances during synchronous meeting. They also utilized posting in schools' learning management system to recognize students with outstanding outputs and to encourage other students to do their best in their performance e-assessments.

Meanwhile, only secondary mathematics teachers, teaching in science curriculum, stated that they systematically and carefully planned their performance e-assessments for the academic year 2020-2021. Since science-curriculum teachers used the DepEd curriculum guide and not the most essential learning competencies (MELC), it took time for them to strategize on how they will deliver the competencies of the face-to-face classes into online learning specially that virtual time is limited.

Below are the detailed accounts on practices of secondary mathematics teachers in developing performance authentic e-assessments.

2.1.1. Science Curriculum

Applies Systematic Planning. Performance e-assessments used by teacher participants were systematically planned prior to development. According to secondary mathematics teachers, a lot of factors were considered such as the content standards and performance standards stipulated in K-12 Curriculum Guide, availability of materials and devices needed, internet connection, relevance to real-life practice, capability of students to accomplish the task, time allotment, integration or alignment to other discipline, and the method of scoring.

The following statements were evident in the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on performance.

"We create performance tasks based on the content standards, performance standards, and learning outcomes stipulated in K-12 Curriculum Guide. At the beginning of the school year, the school's mathematics department collaboratively meet to decide on the performance tasks to give since there are many restrictions due to the COVID-19 pandemic." (Teacher 1)

"Designing the performance tasks for this school year is very challenging based on our experience. At the start of the school year, we plan the assessment so that it will not discriminate those students who doesn't have personal devices and internet connections. We also make sure that the assessment is realistic, inexpensive and can be accomplished by our students given one quarter period." (Teacher 2)

"Setting the criteria for the authentic task rubric is also crucial so we really spend time in making it." (Teacher 2)

Utilizes System for Communication. To ensure that students know what they were going to accomplish, teacher-participants see to it that the information about the authentic e-assessment were properly disseminated. Task sheets, LMS posting, and synchronous meetings were the methods used by the teachers to inform the students about guidelines for the performance task, deadline of submission, and scoring rubric.

The following statements were evident in the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on performance.

"I inform my students about the authentic task they will perform by providing them with a performance task sheet in GRASPS form and a rubric. I also explain the guidelines for doing the authentic performance tasks and the deadline for submission." (Teacher 2)

"Students were given a performance task sheet at the beginning of every quarter. We explain it to them when we meet synchronously. I also post it in google classroom so that students know what they will do even if they are not able to attend the online class." (Teacher 1)

Conducts Follow-ups. Teacher participants made sure that they update students' progress. Teachers constantly remind students about their authentic tasks and the deadline of submissions. They also ask what the students had accomplished during asynchronous meeting atleast once a month.

The following statements below were evident on the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on performance.

"It is a must for us to check how far the students have accomplished the performance tasks. We do this atleast once a month to know if there are challenges experienced by the students while doing the performance assessment." (Teacher 1)

"We do conduct follow ups to remind students on the authentic task and the deadline of submission." (Teacher 2)

Utilizes Harmonize Assessment. Secondary mathematics teachers ensured that the performance e-assessment they gave has significance to other disciplines so they utilize harmonized assessments. Teachers believed that when students could relate their learning to other subjects it becomes more meaningful and it increases students' engagements on the task.

The statement below was evident on the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on performance.

"We do believe that students would love to do tasks in which they can relate and are interested. They find it more engaging and fulfilling when the performance can also be integrated into other subjects. This harmonized performance tasks in which different learning area teachers collaborate considering their learning competencies." (Teacher 1)

Recognizes Best Performances. With lots of performance outputs submitted by students, teacher-participants still find time to select and present best performance outputs. Although synchronous classes in mathematics were limited to twice a week, teachers spent a portion of their time to post outputs, to recognize exemplary works and to encourage students to continue doing their best in making their performance authentic assessments.

The statement below was evident on the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on performance.

"We practice presenting the students' best performances or projects in class or by simply praising them through Facebook group chat or posting through social media with the permission of both students and parents." (Teacher 1)

Utilizes Scoring Rubric. Secondary mathematics teachers use rubrics to achieve standard scoring in performance authentic e-assessments. Teachers disseminated the rubrics at the beginning of the quarter together with the performance task sheets. According to the teachers, this was done to inform the students ahead on the expectations and standards for the performance tasks.

The statement below was evident on the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on performance.

"We give score to our students objectively using the provided rubric that we formulated before the beginning of the school year. This rubric is given to them together with the performance assessment task sheets." (Teacher 2)

"We arrived at well-planned performance assessment guidelines and uses rubrics for scoring." (Teacher 1)

Provides Encouraging Feedback. Secondary mathematics teachers believed that students' hard work in doing the performance task should be properly complimented and the points where the students could improve should also be constructively cited. Secondary mathematics teachers gave positive and constructive feedback on the best features of the students' performances and on the things where the students can improve.

The statement below was evident on the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on performance.

"We recognize the outputs of the students by giving positive and constructive feedbacks. Compliments were posted in Facebook group chats and for the constructive feedbacks, we state it in general when having our synchronous class." (Teachers 1 and 2)

2.1.2. STEP Section

Adopts and Modifies Assessments in DepEd Module. Teacher participants utilized the performance assessments written in the learning modules released by the Department of Education. Mathematics teachers sometimes modify the performance assessment to better fit with the needs and current situation of their students.

The statements below were evident in the practices of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on performance.

"The performance assessments we are giving are included in the module provided by DepEd. Sometimes I made some adjustments if my students have difficulty with the performance assessment or I find something better." (Teacher 3)

"Our performance tasks are stipulated in student's learning modules. We make some revisions for tasks will require students to buy or pay." (Teacher 4)

Utilizes System for Communication. Secondary mathematics teachers informed the students through the DepEd learning modules and during synchronous classes. Teachers discussed the procedure, performance output needed, and the deadline of submission for the performance assessment.

The statement below was evident in the practices of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on performance.

"Students are informed since the performance task is embedded in the module. If we made some adjustments, we inform them during synchronous class or we post in students' group chat." (Teacher 3)

Conducts Follow-ups. Secondary mathematics teachers stated that constant reminders were crucial to students' compliance with the performance task. Through follow ups, students' difficulties and challenges when doing the performance task were identified. Furthermore, participants observed that they give less follow ups to students in higher sections compared to students in the other sections.

The statements below were evident in the practices of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on performance.

"Students are informed since the performance task is embedded in the module. If we made some adjustments, we inform them during synchronous class or we post in students' group chat." (Teacher 3)

"I give reminders on the performance task when we have synchronous classes. I also conduct frequent follow ups to students who are in lower section and less to those students in higher section." (Teacher 4)

Utilizes Scoring Rubric. Teacher stated that they use and sometimes revise the performance rubric written in the learning modules of the students. Since there were times when secondary mathematics teachers modify performance assessments to be aligned with Science and Technology, Engineering mathematics program, they also made necessary adjustments in the rubric to be appropriate and for standard scoring.

The statement below was evident on the practices of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on performance.

"I use the rubric for scoring in the module. Sometimes, I personally revise it if I made revisions in the performance task." (Teacher 3)

"I follow the scoring rubric provided by DepEd in the students' learning modules." (Teacher 4)

Provides Reward / Positive Reinforcement. Secondary mathematics believed that positive reinforcements motivate students to perform. Mathematics teachers reward students by commending them during synchronous classes and in the class group chat. Furthermore, teachers gave additional points, to be added to other grading criteria, for students to feel that their efforts are appreciated by the teacher.

The statements below were evident in the practices of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on performance.

"I give additional points in more creative outputs so that students will feel that their hardworks are very much appreciated." (Teacher 4)

"We commend students' exemplary works during our online class and by posting in class group chat." (Teacher 3)

Provides Encouraging Feedback. Secondary mathematics teachers stated that they gave general feedback rather than individual feedback. With lots of performance outputs submitted to participants, teachers chose to take notes of all the general points for improvement and relay it to class in general.

The statement below was evident in the practices of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on performance.

"We monitor students' learning progress by providing them feedbacks for their submitted performance outputs but we preferred to relay it to them in general to save time." (Teachers 3 and 4)

2.1.3. Regular Curriculum

Utilizes System for Communication. Teacher-participants stated that they inform the students about the performance assessments by explaining it during online classes or by posting instructions and guidelines in group chat or Google classroom. Performance guidelines, materials, expected outcomes, mode and date of submission are the contents of teachers' announcement about the performance task.

The following statements below were evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on performance.

"I deliver instructions during our live or synchronous meetings. I usually relay the guidelines and deadline of submission about performance e-assessment." (Teacher 5)

"In our school, we remind the students about the performance assessment in their group chats. We tell them how they will accomplish the task, the scoring rubric to be used and the date of submission for the assessment." (Teacher 6)

"Since the performance assessments are written in student's module, I just remind them about it and answer students' questions for clarification and dates of submission." (Teacher 7)

"The dates and e-performance task instructions are being posted in their google classroom." (Teacher 9)

<u>*Conducts Follow-ups*</u>. Secondary mathematics teachers reiterated the importance of follow ups to monitor the progress of students in the performance task. According to participants they conducted atleast once a month follow up to know how much the students have accomplished and if there were challenges that hinder them in performing the authentic assessment.

The following statements were evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on performance.

"We remind our students atleast once a month for an update of their performance assessment." (Teacher 5)

"I conduct follow up on the students' performance tasks. During our follow up, students raise their concerns about the task. Lack of device to use, unavailability of materials, and compliance of classmates are some of their concerns." (Teacher 7)

"Sometimes students didn't do the performance assessment so it's our task to constantly remind them about the performance task that they need to accomplish." (Teacher 9)

"We give reminders to our students about their performance e-assessments during synchronous class. Typically, we discuss the guidelines on the first online class of the quarter and one week prior to submission." (Teacher 10)

Recognizes Best Performances. Secondary mathematics teachers presented students' best performance outputs during synchronous class. This is done to commend students' exemplary outputs. Some exemplary outputs were also posted in class group chats and LMS.

The following statements were evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on performance.

"Usually, I present to the class only the best performance of the students. This is to praise students who are really exerting efforts in the performance assessments." (Teacher 5)

"We present students' best outputs during synchronous class." (Teacher 6)

"Due to few online meetings, which are usually spent for discussion, I just post the best performances in the learning management of students." (Teacher 7)

"Every quarter I see to it that I recognize students' output. I send creative outputs to students' group chat to encourage others to also do their best in their performance tasks." (Teacher 8)

"To monitor students' accomplishments on the performance task, I conduct follow ups during live class and on the class GC." (Teacher 9)

<u>*Utilizes Harmonize Assessment*</u>. Secondary mathematics teachers collaborated with other subject-teachers when giving performance assessment. Performance outputs were graded depending on the criteria set by subject teachers.

The statement below was evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on performance.

"In our school, we talk with other subject area teachers on possible collaboration on performance tasks. What we do is to gather the competencies that we will teach for the quarter and look for possible harmonized assessment." (Teacher 5)

<u>*Provides Reward / Positive Reinforcement*</u>. Secondary mathematics teachers gave rewards to students who made exemplary performance outputs. The reward

teachers gave were certificates and ballpen. Students might get their rewards the following week on the retrieval of the next learning module.

The following statements were evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on performance.

"I give rewards to students who are putting so much efforts in making their performance assessments great. Last quarter (1st quarter) I gave ballpens to best outputs." (Teacher 6)

"We practice giving simple tokens and certificates to students who made creative performance or project e-assessments." (Teachers 7 and 8)

<u>*Utilizes Scoring Rubric.*</u> Secondary mathematics teachers stated that they use performance rubric, written in the learning modules of the students, for standard scoring. Some of the teachers revised the rubric for the performance task because they implement harmonized performance assessment.

The following statements were evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on performance.

"To ensure the objectivity of scoring, we use the rubric stipulated in the learning module of students." (Teacher 9)

"Since we made our performance assessment harmonize with other subjects, we also revise the scoring rubric for it to fit with the harmonized assessment." (Teacher 5)

Provides Encouraging Feedback. Due to limited synchronous classes, teacher-participants only gave general feedback on the accomplished output of the students. The feedback included commending the outputs of the students, asking about the challenges they faced, points for improvement, and encouragement for the next performance assessment.

The following statements were evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on performance.

"After I check the performance assessment, I alot portion of our synchronous time to praise students' outputs and to encourage others to do better in the next performance task." (Teacher 7)

"Given limited time, I only relay general evaluation about students' performances. Asking the challenges they encountered is one of my priority so that I can make adjustments for the next performance assessment." (Teacher 5)

"I give feedback to the outputs of the students by group." (Teacher 9)

"In my case, I prefer to give overall feedback on students' performances. I tell them the possible things they can improve and their scores for the performance authentic assessment." (Teacher 9)

"Providing feedback is crucial for performance assessment." (Teacher 10)

Figure 9

Within-Case and Across-Case Analysis of Secondary Mathematics Teachers' Practices on Project E-Assessment

Case 1

-Applies Systematic Planning
-Utilizes System for Communication
-Openness to Queries and Suggestions
-Utilizes Harmonize Assessment
-Recognizes Outstanding Projects
-Utilizes Scoring Rubric
-Provides Encouraging Feedback

Case 2

-Applies Careful Planning
- Utilizes System for Communication
-Openness to Ideas and Suggestions
-Utilizes Scoring Rubric

Case 3

- Applies Systematic Planning
-Utilizes System for Communication
-Conducts Follow-ups
-Recognizes Outstanding Outputs
-Provides Reward/ Positive Reinforcement
-Utilizes Scoring Rubric
-Provides Encouraging Feedback

Cases 1&2

Common
-Applies Systematic and Careful Planning
- Utilizes System for Communication
- Openness to Ideas, Queries, and Suggestions
- Utilizes Scoring Rubric

Unique
-Utilizes Harmonize Assessment
-Recognizes Outstanding Projects
-Provides Encouraging Feedback

Cases 2& 3

Common
- Applies Systematic and Careful Planning
- Utilizes System for Communication
- Utilizes Scoring Rubric

Unique
-Conducts Follow-ups
-Openness to Ideas and Suggestions
-Recognizes Outstanding Projects
-Provides Reward
-Provides Encouraging Feedback

Cases 1&3

Common
-Applies Systematic Planning
-Utilizes System for Communication
-Recognizes Outstanding Projects
-Utilizes Scoring Rubric
-Provides Encouraging Feedback

Unique
-Openness to Ideas and Suggestions
-Utilizes Harmonize Assessment
-Conducts Follow-ups
-Provides Reward / Positive Reinforcement

Themes

-Applies Systematic and Careful Planning
- Utilizes Communication System for project Instruction, Suggestions, Follow-ups, and Feedback.
- Utilizes Scoring Rubric
-Provides positive Reinforcement
-Utilizes Harmonize Assessment

Note. Figure 9 shows the secondary mathematics teachers' practices on project e-assessment.

2.2.Project

In analyzing the practices of secondary mathematics teachers on project e-assessment, the researcher utilized holistic multiple three cases within-case and across-case data analysis. This method advocates to identify the practices of secondary mathematics teachers by describing, analyzing, and discussing their actions in developing and implementing authentic e-assessment on project. After identifying the practices of teachers on project e-assessment in each case, across-case analysis will be utilized, similarities and differences were determined between cases 1 and 2, cases 2 and 3, and cases 1 and 3. Lastly, findings from within-case and across-case analysis were collated to form themes.

Within-Case Analysis

Secondary mathematics teacher, teaching in science curriculum, ensure that project e-assessments that she gave is systematically planned. Similar to performance e-assesment, math teachers in her school, considered a lot of factors such as the content standards and performance standards stipulated in K-12 Curriculum Guide, availability of materials and devices needed, internet connection, relevance to real-life practice, capability of students to accomplish the task, time allotment, integration or alignment to other discipline, and the method of scoring, prior to the development of the project. According to Marimuthu and Ramraj (2016), systematic assessment indicates whether a program has achieved its goals and objectives in comparison with standards. This practice was in accordance with the principles: clarity of learning targets, articulation, appropriateness of assessment method and tools, alignment, validity, reliability, balance, fairness, positive consequences, practicality and efficiency, affordance, authenticity, and accreditation. Second, to ensure that students were informed on the deliverables of the project, teacher utilized a system to better communicate with students on project e-assessment information disseminated. Project sheets, learning management system posting, and synchronous meetings were the methods used by teacher to update the students about guidelines of the project, date of submission, scoring rubric, follow-ups, clarifications, suggestions, and feedback. This was supported by Earl and Katz (2016), that establishing communication and feedback are key essential in students' learning success. This practice was in accordance with the principles: clarity of learning targets, articulation, accreditation, and accountability. Third, secondary mathematics teacher collaborated with other subject teachers to harmonize their project assessment. Teachers look for competencies that can be merged in one project assessments. Teachers then created the guidelines and the success indicator for the project. Teachers applied this method to save resources, time, and expenses in the part of students. This practice was in accordance with the principles: validity, positive consequences, practicality and efficiency, adaptation, authenticity and adaptation. Fourth, teacher utilized standard scoring rubric and recognize outstanding projects of students. Rubrics for scoring were given to students at the beginning of the quarter together with the project sheets. Moreover, these rubrics were uploaded in class group chat and in the learning management system of students. According to teacher, this was done to inform the students ahead so they could plan and prepare or recycle materials needed for the project. After checking the project e-assessments of the students, teacher then select and present exemplary projects during synchronous meeting or by class group page posting. This practice aims to encourage more students to make exemplary project authentic assessments (Sambeka et al., 2017). This practice was in accordance with the principles: accreditation, and positive consequences. Lastly, secondary mathematics teacher gave constructive feedback to students' projects for them to improve their work on the next project assessment. Furthermore, by giving commendations and recommendations to students, they become aware on the areas they could improve (Crisp, 2009). This practice was in accordance with the principles: accreditation, and positive consequences.

Meanwhile, secondary mathematics teacher, teaching in science and technology, carefully planned the project e-assessment he gave. According to the teacher, prior to giving the projects, he personally assessed the project's benefits to students' learning, capability of students to accomplish the projects, and availability of materials for the project. Teacher added that it is his responsibility to ensure that every student can do the project he gave considering the quarantine restrictions implemented. Eickholt et. al (2019) emphasized that teachers must support project-based learning through economic and learning spaces to ensure students have equal opportunities in doing the project. This practice was in accordance with the principles: clarity of learning targets, articulation, appropriateness of assessment method and tools, alignment, validity, reliability, balance, fairness, positive consequences, practicality and efficiency, affordance, authenticity, and accreditation. Second, teacher devised and utilized a system of communication to students about project assessment instructions, expected deliverables, submission date, follow-ups, and scoring scheme. Teacher utilized his synchronous classes to inform students on outputs needed for the project. This practice was in accordance with the principles: clarity of learning targets, articulation, accreditation, and accountability. Third, secondary mathematics teacher ensure that students' concerns and suggestions are properly addressed. Teacher conducted follow-ups on the status of students' projects and welcome suggestions to improve projects. Sambeka et al. (2017) highlighted the importance of communication in project learning to improve students' concept mastery. Teachers believed that being open to students' ideas and suggestions could encourage them (students) in accomplishing the project. This practice was in accordance with the principles: clarity of learning targets, articulation, accreditation, and accountability. Lastly, teacher outsourced and utilized standard scoring rubric to establish standard scoring on students' projects. Teacher look for available rubric online and revise it based on the nature of the project e-assessment he gave. This practice was in accordance with the principles: accreditation, and positive consequences.

Secondary mathematics teachers, teaching in regular curriculum, ensure that project e-assessments they gave are systematically planned. Teachers, together with other math teachers, crafted a project e-assessment that consider factors such as the content standards and performance standards stipulated in the most essential learning competency, availability of materials, devices needed, relevance to real-life practice, capability of students to accomplish the task, time allotment, integration or alignment to other discipline, and the method of scoring prior to the development of the project. This practice was in accordance with the principles: clarity of learning targets, articulation, appropriateness of assessment method and tools, alignment, validity, reliability, balance, fairness, positive consequences, practicality and efficiency, affordance, authenticity, and accreditation. This practice was supported by Marimuthu and Ramraj (2016), stating that systematic planning is essential element of assessment to ensure that goals and objectives were achieved. Second, teachers disseminate project information and guidelines through online and offline platform. According to teachers, it is very important to establish multiple means of communication to ensure that students were properly informed on the deliverables of the project e-assessment. Project sheets, learning management system posting, and synchronous meetings were the methods utilized by teacher to update the students on project e-assessments. Moreover, teachers used this system of communication to address students' queries and suggestions prior making their projects. Some common suggestions of students are related to software applications or materials they may use as an alternative in making their projects. This practice was in accordance with the principles: clarity of learning targets, articulation, accreditation, and accountability. Third, teacher used scoring rubric in rating students' projects. The rubric was disseminated to class group chat and was given to students at the beginning of the quarter together with the project sheet. Likewise, teachers recognized outstanding projects of students. After checking the project e-assessments of the students, teachers identified and presented outstanding projects in class. This practice was in accordance with the principles: accreditation, and positive consequences. Lastly, secondary mathematics teachers gave general feedback on students' submitted projects. The feedback was utilized to inform students on the areas they did best and areas where they can improve. This practice was in accordance with the principles: accreditation, and positive consequences.

Across-Case Analysis

Secondary mathematics teachers teaching in schools with science curriculum, STEP section, and regular curriculum value the importance of planning. Teachers carefully and systematically planned their project e-assessment so that all of their students will be able to do or make the assessment. Factors such as availability of materials, devices needed, relevance to real-life practice, capability of students to accomplish the task, time allotment, integration or alignment to other discipline, and the method of scoring were considered before developing the project. Moreover, teachers utilized multiple platforms to be able to relay project information, attend to students' queries and suggestions, conduct follow-ups, and relay feedback on projects. Furthermore, it was observed that teachers even extended their time beyond 5pm and during weekends just to attend to students' queries. Lastly, teachers from cases 1, 2, and 3, used scoring rubric in rating their students' projects. Teachers created or searched online project rubric and revised it to match with the project e-assessment they gave.

Meanwhile, secondary mathematics teachers, teaching in schools with science curriculum and regular curriculum, gave rewards to students with exemplary projects. Despite the challenging situation of online learning, teachers still look for possible ways to increase students' motivation. The reinforcement can be an additional point or a simple token like ballpen. Furthermore, best projects of students were recognized during synchronous meeting. Lastly, teachers in cases 1 and 2 ensure that they give constructive feedback on students' works. This was conducted before teachers give their next project e-assessment and aimed to commend students works and recommend areas for improvement. Learning management posting and synchronous meetings were used to relay this general feedback.

Meanwhile, only secondary mathematics teacher, teaching in science curriculum, harmonized her project e-assessment with other subjects. According to the teacher, although it is hard for them to go through the different competencies across subject, having harmonized a single performance or project means saving resources to students. There is a great benefit in the part of students since they will be able to lessen the resources, limit time, and save expenses when making projects.

Below are the detailed accounts on practices of secondary mathematics teachers in developing project authentic e-assessments.

2.2.1. Science Curriculum

Applies Systematic Planning. Project e-assessments, used by teacher participants, were systematically planned prior to development. According to secondary mathematics teacher, a lot of factors were considered such as the content standards and performance standards stipulated in K-12 Curriculum Guide, availability of materials, devices needed, relevance to real-life practice, capability of students to accomplish the task, time allotment, integration or alignment to other discipline, and the method of scoring.

The statement below was evident in the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on projects.

"Just like performance e-assessments, our projects are based on the content standards, performance standards, and learning outcomes stipulated in K-12 Curriculum Guide. At the beginning of the school year, grade-level mathematics teachers collaboratively meet to decide on what project to give considering mainly the cost and the alternative materials students can use for the output. Deciding on what project is very challenging. It should not discriminate those students who doesn't have available materials and devices. We also make sure that the assessment is realistic, inexpensive, related-to other subjects, and can be accomplished by our students." (Teacher 1)

Utilizes System for Communication. To ensure that students know what they were going to accomplish, teacher-participants see to it that the information about the project-assessment were properly disseminated. Project sheets, LMS posting, and synchronous meetings were the methods used by teachers to inform the students about guidelines for the project, date of submission, and scoring rubric.

The statement below was evident in the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on projects.

"Our students were given project sheets similar to performance sheets. We thoroughly explained it to them (students) including the use of recyclable materials, submission date, and the rubric during online meeting and posting in group chats." (Teacher 1)

Openness to Queries and Suggestions. Teacher-participants make sure that she answers all queries and suggestions of students in making their product-outputs. Furthermore, the teacher responds to queries about the materials to recycle and the deadline of submission in group chats.

The statement below was evident in the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on projects.

"Sometimes students ask for questions, clarifications and suggestions in our class group chat, I see to it that I answer all their questions and accommodate their suggestions." (Teacher 1)

Utilizes Harmonize Assessment. Secondary mathematics teacher stated that the projects they ask the students to make were not only intended for mathematics but for other subjects as well. Teachers understand the challenging situation of the students in this time of pandemic so to lessen students work and limit expenses, teachers collaboratively design projects that could be credited for multiple subjects.

The statement below was evident in the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on projects.

"We harmonize our projects just like performances. My first project in math was in collaboration to Computer and English subjects because it requires visual images and presentation-like reporting." (Teacher 1)

Recognizes Outstanding Projects. Teacher-participants recognized exemplary outputs of students by presenting it during synchronous class. Teachers also post photos of the best products in the school's learning management system and in class group chat to commend, inspire, and motivate students.

The statement below was evident in the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on projects.

"We practice presenting the students' best performances or projects in class or by simply praising them through Facebook group chat or posting through social media with the permission of both students and parents." (Teacher 1)

Utilizes Scoring Rubric. Teacher-participants utilized rubrics for standard scoring in students' projects. Rubrics for scoring were given to students at the beginning of the quarter together with the project sheets. Moreover, these rubrics were uploaded in class group chat and LMS. According to teacher, this was done to inform the students ahead so they could plan and prepare or recycle materials needed for the project.

The statement below was evident in the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on project.

"Just the same with performance e-assessment, we disseminate and use rubric to objectively score the projects of our students." (Teacher 1)

Provides Encouraging Feedback. Teacher-participant believed that constructive criticism improved students' projects so they made sure to provide general feedback at the end of every project. Secondary mathematics-teacher utilized portion of their synchronous class and group chats to relay the overall output-feedback to the class.

The statement below was evident in the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on project

"With feedbacks, students will know what aspect of the project they can improve next time so we make sure that we practice giving them after we checked the projects." (Teacher 1)

2.2.2. STEP Section

Applies Careful Planning. Secondary mathematics teacher carefully planned the project assessment he gave to his students. According to the teacher, prior to giving the projects, he personally assessed the project's benefits to students' learning, capability of students to accomplish the projects, and availability of materials for the project.

The statement below was evident in the practices of secondary mathematics teachers, teaching the STEP section, in developing authentic e-assessment on projects.

"I personally prepare for the projects to give to my students. I consider a lot of factors like the learnings that my students can get out of the project and if they can do the project. I seldom give projects because I don't want my students to spend specially at this time of crisis." (Teacher 3)

Utilizes System for Communication. Secondary mathematics teacher informed his students by posting the assessment-instructions in class group chat and stating the guidelines and date of submission during synchronous class.

The statement below was evident on the practices of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on projects.

"During our online class, I tell my students what project to do, the objectives of it, when and how they will submit it." (Teacher 3)

Openness to Ideas and Suggestions. Teachers believed that being open to students' ideas and suggestions could encourage them (students) in accomplishing the project. Before class discussion, the teacher entertains students' suggestions and ideas for the betterment of students' projects.

The statement below was evident on the practices of secondary mathematics teachers, teaching the STEP section, in developing authentic e-assessment on projects.

"Sometimes, students tell me their ideas and suggestions about the project and I'm open about it." (Teacher 3)

Utilizes Scoring Rubric. Secondary mathematics teacher stated that he created and used rubric for standard scoring of the project. According to the participant, he looked for available rubric and revised it to measure the project e-assessment.

The statement below was evident in the practices of secondary mathematics teachers, teaching STEP section, in developing authentic e-assessment on projects. *"I look for available rubric and revise it to suit with my project e-assessment."* (Teacher 3)

2.2.3. Regular Curriculum

Applies Systematic Planning. Secondary mathematics teachers systematically planned their project e-assessment prior to school opening. According to participants, a lot of factors were considered in designing the project e-assessment such as the content standards and performance standards stipulated in the most essential learning competency, availability of materials, devices needed, relevance to real-life practice, capability of students to accomplish the task, time allotment, integration or alignment to other discipline, and the method of scoring. Furthermore, some teacher participants opted not to give project assessment due to financial difficulty experienced by the students.

The following statements were evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on projects.

"Giving project assessment nowadays is very difficult for us since we know that our students are now experiencing financial difficulties so we tried our best to plan and design project assessments that are aligned with the learning competencies and will not require students to buy." (Teacher 5)

"Although we stop giving projects, before we carefully plan and design our projects making sure that it is aligned with the MELC and doable in the part of our students." (Teacher 10)

Utilizes System for Communication. Teacher-participants stated that they informed the students about the project assessments by explaining it during online classes or by posting instructions and guidelines in group chat.

The following statements below were evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on projects.

"Similar to performance assessment, I deliver project instructions during our live or synchronous meetings. Sometimes, I post the guidelines in their (students) messenger group." (Teacher 5)

"We give reminders about the project during our synchronous session and I make follow ups by posting in students' group chat." (Teacher 10)

Conducts Follow-ups. Secondary mathematics teachers stated that follow ups allow them to monitor the progress of students' projects. According to participants, they conducted atleast once a month a follow up to know how much the students have accomplished and if there are challenges that hinders them in doing the project assessment.

The statements were evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on projects.

"We give reminders about the project during our synchronous session and I make follow ups by posting in students' group chat." (Teacher 10)

"Constant reminders are crucial in students, submission especially now that it is online, so I make sure that I utilized all the means to remind my students about the project." (Teacher 5)

Recognizes Outstanding Projects. Secondary mathematics teachers present students' best projects by posting it in class group chat or in LMS. According to participants, posting best outputs encourages students to do their best in making their projects.

The following statements were evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on projects.

"Usually, I present exemplary projects during our synchronous class. But due to few online meetings, I post the best projects in the class group chats." (Teacher 5)

"I recognize students' output by sending exemplary works in class group chat mainly to motivate other students to do their best." (Teacher 10)

Provides Reward/Positive Reinforcement. Secondary mathematics teachers gave rewards to students who made creative projects. The reward teachers gave are certificates, simple tokens, and additional points. Students might get their rewards the following week on the retrieval of the next learning module.

The following statements were evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on projects.

"I give rewards to students who are putting so much efforts in making their projects. I gave additional points and certificate to best outputs during retrieval of the students' module." (Teacher 5)

"We practice giving simple tokens and certificates to students who made creative performance or projects e-assessments." (Teacher 10)

Utilizes Scoring Rubric. Secondary mathematics teachers stated that they collaboratively created scoring rubric for the project. Since projects were harmonized with other subjects, participants consolidated the other subject teachers in constructing the scoring rubric.

The following statements were evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on projects.

"Since we made our project assessment harmonize with other subjects, we consolidated and collaboratively make the scoring rubric for the project." (Teacher 5)

"I personally create the scoring rubric for my project e-assessment." (Teacher 10)

Provides Encouraging Feedback. General feedback was given by teacher-participants to students during synchronous classes. Although there were only limited face-to-face classes a week, the teacher has spent time giving his general feedback on the students' submitted projects.

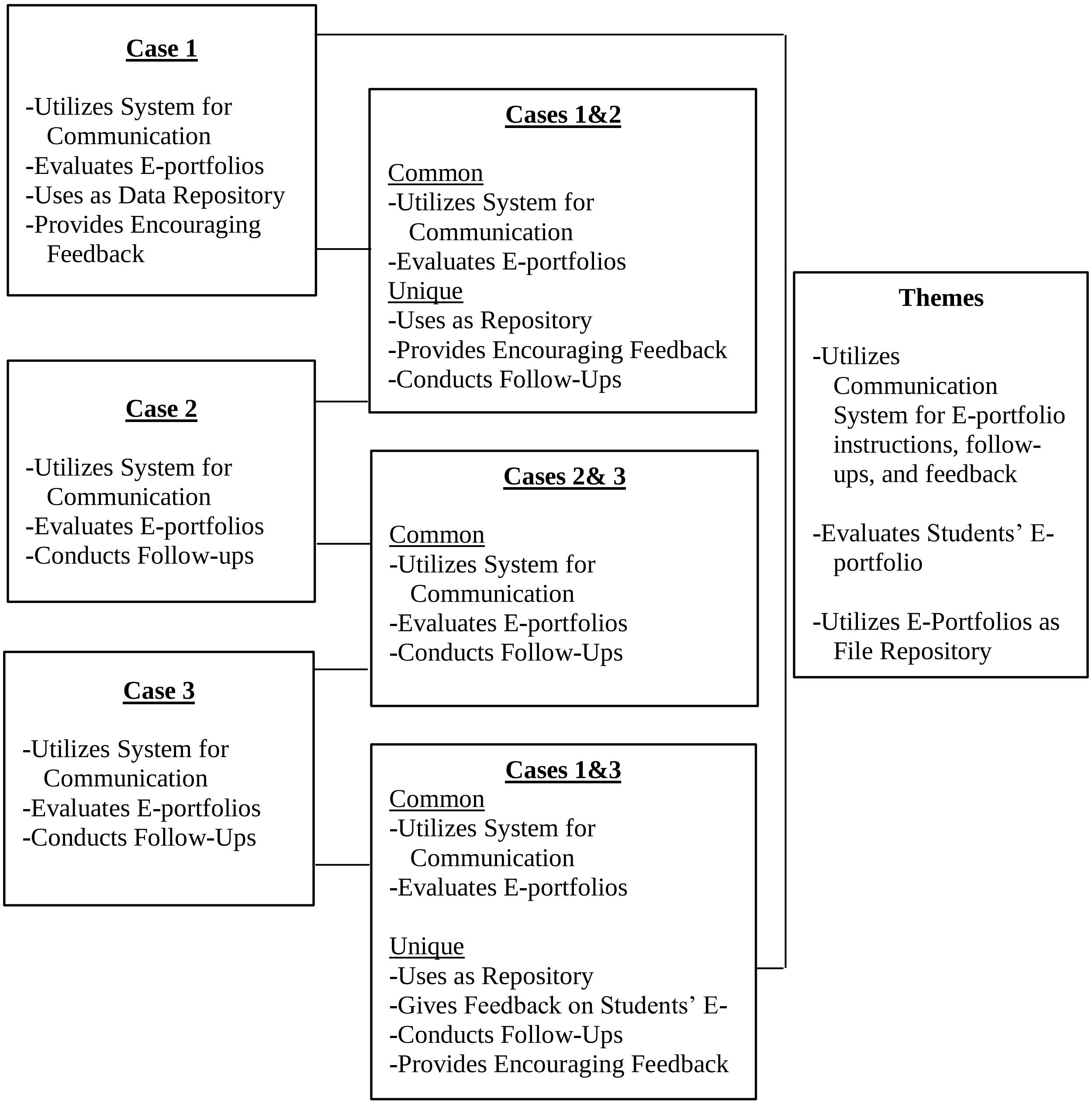
The following statements were evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on projects.

"After checking the projects of my students, I prepare a summary sheet of the output's good points and needs to improve. I stated these during our online session." (Teacher 5)

"I give feedback to the outputs of the students by group." (Teacher 10)

Figure 10

Within-Case and Across-Case Analysis of Secondary Mathematics Teachers' Practices on E-portfolio



Note. Figure 10 shows the secondary mathematics teachers' practices on e-portfolio.

2.3.E-portfolio

In analyzing the practices of secondary mathematics teachers on e-portfolio assessment, the researcher utilized holistic multiple three cases within-case and across-case data analysis. This method advocates to identify the practices of secondary mathematics teachers by describing, analyzing, and discussing their actions in developing and implementing authentic e-assessment on e-portfolio. After identifying the practices of teachers on e-portfolio e-assessment in each case, across-case analysis will be utilized, similarities and differences were determined between cases 1 and 2, cases 2 and 3, and cases 1 and 3. Lastly, findings from within-case and across-case analysis were collated to form themes.

Within-Case Analysis

Secondary mathematics teacher, teaching in science curriculum, informed students about the e-portfolio that they would do. Teacher disseminate information by discussing the components of the e-portfolio and showing a sample relative to what students would do. Furthermore, dissemination of information was done during the first synchronous class and group chat posting for follow ups. Teacher also explained the purpose and role of the e-portfolio in their academic success. This was supported by Earl and Katz (2006) stating that communication is a key element in successful assessment. This practice was in accordance with the principles: clarity of learning targets, articulation, accreditation, and accountability. Second, secondary mathematics teacher devoted time to collect, check and evaluate students' progress through their e-portfolios. Teacher evaluated e-portfolios every after a quarter to verify students' submissions. Moreover, teachers consider the e-portfolio as an extra data repository of students' outputs. In cases where students submitted their outputs late, teacher then check the e-portfolio for verification and scoring. This practice was in accordance with the principles: accountability, positive consequences, and authenticity. However, Mueller and Bair (2018) stated that e-portfolio is not a mere collection of students' works. More than a storage or repository, e-portfolios must have the capability to make students to reflect on their works. Lastly, secondary mathematics teacher gave constructive feedback on students' e-portfolio after evaluation. Crisp et al. (2016), emphasized that authentic e-assessment was crucial in giving timely feedback and in improving the learning outcomes of students. It was observed that the teacher commended students with creative and complete e-portfolios while encouraging other students to do their best and complete their e-portfolios on the next quarter. This practice was in accordance with the principles: accreditation, and positive consequences.

Meanwhile, secondary mathematics teachers, teaching in science and technology engineering mathematics section – regular curriculum, informed the students about the guidelines and parts of the e-portfolio that they will be submitting through group chat posting. The guidelines included the objective of the e-portfolio, format, and date of submission. It was observed that teachers utilized both synchronous and asynchronous platforms to systematically communicate with students about the e-portfolio and also during follow ups. Mueller and Bair (2018), stressed that e-portfolios must be properly instructed because it has high impact in improving students' practice. This practice was in accordance with the principles: clarity of learning targets, articulation, accreditation, and accountability. Furthermore, teachers allotted ample time to collect, check and evaluate students' progress through their e-portfolios. Azis et al. (2020) emphasized that teachers don't have enough time in planning, developing, and evaluating authentic e-assessments. Teachers treated students' e-portfolios as back up storage of students' submission and evaluated every after the end of a quarter. This practice was in accordance with the principles: accreditation.

Secondary mathematics teachers, teaching in schools with regular curriculum, utilized a system to communicate with the students on the guidelines and instructions of e-portfolio assessment. Due to limited synchronous time, teachers maximized students' group chats by posting guidelines about e-portfolio. It was observed that there are some students who were not informed about the e-portfolio even when the teachers already disseminate instructions on class group chat. Because of this, teachers utilized portion of their synchronous time to further explain and inform students about the e-portfolio. This practice was in accordance with the principles: clarity of learning targets, articulation, accreditation, and accountability. Second, secondary mathematics teachers devoted time to collect, check and evaluate students' e-portfolios at the end of each quarter. E-portfolios of students with incomplete submissions were checked for validation. Likewise, students' e-portfolios were submitted in google drive or through students' group chat. This practice was in accordance with the principles: accreditation. Lastly, teachers conducted constant follow-ups to students on their submission and completion of e-portfolio. It was observed that teachers frequently update students who belong to the lower section of the grade level. Teachers even sent personal messages to students who did not submit e-portfolios on the set date. This practice was in accordance with the principles: accountability.

Across-Case Analysis

Secondary mathematics teachers teaching in schools with science curriculum, STEP section, and regular curriculum established a communication system that would inform the students on the objectives, guidelines, and expected outputs for the e-portfolio. Likewise, through this system, teachers were able to update or follow up on students' submissions and compliance as this would indicate learning progress of students. E-portfolios were also considered by teachers as an indicator of students' success on the required competencies set by the Department of education and the program school implemented. Furthermore, teachers form cases 1, 2, and 3, checked and evaluated students' e-portfolios. These e-portfolios were also considered as additional data repository in which teachers can access in case of incomplete submission in the part of students.

Meanwhile, secondary mathematics teacher, teaching in science curriculum, practiced and emphasized feedback as an evaluation tool conducted to highlight students' exemplary works and to identify areas of improvement. The teacher reiterated that every time he gave feedback on students' works, their e-portfolios are getting better.

Below are the detailed accounts on practices of secondary mathematics teachers in developing e-portfolio.

2.3.1. Science Curriculum

Utilizes System for Communication. Secondary mathematics teacher informed the students about the e-portfolio that they would do. Teacher-participant discussed the components of the E-Portfolio and showed a sample for students to understand what they would do. Furthermore, dissemination of information was done during the first synchronous class and group chat posting.

The statement below was evident in the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on e-portfolio.

"Before the start of the school year, I already told my students that they will be preparing an e-portfolio for every quarter. I showed a sample, it contains answered exercises in the module, seatworks, photos of performance and project assessments. My students used google drive for the compilation of their outputs." (Teacher 2)

Evaluates E-portfolios. Secondary mathematics teacher collected and checked students' e-portfolios after every quarter. They use the e-portfolio to verify students' submissions and to back-up students' files.

The statement below was evident in the practices of secondary mathematics teachers, teaching science curriculum, in developing authentic e-assessment on e-portfolio.

"A week before the end of every quarter, I gather all the e-portfolios of my students. I use the e-portfolio to know the outputs students had accomplished and submitted." (Teacher 2)

Uses as Data Repository. Secondary mathematics teacher reminded his students not to delete the files stored in their e-portfolios. Furthermore, the participant told the students that they might refer to their e-portfolios to track their learning progress and as an additional storage of their files.

The statement below was evident in the practices of secondary mathematics teacher, teaching science curriculum, in developing authentic e-assessment on e-portfolio.

"I always tell my students to properly keep their e-portfolios and not to delete or remove files. Thru their e-portfolios, they may check the outputs they submitted and know where they can still improve at." (Teacher 2)

Provides Encouraging Feedback. Secondary mathematics teacher commended students who have creative and complete files in the e-portfolio. Moreover, teacher gave his constructive feedbacks to other students e-portfolios for them to improve on their next submission.

The statement below was evident in the practices of secondary mathematics teacher, teaching science curriculum, in developing authentic e-assessment on e-portfolio.

"I praise students who submitted creative e-portfolios. I also give constructive feedbacks to other students on how to improve their e-portfolios." (Teacher 2)

2.3.2. STEP Section

Utilizes System for Communication. Teachers informed the students about the guidelines and parts of the e-portfolio that they will be submitting through group chat posting. The guidelines included the objective of the e-portfolio, format, and date of submission.

The statement below was evident in the practices of secondary mathematics teacher, teaching the STEP section, in developing authentic e-assessment on e-portfolio.

"We explain the objectives of the e-portfolio to my students at the start of the school year. We also remind them at the end of every quarter to submit their e-portfolios." (Teachers 3 and 4)

Evaluates E-portfolios. Secondary mathematics teacher collected students' e-portfolios at the end of each quarter. Students' e-portfolios were submitted in google drive or by sending the link to the teacher's messenger account.

The statement below was evident in the practices of secondary mathematics teacher, teaching the STEP section, in developing authentic e-assessment on e-portfolio.

"I tell my student to submit their e-portfolios in my shared google drive or by sending the link in my messenger account. After I gather the e-portfolios of my students I check it and verify my recorded scores." (Teacher 3)

Conducts Follow-Ups. Secondary mathematics teachers again reiterated the importance of follow-ups to students' compliance or submission. Teacher reminded students to submit their e-portfolios in google drive or by sending a message in Facebook messenger. Moreover, the frequency of submission differs according to the students' section.

The statement below was evident in the practices of secondary mathematics teacher, teaching STEP section, in developing authentic e-assessment on e-portfolio.

"Just like performance and project assessments, students are reminded to submit their e-portfolios. I send personal message and a general message in students group chat." (Teachers 3 and 4)

2.3.3. Regular Curriculum

Utilizes System for Communication. Secondary mathematics teachers informed the students about the e-portfolio in class group chats. Due to limited synchronous time, participants maximized students' group chats by posting guidelines about e-portfolio.

The statements below were evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on e-portfolio.

"Since we have only one synchronous class per week, I just post the guidelines and deadline of submission in the class group chat." (Teacher 7)

"For e-portfolio, students were informed in their facebook messenger group. I post announcement and some reminders regarding the parts of the portfolio." (Teacher 8)

Evaluates E-portfolios. Teacher-participants collected students' e-portfolios at the end of each quarter. E-portfolios of students with incomplete submissions were checked for validation. Likewise, students' e-portfolios were submitted in google drive or through students' group chat.

The statements below are evident in the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on e-portfolio.

"Our students submitted their e-portfolios in google drive." (Teachers 7 and 8)

"In my case, due to lots of paperwork, I only check the e-portfolios of students with incomplete or no submission. Incomplete submissions were given extension to comply with the outputs." (Teacher 8)

Conducts Follow-Ups. Secondary mathematics teachers stated that submission follow ups were conducted specially to classes that belong to the lower section. Teachers sent personal messages to students who did not submit e-portfolios on the set date.

The statements below were evident on the practices of secondary mathematics teachers, teaching regular curriculum, in developing authentic e-assessment on e-portfolio.

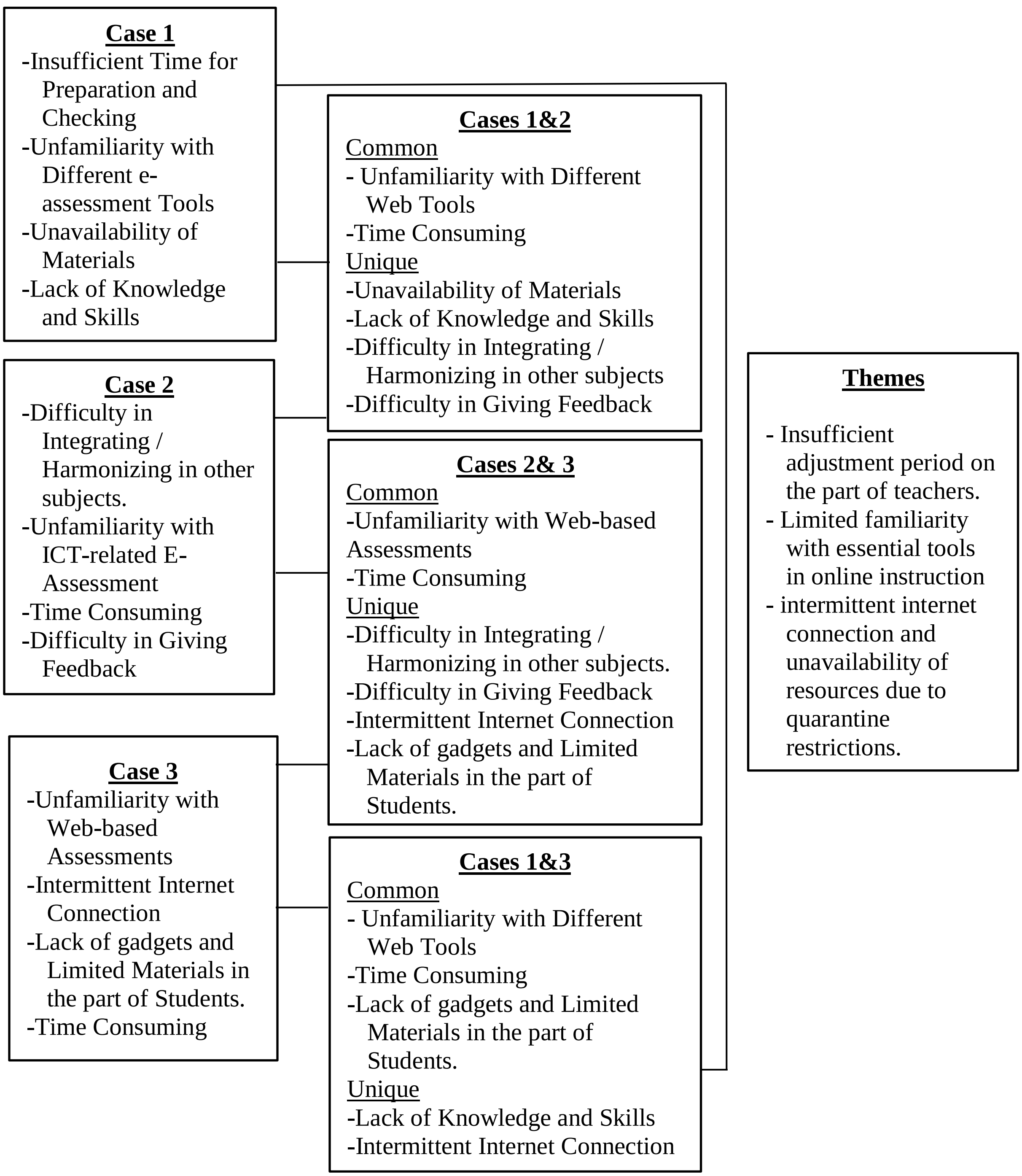
"Like performance tasks, I conduct follow ups on my students' e-portfolio especially those that are in the lower section." (Teacher 7)

"I remind my students about their e-portfolios by sending personal message. I also post general reminder in their class group chat." (Teacher 8)

3. Identify challenges that teachers encounter in the development of authentic e-assessment particularly,

Figure 11

Within-Case and Across-Case Analysis of Secondary Mathematics Teachers' Challenges in the Development and Implementation of Performance E-Assessment



Note. Figure 11 shows the secondary mathematics teachers' challenges in the development and implementation of performance e-assessment.

3.1. Performance

In analyzing the challenges of secondary mathematics teachers on performance e-assessment, the researcher utilized holistic multiple three cases within-case and across-case data analysis. This method advocates to identify the challenges of secondary mathematics teachers by describing, analyzing, and discussing their experiences in developing and implementing authentic e-assessment on performance. After identifying the challenges of teachers on performance e-assessment in each case, across-case analysis will be utilized, similarities and differences were determined between cases 1 and 2, cases 2 and 3, and cases 1 and 3. Lastly, findings from within-case and across-case analysis were collated to form themes.

Within-Case Analysis

Secondary mathematics teachers, teaching in science curriculum, stated that deciding, creating guidelines, making rubrics, assessing performance e-assessments were very time consuming. Teachers considered lots of factors like aligning the e-assessment with the curriculum guide, materials needed, abilities and skills of students, and time it takes for students to accomplish the tasks before developing a performance e-assessment. Moreover, it was observed that conducting follow-ups, feedbacks, recording of students' ratings, and teacher's paperworks consumed most of the time of the teachers. Azis et al. (2020) stated that development of authentic assessment calls for tantamount of time and paperwork which give teachers excessive stress. Second, teachers admitted that their unfamiliarity with suitable e-assessment tools hindered them to employ the assessment that they want to do. Likewise, teachers stated that simulation applications were difficult to identify and utilize given the hasty shift to online learning modality. Lack of support in the preparation and implementation and unfamiliarity of teachers with e-assessments are some challenges teachers might encounter (Azis et al., 2020; Azevedo et al., 2017). Third, teachers identified students' unavailability to acquire needed devices or materials to complete the performance e-assessments. Although teachers planned their authentic e-assessments, still there were instances where students failed to submit the assessment. Hence, teachers identified students' economic status and the strict quarantine restrictions implemented as the reasons for students incompliance. This was supported by Azevedo et al. (2017) stating that technical difficulties and limited accessibility to gadgets and internet hinders e-assessment. Lastly, secondary mathematics teachers admitted that they had hard time developing and implementing authentic e-assessments because it was relatively new and they lack the knowledge and the skills to carry out the assessment. Azis et al. (2020) stressed that teachers find authentic e-assessment planning as burdening teaching. Furthermore, teachers stated that the hasty shift in online learning made them adjust their instruction and assessment in a short period of time.

Meanwhile, secondary mathematics teachers, teaching in science and technology engineering mathematics section – regular curriculum, found difficulty in integrating/harmonizing their math topics into topics of other subjects. Although teachers spent a lot of their time looking at the competencies together with other subject-teachers, it was still difficult for them to properly harmonize their performance e-assessment. Second, teachers admitted that they lack the familiarity with various ICT-based e-assessments. Mathematics teachers stated that the abrupt shift to digitizing learning negatively impacted their teaching. Most of them viewed e-learning as new and their familiarity and skills with ICT-related e-assessments are insufficient. With this, they found it challenging to identify and select appropriate web tools to use for the performance authentic e-assessments Third, STEP-section teachers pointed out that the preparation for performance e-assessment was time consuming. Due to this, teachers allocate only few hours in preparing authentic e-assessments and thus, created a less effective assessment (Azis et al. 2020). Teachers ensured that the e-assessments were aligned with the competencies stipulated in the Most Essential Learning Competencies (MELC) and the guidelines were clear. Likewise, materials needed must be simple and can easily be accessed by students. This was supported by Eickholt et al (2019), where assessments should be economical. Lastly, it was observed that teachers were having difficulty in giving feedback to students' performances. Teachers shared that it took them atleast 3 hours to watch and check students recorded performances in one grade level before they can write their general feedback.

Secondary mathematics teachers, teaching in schools with regular curriculum, stated that shifting to digitized teaching and learning brought up challenges with their familiarity of web-based assessments. Although there were webinars conducted prior to class opening, teachers were not confident to deliver their lessons alone. Teachers, especially the digital migrants, stated that their technical skills were insufficient to deliver e-learning and e-assessments. Furthermore, teachers only utilized assessment applications that they were familiar with even if sometimes they think it was not suitable. Second, teachers stated that unstable internet connection in their localities aggravated the challenges they encountered in giving assessment online. There were instances where performance e-assessments were interrupted or sometimes rescheduled due to intermittent connection on the part of teacher, students, or both. Third, secondary mathematics teachers had hard time in designing and implementing performance e-assessment due to students' lack of devices and materials to perform the authentic e-assessment. Teachers identified students' socioeconomic status and the quarantine restrictions as the cause of this challenges. Students were no longer on the same platform since all of them were studying in their respective homes. Lastly, teachers realized that designing and implementing authentic e-assessments were very time consuming. Teachers specified that ensuring the alignment of the assessment with the competencies and standards, informing students about e-assessment, checking students' outputs, providing feedbacks, and the overwhelming paperwork, make performance authentic e-assessment consume most of their time.

Across-Case Analysis

Secondary mathematics teachers teaching in schools with science curriculum, STEP section, and regular curriculum, had difficulty to modify their instructions and assessments due to insufficient adjustment period prior to class opening. Teachers challenging experiences rooted on insufficient time for them to prepare and implement virtual instruction and assessments. Although there were webinars conducted by the Department of education and private organizations, not all teachers were able to cope up immediately. Teachers finished their studies in different years so their education background varies. Likewise, their skills in handling online learning took time to adjust. Teachers felt that they were consuming most of their time in preparing and implementing authentic e-assessment because they were figuring out how their skills in face-to-face classes can be improve to be used in e-learning. Teachers also observed that the sudden shift to virtual learning made it difficult for them to harmonize their assessments since the needs and demands on learning changes.

Furthermore, it was observed that familiarity with different essential tools in online assessment was limited. Teachers admitted that their knowledge and skill set for online learning were not as competitive as compared in their teaching skills during face-to-face learning. Seasoned teachers stated that their education before were not focused on online learning and they were digital migrants so the hasty shift was difficult for them.

Lastly, external factors such as students' accessibility to essential devices and materials, and the intermittent internet connection in the Philippines aggravated the challenges teachers experienced in online learning. Secondary mathematics teachers pointed out that the socioeconomic status of each student played a significant role on their learning. In online classes where students study on the comfort of their own home, students who belong to the marginalized families were the ones who had hard time accomplishing the authentic e-assessment. Lack of devices, difficulty in outsourcing materials were the reasons for these. Moreover, teachers stated that there were instances where they need to repeat the e-assessment instructions or revise the authentic e-assessment only to make every student capable of doing the performance e-assessment.

Below are the detailed accounts on challenges of secondary mathematics teachers in developing performance e-assessment.

3.1.1. Science Curriculum

Insufficient Time for Preparation and Checking. Secondary mathematics teachers stated that deciding, creating guidelines, making rubrics, assessing performance e-assessments were very time consuming. There were lots of things to consider before deciding on e-performance assessment like the performance and content standards in the curriculum guide, materials needed, abilities and skills of students, and time it takes for students to accomplish the tasks. Furthermore, bulk of paperwork and assessing students' performances, especially if video recorded, is very time consuming.

The following statements below were evident in the challenges secondary mathematics teacher, teaching science curriculum, encountered in developing and implementing authentic e-assessment on performance.

"The challenge that I encountered in the practice of authentic e-assessment is the amount of time I must devote in developing and evaluating performance e-assessment. I make sure that it is aligned with the competencies in the curriculum guide and my students can accomplish given their abilities and skills." (Teacher 1)

"The lack of time preparation due to bulk of works and time spent in checking students' performances." (Teacher 2)

Unfamiliarity with different web tools. Teacher-participant stated that one of the challenges she encountered was her unfamiliarity with different web tools that could be utilized for e-assessment. Moreover, teachers stated that simulation applications were very difficult to identify and utilize given the hasty shift to online learning modality.

The statement below was evident in the challenges secondary mathematics teacher, teaching science curriculum, encountered in developing and implementing authentic e-assessment on performance.

"Also, my lack of knowledge in introducing new tools to manage and enhance assessment methodologies. Perhaps this is due to swift change from face-to-face learning into online learning." (Teacher 1)

Unavailability of Materials. Secondary mathematics teachers stated that most of their students do not have the necessary gadgets and materials to be used in performance assessments. According to teachers, these were due to students' economic status and inability to go outside due to quarantine restrictions.

The following statements below were evident in the challenges secondary mathematics teachers, teaching science curriculum, encountered in developing and implementing authentic e-assessment on performance.

"Lastly, the unavailability of materials in the part of the students due to local quarantine restrictions." (Teacher 1)

"It is really challenging to give performance or project e-assessments online because not all students have available devices to use for recording and editing. It is also not easy for them to buy the materials needed since most of them are financially challenged at this time of pandemic." (Teachers 1 and 2)

Lack of knowledge and skills in developing and implementing authentic e-assessments. Secondary mathematics teachers admitted that they had hard time developing and implementing authentic e-assessments because it was relatively new and they lack the knowledge and skills in developing and implementing authentic e-assessments.

The following statements below were evident in the challenges secondary mathematics teachers, teaching science curriculum, encountered in developing and implementing authentic e-assessment on performance.

"I personally have few knowledge and lack of training in designing authentic e-assessment guidelines and rubrics." (Teacher 1)

"My lack of knowledge in introducing and practicing e-assessment because of the sudden shift in learning modality." (Teacher 2)

3.1.2. STEP Section

Difficulty in Integrating/Harmonizing in other Subjects. Secondary mathematics teachers found difficulty in integrating/harmonizing their math topics into topics of other subjects. Furthermore, the teachers stated that they really spent time looking at the competencies together with other subject-teachers to properly harmonize their performance assessments.

The statement below was evident in the challenges secondary mathematics teacher, teaching STEP section – regular curriculum, encountered in developing and implementing authentic e-assessment on performance.

"It is very difficult in our part to integrate authentic e-assessments, both performance and project, in the lessons/topics of other subjects." (Teacher 3)

Unfamiliarity with ICT-related E-Assessments. Teacher-participants stated that the hasty shift to digitizing learning negatively impacted their teaching. Most of them viewed e-learning as new and their familiarity and skills with ICT-related e-assessments are insufficient. With this, they found it challenging to identify and select appropriate web tools to use for the authentic e-assessments.

The following statements below were evident in the challenges secondary mathematics teacher, teaching STEP section – regular curriculum, encountered in developing and implementing authentic e-assessment on performance.

"Also, being able to select appropriate ICT-related e-assessment is challenging to me since this is new and I only have few knowledge about computer softwares." (Teacher 3)

"My lack of skills in using ICT." (Teacher 4)

Time Consuming. Secondary mathematics teachers pointed out that preparing for an authentic e-assessment, both performance and project, are time consuming. Teachers must ensure that the e-assessments were aligned with the competencies stipulated in the Most Essential Learning Competencies (MELC) and the guidelines were clear. Furthermore, integration to other subjects was sufficiently collaborated.

The following statements below were evident in the challenges secondary mathematics teacher, teaching STEP section – regular curriculum, encountered in developing and implementing authentic e-assessment on performance.

"Based on our experience, it really takes time to create a good authentic e-assessment. We aligned it with the MELC, and the creation of guidelines is quite difficult." (Teachers 3 and 4)

"I personally spent ample time developing my performance e-assessment. Also, when we harmonize our assessments, we a lot time so that the subject-teachers can sufficiently collaborate their assessments." (Teacher 3)

Difficulty in giving feedback. Secondary mathematics teacher emphasized that it was very difficult to give feedback to students' outputs. Although teachers provided general feedback, still it took time to view each student's outputs.

The statement below was evident in the challenges secondary mathematics teacher, teaching STEP section – regular curriculum, encountered in developing and implementing authentic e-assessment on performance

"Another challenge that I encountered is when checking students' outputs and giving feedback about their assessment." (Teacher 3)

3.1.3. Regular Curriculum

Unfamiliarity with Web-based Assessments. Secondary mathematics teachers stated that shifting to digitized teaching and learning brought up challenges with their familiarity of web-based assessments. Some of the participants admitted that their technical skills were insufficient to deliver e-learning and e-assessments. Furthermore, teachers only utilized assessment applications that they were familiar with even if sometimes they think it was not suitable.

The following statements below were evident in the challenges secondary mathematics teacher, teaching regular curriculum, encountered in developing and implementing authentic e-assessment on performance.

"Familiarity with software poses a problem on my part since I'm not so technically inclined with it. I sometimes do not know if the application that I'm using is the most suitable with my e-assessment." (Teacher 5)

"Conducting authentic e-assessment is challenging because there are minimal trainings for teachers conducted on how to facilitate it. We personally know only few web-based applications." (Teachers 6 and 7)

"I have a little knowledge on how to incorporate this e-assessment in teaching mathematics online. I have also a background in terms of the software to be used in authentic e-assessment both performance and project." (Teacher 10)

Intermittent Internet Connection. Teachers stated that unstable internet connection in their localities augmented the challenges they encountered in giving assessment online. There were instances where performance e-assessments were interrupted or sometimes rescheduled due to intermittent connection on the part of teacher, students, or both.

The following statements below were evident in the challenges secondary mathematics teacher, teaching regular curriculum, encountered in developing and implementing authentic e-assessment on performance.

"The intermittent internet connection and the gadgets to be used by my students are big challenges for me as a teacher." (Teacher 5)

"Slow internet connectivity in our area made my online e-assessments challenging. I experienced having an online performance assessment then all of a sudden, I lost my connection. It is challenging because I need to adjust my scheduled activities." (Teacher 8)

"Internet connection problem negatively affects the performance of my students in online assessments." (Teacher 9)

"Poor internet connection due to lack of budget is one of the challenges I experienced when giving my authentic e-assessments." (Teacher 10)

Lack of Gadgets and Limited Materials in the part of students. Without the necessary devices and materials, students could not perform the e-assessment given by teachers. Furthermore, teachers had a hard time to design and implement their performance and project e-assessments due to these reasons.

The following statements below were evident in the challenges secondary mathematics teachers, teaching regular curriculum, encountered in developing and implementing authentic e-assessment on performance.

"Unavailability of gadgets to be used by my students also is a big challenge for me as a teacher." (Teacher 5)

"It is also hard to design and give performance and project e-assessments due to limited resources that our students have. We also consider that not all of them have the devices for authentic e-assessments."

Time-consuming. Secondary mathematics teachers realized that designing and implementing authentic e-assessments, in performance and project, were very time consuming. Furthermore, teachers stated that ensuring the alignment of the assessment with the competencies and standards, informing students about e-assessment, checking students' outputs, providing feedbacks, and the overwhelming paperwork, make authentic e-assessment time consuming.

"One of the challenges I encountered about authentic assessment is its very time consuming to prepare and check." (Teacher 5)

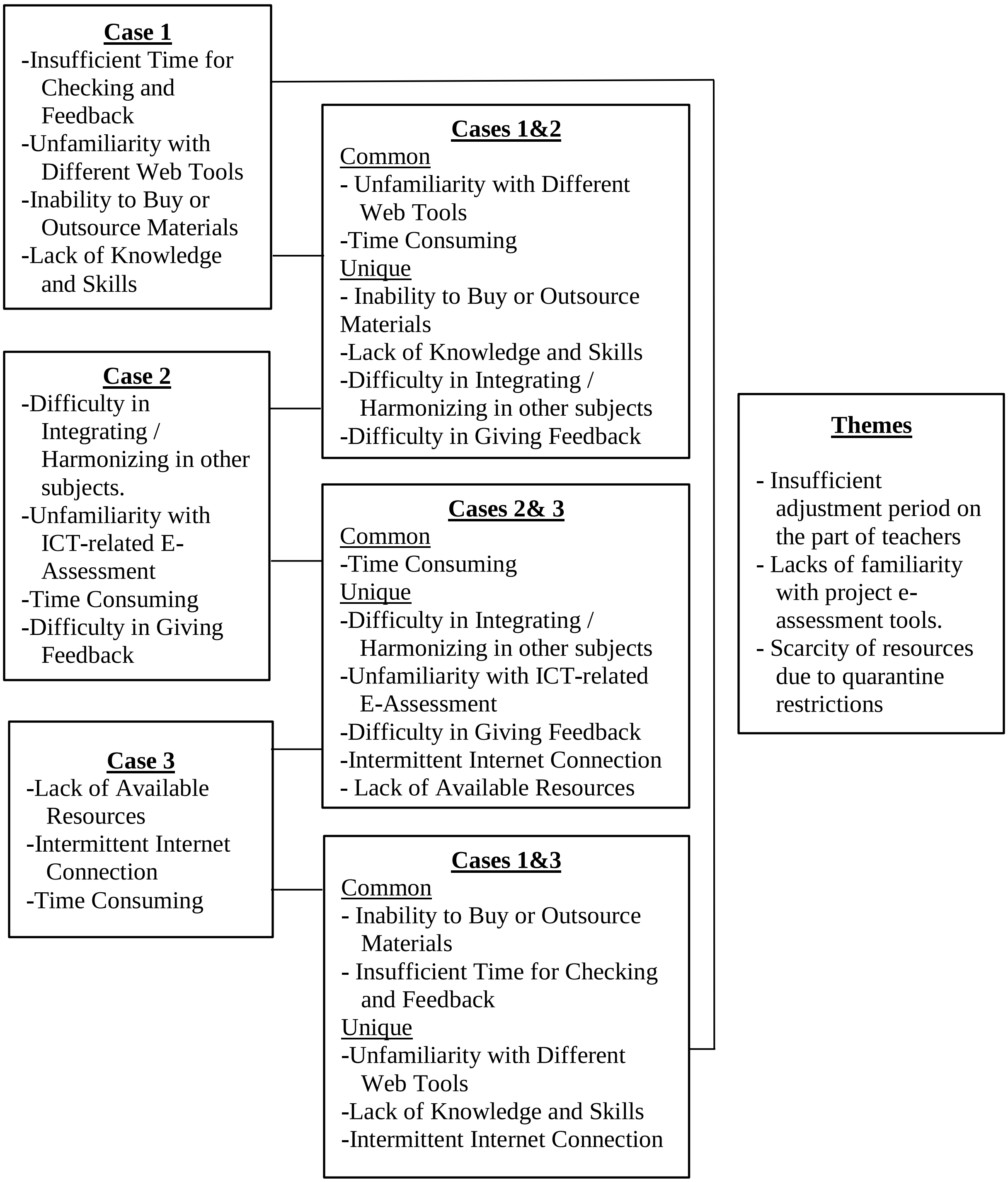
"It requires so much time to assess and give feedback to students." (Teachers 6, 7, and 8)

"During first and second quarters, I noticed that performance assessments online are time consuming from informing the students, follow ups, and evaluation." (Teacher 9)

"With bulky paperworks that we have, it's very challenging to us the development and implementation of authentic e-assessments." (Teacher 10)

Figure 12

Within-Case and Across-Case Analysis of Secondary Mathematics Teachers' Challenges in the Development and Implementation of Project E-Assessment



Note. Figure 12 shows the secondary mathematics teachers' challenges in the development and implementation of project e-assessment.

3.2. Project

In analyzing the challenges of secondary mathematics teachers on project e-assessment, the researcher utilized holistic multiple three cases within-case and across-case data analysis. This method advocates to identify the challenges of secondary mathematics teachers by describing, analyzing, and discussing their experiences in developing and implementing authentic e-assessment on project. After identifying the challenges of teachers on project e-assessment in each case, across-case analysis will be utilized, similarities and differences were determined between cases 1 and 2, cases 2 and 3, and cases 1 and 3. Lastly, findings from within-case and across-case analysis were collated to form themes.

Within-Case Analysis

Secondary mathematics teacher, teaching in schools with science curriculum, had difficulty in managing her time checking and giving feedback to the e-projects of each student. Teacher found it health-alarming in their part spending almost 12 hours looking at their devices' screens. Likewise, it was observed that conducting follow-ups, giving feedbacks, recording of students' ratings, and teacher's paperworks consumed most of her time. According to Azis et al. (2020) authentic assessments call for tantamount of paperwork which gives teachers excessive stress. Second, teacher stated that one of the challenges she encountered is her unfamiliarity with different web tools that could be utilized for e-assessment. Moreover, teacher stated that simulation applications were very difficult to identify and utilize given the hasty shift to online learning modality. teacher admitted that her unfamiliarity with suitable e-assessment tools hindered her to employ the assessment that she wants to do. Likewise, teacher stated that simulation applications were difficult to identify and utilize given the hasty shift to online learning modality. Third, teacher identified students' unavailability to acquire needed devices or materials to complete the project e-assessments. Teacher identified students' economic status and the strict quarantine restrictions implemented as the reasons for students incompliance. Lastly, Secondary mathematics teacher admitted that she had hard time developing and implementing authentic e-assessments because it was relatively new and they lack the knowledge and skills in developing and implementing authentic e-assessments.

Meanwhile, secondary mathematics teacher found difficulty in integrating/harmonizing his math topics into topics of other subjects. Crisp (2012) stated that although authentic assessments improve students learning, it needs familiarity and mastery to integrate assessments. Since there was only one project e-assessment given to students every quarter, teacher stated that he, together with other subject teachers, spend time looking at the competencies to properly harmonize their project e-assessments. Second, teacher stated that the hasty shift to digitizing learning negatively impacted their teaching. Teacher viewed e-learning as new and his familiarity and skills with ICT-related e-assessments were insufficient. With this, he found it challenging to identify and select appropriate web tools to use for the authentic e-assessments. Third, secondary mathematics teacher pointed out that preparing for an authentic e-assessment, both performance and project, are time consuming. Teacher must ensure that the e-assessments were aligned with the competencies stipulated in the Most Essential Learning Competencies (MELC) and the guidelines were clear. Furthermore, integration to other subjects was sufficiently collaborated. Lastly, secondary mathematics teacher emphasized that it was very difficult to give feedback to students' outputs. Although teacher provided general feedback, still it took time to view each student's outputs.

Secondary mathematics teachers, teaching in schools with regular curriculum, reiterated that lack of available resources on the part of students posed a major challenge in giving projects. Moreover, teachers stated that the majority of their students belong to low-income families and the current quarantine restrictions restricted students to buy or outsource materials needed for the project. Second, teachers stated that unstable internet connection in their localities augment the challenges they encountered in giving assessment online. There were instances where performance e-assessments were interrupted or sometimes rescheduled due to intermittent connection on the part of teachers, students, or both. Lastly, secondary mathematics teachers realized that designing and implementing authentic e-assessments, in performance and project, are very time consuming. Furthermore, participants stated that ensuring the alignment of the assessment with the competencies and standards, informing students about e-assessment, checking student's' outputs, providing feedback, and the overwhelming paperwork, make authentic e-assessment time consuming.

Across-Case Analysis

Secondary mathematics teachers teaching in schools with science curriculum, STEP section, and regular curriculum, had difficulty to modify their instructions and assessments due to insufficient adjustment period before school opening. Teachers' challenging experiences rooted on insufficient time for them to prepare and implement virtual instruction and assessments. Although there were webinars conducted by the Department of education and private organizations, not all teachers were able to cope up immediately. Teachers finished their studies in different years so their education background varies. Likewise, their skills in handling online learning took time to adjust. Teachers felt that they were consuming most of their time in preparing and implementing authentic e-assessment because they were figuring out how their skills in face-to-face classes can be improve to be used in e-learning. Teachers also observed that the sudden shift to virtual learning made it difficult for them to harmonize their assessments since the needs and demands on learning changes.

Furthermore, it was observed that familiarity with different essential tools in online assessment was limited. Teachers admitted that their knowledge and skill set for online learning were not as competitive as compared in their teaching skills during face-to-face learning. Seasoned teachers stated that their education before were not focused on online learning and they were digital migrants so the hasty shift was difficult for them. Lastly, scarcity of resources and materials greatly affected students when making their e-projects.

Below are the detailed accounts on challenges of secondary mathematics teachers in developing project e-assessment

3.2.1. Science Curriculum

Insufficient Time for Checking and Feedback. Secondary mathematics teacher stated that he had a hard time checking the projects of each student as well as providing feedback to students' outputs. Furthermore, teachers found it health-alarming in their part spending almost 12 hours looking at their devices' screens.

The following statements below were evident in the challenges secondary mathematics teacher, teaching science curriculum, encountered in developing and implementing authentic e-assessment on project.

"Assessing students' projects is quite difficult since we need to spend ample time just to view our students' outputs. There is a time where I spent almost 12hours to finish viewing the projects." (Teacher 1)

"After checking my students' projects, I identify and relay my general feedback to them. This is quite challenging in my part because I need to be very keen in checking and careful in delivering the feedback to my students." (Teacher 1)

Unfamiliarity with different web tools. Teacher stated that one of the challenges she encountered is her unfamiliarity with different web tools that could be utilized for e-assessment. Moreover, teacher stated that simulation applications were very difficult to identify and utilize given the hasty shift to online learning modality.

The statement below was evident in the challenges secondary mathematics teacher, teaching science curriculum, encountered in developing and implementing authentic e-assessment on project.

"Also, my lack of knowledge in introducing new tools to manage and enhance assessment methodologies. Perhaps this is due to swift change from face-to-face learning into online learning." (Teacher 1)

Inability to Buy or Outsource Materials. Secondary mathematics teacher stated that one of their problems in giving projects was the inability of students to buy or outsource materials needed for the project e-assessment due to quarantine restrictions. Furthermore, teacher stated that most of their students belong to low income earning families who do not have the necessary gadgets and materials to be used in project e-assessments.

The following statements below were evident in the challenges secondary mathematics teachers, teaching science curriculum, encountered in developing and implementing authentic e-assessment on project.

"Lastly, the unavailability of materials in the part of the students due to local quarantine restrictions." (Teacher 1)

"It is really challenging to give performance or project e-assessments online because not all students have available devices to use for recording and editing. It is also not easy for them to buy the materials needed since most of them are financially challenged at this time of pandemic." (Teachers 1 and 2)

Lack of knowledge and skills in developing and implementing authentic e-assessments. Secondary mathematics teachers admitted that they had hard time developing and implementing authentic e-assessments because it was relatively new and they lack the knowledge and skills in developing and implementing authentic e-assessments.

The following statements below were evident in the challenges secondary mathematics teachers, teaching science curriculum, encountered in developing and implementing authentic e-assessment on project.

"I personally have few knowledge and lack of training in designing authentic e-assessment guidelines and rubrics." (Teacher 1)

3.2.2. STEP Section

Difficulty in Integrating/Harmonizing in other Subjects. Similar to performance e-assessment, secondary mathematics teachers found difficulty in integrating/harmonizing their math topics into topics of other subjects. Since there was only one project e-assessment given to students every quarter, participants stated that he, together with other subject teachers, spend time looking at the competencies to properly harmonize their project e-assessments.

The statement below was evident in the challenges secondary mathematics teacher, teaching STEP section – regular curriculum, encountered in developing and implementing authentic e-assessment on project.

"It is very difficult in our part to integrate authentic e-assessments, both performance and project, in the lessons/topics of other subjects." (Teacher 3)

Unfamiliarity with ICT-related E-Assessments. Teacher stated that the hasty shift to digitizing learning negatively impacted their teaching. Most of them viewed e-learning as new and their familiarity and skills with ICT-related e-assessments were insufficient. With this, they found it challenging to identify and select appropriate web tools to use for the authentic e-assessments.

The following statements below were evident in the challenges secondary mathematics teacher, teaching STEP section – regular curriculum, encountered in developing and implementing authentic e-assessment on project.

"Also, being able to select appropriate ICT-related e-assessment is challenging to me since this is new and I only have few knowledge about computer softwares." (Teacher 3)

Time Consuming. Secondary mathematics teachers pointed out that preparing for an authentic e-assessment, both performance and project, are time consuming. Teachers must ensure that the e-assessments were aligned with the competencies stipulated in the Most Essential Learning Competencies (MELC) and the guidelines were clear. Furthermore, integration to other subjects was sufficiently collaborated.

The following statements below were evident in the challenges secondary mathematics teachers, teaching STEP section – regular curriculum, encountered in developing and implementing authentic e-assessment on project.

"Based on our experience, it really takes time to create a good authentic e-assessment. We aligned it with the MELC, and the creation of guidelines is quite difficult." (Teachers 3 and 4)

"I personally spent ample time developing my performance e-assessment. Also, when we harmonize our assessments, we a lot time so that the subject-teachers can sufficiently collaborate their assessments." (Teacher 3)

Difficulty in giving feedback. Secondary mathematics teacher emphasized that it was very difficult to give feedback to students' outputs. Although participants provided general feedback, still it took time to view each student's outputs.

The statement below was evident in the challenges secondary mathematics teacher, teaching STEP section – regular curriculum, encountered in developing and implementing authentic e-assessment on project.

"Another challenge that I encountered is when checking students' outputs and giving feedback about their assessment." (Teacher 3)

3.2.3. Regular Curriculum

Lack of Available Resources. Secondary mathematics teachers reiterated that lack of available resources on the part of students posed a major challenge in giving projects. Moreover, teachers stated that the majority of their students belong to low-income families and the current quarantine restrictions restricted students to buy or outsource materials needed for the project.

The following statements below were evident in the challenges secondary mathematics teachers, teaching regular curriculum, encountered in developing and implementing authentic e-assessment on project.

"Almost all of our students came from low-income families so it is really challenging for us to think and give projects because we know that most of them are not capable of buying materials." (Teacher 5)

"Before the pandemic, we ask our students to recycle materials for their projects but with the restrictions due to health reasons, our students are confined at their homes and looking for available resources is really challenging." (Teacher 5)

"Most of our students don't have enough finances for their project e-*assessment."* (Teacher 10)

Intermittent Internet Connection. Teachers stated that unstable internet connection in their localities augment the challenges they encountered in giving assessment online. There were instances where performance e-assessments were interrupted or sometimes rescheduled due to intermittent connection on the part of teachers, students, or both.

The following statements below were evident in the challenges secondary mathematics teachers, teaching regular curriculum, encountered in developing and implementing authentic e-assessment on project.

"The intermittent internet connection and the gadgets to be used by my students are big challenges for me as a teacher." (Teacher 5)

"Poor internet connection due to lack of budget is one of the challenges I experienced when giving my authentic e-assessments." (Teacher 10)

Time-consuming. Secondary mathematics teachers realized that designing and implementing authentic e-assessments, in performance and project, are very time consuming. Furthermore, participants stated that ensuring the alignment of the assessment with the competencies and standards, informing students about e-assessment, checking student's' outputs, providing feedback, and the overwhelming paperwork, make authentic e-assessment time consuming.

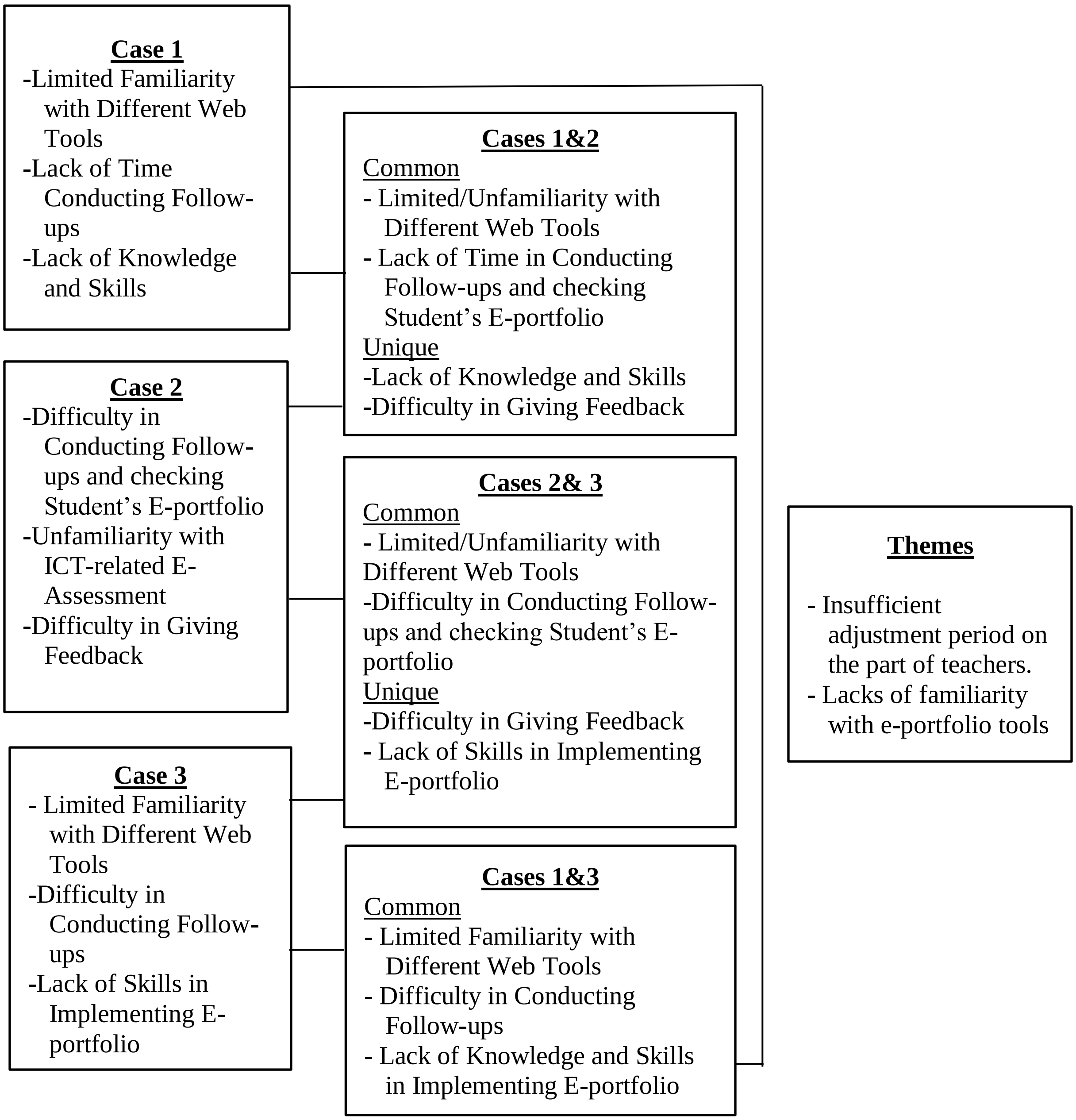
The following statements below were evident in the challenges secondary mathematics teachers, teaching regular curriculum, encountered in developing and implementing authentic e-assessment on project.

"One of the challenges I encountered about authentic assessment is its very time consuming to prepare and check." (Teacher 5)

"With bulky paperworks that we have, it's very challenging to us the development and implementation of authentic e-assessments." (Teacher 10)

Figure 13

Within-Case and Across-Case Analysis of Secondary Mathematics Teachers' Challenges in the Development and Implementation of E-portfolio



Note. Figure 13 shows the secondary mathematics teachers' challenges in the development and implementation of e-portfolio.

3.3. E-portfolio

In analyzing the challenges of secondary mathematics teachers on e-portfolio assessment, the researcher utilized holistic multiple three cases within-case and across-case data analysis. This method advocates to identify the challenges of secondary mathematics teachers by describing, analyzing, and discussing their experiences in developing and implementing authentic assessment on e-portfolio. After identifying the challenges of teachers on e-portfolio in each case, across-case analysis will be utilized, similarities and differences were determined between cases 1 and 2, cases 2 and 3, and cases 1 and 3. Lastly, findings from within-case and across-case analysis were collated to form themes.

Within-Case Analysis

Secondary mathematics teacher, teaching in schools with science curriculum, pointed out that his limited familiarity with web-tools utilized for their e-portfolio was a challenge for him. There were times where students were more knowledgeable to teachers when utilizing web-tools for e-portfolio. According to Azevedo et al. (2017), teachers lack of support and training in the implementation of authentic assessment posed a challenge in teachers' familiarity of assessment. Second, due to overwhelming paperwork this online learning, added to his preparation for synchronous class, the teacher pointed out that there was insufficient time left for him to update students' submissions of e-portfolio. This was supported by Azis et al. (2020), teachers don't have time anymore to plan and update students' assessments. Furthermore, the teacher shared that he only checks the e-portfolio a week before the end of the quarter. This oppose the study of Earl and Katz (2006), numerous immediate descriptive feedback is a key to make assessment successful, Third, secondary mathematics teacher admitted that he had hard time developing and implementing authentic e-assessments because it was relatively new and they lack the knowledge and skills in developing and implementing authentic e-assessments.

Meanwhile, secondary mathematics teachers stated that they are having difficulty conducting follow ups of students' e-portfolios. Moreover, the teachers added that it was very challenging for him to check students' submissions so they only utilized e-portfolio whenever there were missed out submissions by a student. This contradicts the study of Mueller and Bair (2019), continuous assessment of students e-portfolio is needed to positively contribute in students' learning. Second, teachers stated that the hasty shift to digitizing learning negatively impacted their teaching. Most of them viewed e-learning as new and their familiarity and skills with ICT-related e-assessments were insufficient. With this, they find it challenging to identify and select appropriate web tools to use for the authentic e-assessments. Third, secondary mathematics teachers emphasized that it was very difficult to give general feedback to students' outputs.

Secondary mathematics teachers, teaching in schools with regular curriculum, stated that their limited familiarity with different web-tools for e-portfolio was a challenge in their part. Moreover, teachers stated that the majority of their students belong to the digital era where their knowledge and understanding are sometimes higher to what teachers know, students' suggestions sometimes pressure the teacher to study the web tool students suggested. Second, teachers emphasized the difficulty in asking each student on their output submission. Furthermore, participants stated that only around 50% of their students complied with submission dates. They believed that this was caused by several reasons like, limited devices and resources, poor internet connection, negligence on the part of students, and lack of motivation due to the situation. Lastly, secondary mathematics teachers realized that designing and implementing authentic e-assessments on e-portfolio was challenging since it was new and some of them were not equipped with the essential skills to implement it. Furthermore, teachers' lack of familiarity with e-portfolio and applications were factors participants identified.

Across-Case Analysis

Secondary mathematics teachers teaching in schools with science curriculum, STEP section, and regular curriculum, had difficulty to modify their e-portfolio assessment due to insufficient adjustment period they had before school opening. Teachers challenging experiences rooted mainly on insufficient time for them to prepare and implement virtual instruction and assessments. Although there were webinars conducted by the Department of education and private organizations, not all teachers were able to cope up immediately. Teachers finished their studies in different years so their education background varies. Likewise, their skills in handling online learning took time to adjust. Teachers felt that they were consuming most of their time in preparing and implementing authentic e-assessment because they were figuring out how their skills in face-to-face classes can be improve to be used in e-learning. Teachers observed that the sudden shift to virtual learning made it difficult for them to harmonize their assessments since the needs and demands on learning changes.

Furthermore, it was observed that familiarity with different essential e-portfolio tools in online assessment was limited. Teachers admitted that their knowledge and skill set to facilitate e-portfolio were not as competitive as compared in their teaching skills during face-to-face learning. Seasoned teachers stated that their education before were not focused on online learning and they were digital migrants so the hasty shift was difficult for them.

Below are the detailed accounts on challenges of secondary mathematics teachers in developing e-portfolio assessment.

3.3.1. Science Curriculum

Limited Familiarity with Different Web-tools for E-portfolio. Secondary mathematics teacher stated that his limited familiarity with web-tools utilized for their e-portfolio was a challenge for him. There were times where students were more knowledgeable to teachers when utilizing web-tools for e-portfolio.

The statement below was evident in the challenges secondary mathematics teacher, teaching science curriculum, encountered in developing and implementing authentic e-assessment on e-portfolio.

"For e-portfolio, I might say that the biggest challenge is my limited familiarity to different web tools that can be used for e-portfolio. There is a time where my students know better in navigating in the web site." (Teacher 2)

Lack of Time Conducting Follow-ups. Due to overwhelming paperwork, this online learning plus his preparation for synchronous class, the teacher pointed out that there was insufficient time left for him to update students' submissions of e-portfolio. Furthermore, the participant stated that he only checks the e-portfolio a week before the end of the quarter.

The statement below was evident in the challenges secondary mathematics teacher, teaching science curriculum, encountered in developing and implementing authentic e-assessment on e-portfolio.

"It is indeed challenging to update students about their e-portfolio submissions. Honestly speaking, I can only check the e-portfolios of my students at the end of a

quarter. This is due to overwhelming paperwork that we need to submit, time I spent preparing for my class and checking students' activities." (Teacher 2)

Lack of knowledge and skills in developing and implementing authentic e-assessments. Secondary mathematics teachers admitted that they had hard time developing and implementing authentic e-assessments because it was relatively new and they lack the knowledge and skills in developing and implementing authentic e-assessments.

The following statements below were evident in the challenges secondary mathematics teachers, teaching science curriculum, encountered in developing and implementing authentic e-assessment on e-portfolio.

"My lack of knowledge in introducing and practicing e-assessment because of the sudden shift in learning modality." (Teacher 2)

3.3.2. STEP Section

Difficulty in Conducting Follow-ups and Checking Students' E-portfolios. Secondary mathematics teacher stated that he is having difficulty conducting follow ups of students' e-portfolios. Moreover, the teacher added that it was very challenging for him to check students' submissions so he only utilized e-portfolio whenever there were missed out submissions by a student.

The statement below was evident in the challenges secondary mathematics teacher, teaching STEP section – regular curriculum, encountered in developing and implementing authentic e-assessment on e-portfolio.

"Asking each student about their e-portfolio submission is a big challenge in my part. Sometimes, I only check the e-portfolio of my student to verify outputs which they initially failed to submit." (Teacher 3)

Unfamiliarity with ICT-related E-Assessments. Teachers stated that the hasty shift to digitizing learning negatively impacted their teaching. Most of them viewed e-learning as new and their familiarity and skills with ICT-related e-assessments were insufficient. With this, they find it challenging to identify and select appropriate web tools to use for the authentic e-assessments.

The following statements below were evident in the challenges secondary mathematics teachers, teaching STEP section – regular curriculum, encountered in developing and implementing authentic e-assessment on project.

"Also, being able to select appropriate ICT-related e-assessment is challenging to me since this is new and I only have few knowledge about computer softwares." (Teacher 3)

"My lack of skills in using ICT." (Teacher 4)

Difficulty in giving feedback. Secondary mathematics teacher emphasized that it was very difficult to give feedback to students' outputs. Although participants provided general feedback, still it took time to view each student's outputs.

The statement below was evident in the challenges secondary mathematics teacher, teaching STEP section – regular curriculum, encountered in developing and implementing authentic e-assessment on e-portfolio.

"Another challenge that I encountered is when checking students' outputs and giving feedback about their assessment." (Teacher 3)

3.3.3. Regular Curriculum

Limited familiarity with Web-tools for E-portfolio. Secondary mathematics teachers stated that their limited familiarity with different web-tools for e-portfolio was a challenge in their part. Moreover, teachers stated that the majority of their students belong to the digital era where their knowledge and understanding are sometimes higher to what teachers know, students' suggestions sometimes pressure the teacher to study the web tool students suggested.

The following statements below were evident in the challenges secondary mathematics teachers, teaching regular curriculum, encountered in developing and implementing authentic e-assessment on e-portfolio.

"Sometimes I'am confused whether I used a right tool to store my students' e-portfolios or not." (Teacher 8)

"It is challenging to identify appropriate application for students' e-portfolios. There is an instance where one of my students suggested an application and I was pressured to study it to know if that will work with my class." (Teacher 7)

Difficulty in Conducting Follow-ups for Students' E-portfolio. Teachers emphasized the difficulty in asking each student on their output submission. Furthermore, participants stated that only around 50% of their students complied with submission dates. They believed that this was caused by several reasons like, limited devices and resources, poor internet connection, negligence on the part of students, and lack of motivation due to the situation.

The following statements below were evident in the challenges secondary mathematics teachers, teaching regular curriculum, encountered in developing and implementing authentic e-assessment on e-portfolio.

"Students' compliance with submissions is my major problem. In my class only half or 50% submitted their e-portfolios last 2nd quarter." (Teacher 7)

"It is very hard to follow up the e-portfolios of the students. Some will say that they cannot submit because they are just sharing a device with a sibling, their internet connection is slow, and some did not respond to our messages." (Teacher 8)

Lack of skills in Implementing E-portfolio. Secondary mathematics teachers realized that designing and implementing authentic e-assessments on e-portfolio was challenging since it was new and some of them were not equipped with the essential skills to implement it. Furthermore, teachers' lack of familiarity with e-portfolio and applications were factors teachers identified.

The following statements below were evident in the challenges secondary mathematics teachers, teaching regular curriculum, encountered in developing and implementing authentic e-assessment on e-portfolio.

"I personally admitted that I am a digital migrant and this relatively new type of assessment poses a challenge in my part since my skill set is not that efficient in implementing such e-assessment." (Teacher 8)

> *"This is new to all of us and we cannot guarantee that our skills will become effective right away. So, the challenge that I think all of us are experiencing is our lack of skills in implementing e-portfolio assessment."* (Teacher 7)

4. Determine the level of authenticity of teacher-made authentic e-assessment.

Data triangulation in qualitative research study is vital in increasing the credibility and validity of results (Creswell, 2013). In this study, the researcher developed an instrument that will measure the authenticity level of teacher-made authentic e-assessments to further validate the results on conception, practices and challenges experienced by the teachers while developing and implementing authentic e-assessment.

In determining the level of authenticity of teacher-made authentic e-assessments, the researcher together with two external assessors evaluated the teachers' authentic e-assessments using the researcher-made level of authenticity of authentic e-assessment instrument. The level of authenticity of authentic e-assessment instrument was specifically designed to evaluate performance, project, and e-portfolio assessments. Likewise, assessors were composed of two Master of Arts specialized in Educational Assessment and Evaluation – students who have successfully completed the academic requirements and passed the comprehensive examination for the program.

Below are the level of authenticity evaluation results of secondary mathematics teachers on performance, project, and e-portfolio authentic e-assessment.

4.1 Performance Assessment

10 out of 10 teacher teachers submitted sample authentic e-assessments on performance. Table 2 shows the level of authenticity of teacher-made authentic e-assessments on performance. The mean responses for all the participants ranged from 3.95 to 4.69 and standard deviation ranged from 0.46 to 0.76 with interpretations of "High Level of Authenticity is Manifested" and "Very High Level of Authenticity is Manifested".

Table: 2

Level of Authenticity of Teacher-Made Authentic E-Assessments on Performance

Cases	Teacher	Mean Score	Standard Deviation	Interpretation
Case 1: Science Curriculum	Teacher 1	4.69	0.46	Very High Level of Authenticity is Manifested
	Teacher 2	4.44	0.63	High Level of Authenticity is Manifested
Case 2: STEP Section / Pilot Section – Regular Curriculum	Teacher 3	4.38	0.47	High Level of Authenticity is Manifested
	Teacher 4	3.95	0.72	High Level of Authenticity is Manifested
Case 3 Regular Curriculum	Teacher 5	4.51	0.61	Very High Level of Authenticity is Manifested
	Teacher 6	4.54	0.48	Very High Level of Authenticity is Manifested
	Teacher 7	4.54	0.48	Very High Level of Authenticity is Manifested
	Teacher 8	3.95	0.76	High Level of Authenticity is Manifested

	Teacher 9	4.41	0.63	High Level of Authenticity is Manifested
	Teacher 10	4.31	0.66	High Level of Authenticity is Manifested

Note. Table 2 shows the mean score, standard deviation, and interpretation on level of authenticity of secondary mathematics teachers' performance e-assessments.

4.1.1. Science Curriculum.

As shown in Table 2, secondary mathematics teachers, teaching in schools with science curriculum, had mean scores of 4.69 and 4.44, and standard deviation of 0.46 and 0.63. The performance e-assessments of the teachers were interpreted as "Very High Level of Authenticity is Manifested" and "High Level of Authenticity is Manifested", respectively. This implied that the performance e-assessments given by teachers in science curriculum are highly aligned with the principles of high-quality assessment and seven principles of effective e-assessments.

4.1.2. STEP section - Regular Curriculum.

Table 2 shows that two secondary mathematics teachers, teaching in schools with science and technology, engineering mathematics section-regular curriculum, had mean scores of 4.38 and 3.95, and standard deviation 0.47 and 0.72, respectively. The performance e-assessment of the teachers were interpreted as "High Level of Authenticity is Manifested". This suggested that performance e-assessment of the teachers are highly aligned with the principles of high-quality assessment and seven principles of effective e-assessments.

4.1.3. Regular Curriculum.

Table 2 shows that secondary mathematics teachers teaching in schools with regular curriculum had mean scores ranging from 3.95 to 4.54, and standard deviation ranging from 0.48 to 0.76. Performance e-assessment of teachers 5,6, and 7 were interpreted as “Very High Level of Authenticity is Manifested”. Meanwhile, performance e-assessment of teachers 8, 9, and 10 were interpreted as “High Level of Authenticity is Manifested”. This indicated that performance e-assessment of mathematics teachers teaching in schools with regular curriculum were highly aligned with the principles of high-quality assessment and seven principles of effective e-assessments.

4.2. Project Assessment

4 out of 10 secondary mathematics teachers submitted sample authentic e-assessments on the project. Table 3 below shows the level of authenticity of teacher-made authentic e-assessments on projects. The mean responses for all the participants ranged from 4.31 to 4.46 and standard deviation ranged from 0.39 to 0.62 with interpretation of “High Level of Authenticity is Manifested”.

Table: 3

Level of Authenticity of Teacher-Made Authentic E-Assessments on Project

Cases	Teacher	Mean Score	Standard Deviation	Interpretation
Case 1: Science Curriculum	Teacher 1	4.46	0.39	High Level of Authenticity is Manifested
Case 2: STEP Section / Pilot Section – Regular Curriculum	Teacher 3	4.31	0.62	High Level of Authenticity is Manifested

Case 3: Regular Curriculum	Teacher 5	4.43	0.46	High Level of Authenticity is Manifested
	Teacher 10	4.41	0.48	High Level of Authenticity is Manifested

Note. Table 3 shows the mean score, standard deviation, and interpretation on level of authenticity of secondary mathematics teachers' project e-assessments.

4.2.1. <u>Science Curriculum.</u>

As shown in Table 3, secondary mathematics teacher, teaching in a school with science curriculum, had a mean score of 4.46 and a standard deviation of 0.39. Teacher's project was interpreted as "High Level of Authenticity is Manifested". This implied that the project authentic e-assessment given by the teacher was highly aligned with the principles of high-quality assessment and seven principles of effective e-assessments.

4.2.2. <u>STEP section – Regular Curriculum.</u>

Table 3 shows that the project e-assessment of secondary mathematics teacher, teaching in school with science and technology, engineering mathematics section-regular curriculum, had a mean score of 4.31 and standard deviation of 0.62. This was interpreted as "High Level of Authenticity is Manifested". This indicated that the project e-assessment given by the teacher in the STEP section – regular curriculum was highly aligned with the principles of high-quality assessment and seven principles of effective e-assessments.

4.2.3. <u>Regular Curriculum.</u>

As shown in Table 3, project e-assessments of secondary mathematics teachers, teaching in school with regular curriculum, had mean scores of 4.43 and 4.41 and standard deviation of 0.46 and 0.48 respectively. Project e-assessments of teachers 5 and 10 were interpreted as "High Level of Authenticity is Manifested". This meant that the project e-assessments were highly aligned with the principles of high-quality assessment and seven principles of effective e-assessments.

4.3. E-Portfolio

5 out of 10 teacher participants submitted sample authentic e-assessments on e-portfolio. Table 4 shows the level of authenticity of teacher-made authentic e-assessments on e-portfolio. The mean responses for all the participants ranged from 3.96 to 4.36 and standard deviation ranged from 0.28 to 0.75 with interpretation of "High Level of Authenticity is Manifested".

Table: 4

Level of Authenticity of Teacher-Made Authentic E-Assessments on E-Portfolio

Cases	Teacher	Mean Score	Standard Deviation	Interpretation
Case 1: Science Curriculum	Teacher 2	4.36	0.28	High Level of Authenticity is Manifested
Case 2: STEP Section / Pilot Section – Regular Curriculum	Teacher 3	4.09	0.58	High Level of Authenticity is Manifested
	Teacher 4	3.96	0.75	High Level of Authenticity is Manifested
Case 3: Regular Curriculum	Teacher 7	4.23	0.72	High Level of Authenticity is Manifested
	Teacher 8	4.06	0.64	High Level of Authenticity is Manifested

Note. Table 4 shows the mean score, standard deviation, and interpretation on level of authenticity of secondary mathematics teachers' e-portfolios.

4.3.1. <u>Science Curriculum.</u>

As shown in Table 4, the e-portfolio of secondary mathematics teacher, teaching in a school with science curriculum, had a mean score of 4.36 and standard deviation of 0.28. This was interpreted as “High Level of Authenticity is Manifested”. This implied that the e-portfolio given by the teacher in the science curriculum was highly aligned with the principles of high-quality assessment and seven principles of effective e-assessments.

4.3.2. <u>STEP section – Regular Curriculum.</u>

Table 4 shows that e-portfolios of secondary mathematics teachers, teaching in school with science and technology, engineering mathematics section-regular curriculum, had mean scores of 4.09 and 3.96, and standard deviation of 0.58 and 0.75, respectively. The e-portfolios of teachers 3 and 4 were interpreted as “High Level of Authenticity is Manifested”. This suggested that e-portfolios of teachers were highly aligned with the principles of high-quality assessment and seven principles of effective e-assessments.

4.3.3. <u>Regular Curriculum.</u>

As shown in Table 4, the e-portfolios of secondary mathematics teachers, teaching in school with regular curriculum, had mean scores of 4.23 and 4.06 and standard deviation of 0.72 and 0.64, respectively. The e-portfolios of teachers 7 and 8 were interpreted as “High Level of Authenticity is Manifested”. This implied that the e-portfolios given by the secondary mathematics teachers were highly aligned with the principles of high-quality assessment and seven principles of effective e-assessments.

5. Prepare a teacher support program for the development and implementation of authentic e-assessment.

Teachers' instruction and assessment methods are key determinants of students' learning and outcomes. According to Sigrun (2019), support programs significantly improve teachers' instruction skills and thus, provides better learning experience to students. Based on the results of the study, it was found out that most of teachers' concepts of authentic e-assessment are in accordance with the principles of high-quality assessment and seven principles of effective e-assessments. However, there are misconceptions identified in teachers' responses and needed to be corrected. Second, findings showed that teachers' conceptions have direct implication to their practices. Since most of teachers' concepts are aligned with assessment principles, their practices are mostly right and aligned with principles of effective assessment. Though, there are still some "wrong" practices that were identified in the study. These "wrong" practices rooted to teachers' unfamiliarity of different e-assessment tools and their insufficient understanding of e-assessments. Most of the teachers are applying their teaching and assessment methods in face-to-face learning into virtual learning. Teachers' unfamiliarity with e-assessments and insufficient skills are the reasons for teachers' encountered challenges. Likewise, these practices are needed to be identified and addressed properly to improve authentic e-assessment in online learning context. With this, teachers must be given an intervention that would educate them on the nature, characteristics, and proper application of different authentic e-assessments to produce quality authentic e-assessments and limit teacher encountered challenges.

Based on these findings, the researcher prepared a teacher support program planning matrix that focuses on increasing teachers' understanding of authentic e-assessment to lessen or eradicate misconceptions on e-assessments. The support program includes activities that will bring light to authentic e-assessment purposes and characteristics. Through familiarization of authentic e-assessment, teachers can better apply and create quality authentic e-assessments that are aligned with principles of assessments. Guidelines on scoring process online and use of results will also be included in the support program to address challenges encountered related to online checking and evaluation.

The teacher support program framework was composed of four intervention strategy elements namely: development goal, program purpose, outputs / results, and activities. The developmental goal focuses in increasing teachers' understanding of authentic e-assessments. This element aims to further educate teachers in the e-assessment process, correct misconceptions, and guide teachers in developing high-quality authentic e-assessments. Meanwhile, program purpose focuses on the specific details of authentic e-assessment such as definition of authentic e-assessment in online learning context, providing guidelines on proper development and implementation so that challenges encountered by teachers will be limited. Outputs and results are teachers' expected products during the support program. It includes their responses on four modules and their developed authentic e-assessments following e-assessment guidelines. Furthermore, teachers' authentic e-assessments on performance, project, and e-portfolio will be evaluated using the researcher-made level of authenticity instrument. Lastly, activities aim to engage teachers to plenary discussions and workshops to make their experience and learning more meaningful. For the teacher support program, four modules were recommended.

Each element stated has program narrative summary to clearly identify the goals intended to accomplish the program. Objective verifiable indicators show the important characteristics of the objectives and the standards expected to be reached. Means of verification are the tools used and processes followed to collect the data necessary to measure each objective. Furthermore, assumptions prepare the program for potential challenges in meeting the goals as well as determining if a program redesign would be beneficial. The researcher also added the anticipated inputs namely: resources, budget, time, for the proposed program.

The support program is intended to secondary mathematics teachers who are teaching in online distance learning modality. However, teachers teaching in modular learning and blended learning modalities may also undergo training on the support program of authentic e-assessment to increase teachers' understanding on authentic e-assessment and improve its practice. Moreover, to inform the teachers and correct misconceptions about authentic e-assessment in the context of online learning. Meanwhile, the Department of Education-division offices, in coordination with the DepEd-regional offices, is expected to be the main organizations in-charge for the implementation of the proposed teacher support program. Education partners and ICT-based institutions are highly encouraged to be part of the support program. Below shows the logical program matrix of the teacher support program.

Table 5:
Teacher Support Program Matrix on the Development and Implementation of authentic e-assessments

Intervention Strategy Elements	Program Narrative Summary	Objectively Verifiable Indicators (OVI)	Means of Verification (MOV)	Important Assumptions
Development Goal	Increase teachers' understanding of authentic e-assessment, including the purpose, application, scoring process, and use of results.	Identify teachers "correct" concepts and misconceptions on authentic e-assessment purpose, application, scoring process, and results.	Teachers' responses on the modules and discussions. Teachers' self-reflection on their authentic e-assessment practice.	Teachers retool themselves on the right concepts of authentic e-assessment. Lessen the challenges experienced by teachers in terms

				of application, scoring, and use of results.
	Learn to develop high-quality authentic e-assessment that are aligned with the principles of high-quality assessment and principles of effective e-assessments.	High or Very High authenticity level on teacher-made authentic e-assessment on performance, project, and e-portfolio.	Evaluation Result using the researcher-made level of Authenticity of an authentic e-assessment instrument.	Authentic e-assessments made by teachers have high to very high authenticity level. Increase students' motivation and provide better learning outcome.
Program Purpose	To define authentic e-assessment in the context of online learning.	Teachers are able to answer question about defining authentic e-assessments in online learning in the module.	Responses on modules and sharing	Teachers have clearly defined and understand authentic e-assessment in the context of online learning.
	To identify "correct" concepts and misconceptions on different authentic e-assessments.	Teachers are able to answer question about their concepts and practices on authentic e-assessment in the module.	Responses on modules and sharing	Teachers became aware on the correct concepts and misconceptions they have about authentic e-assessments.
	To improve the authenticity level of teacher-made authentic e-assessments by providing	Teachers were able to follow atleast 90% of the checklist-guidelines on the process of	Report on the checklist guidelines.	Teachers learned and apply the guidelines in developing and implementing authentic e-

	guidelines on the process of developing and implementing authentic e-assessment.	developing and implementing authentic e-assessment.		assessments with ease. Lessen the challenges experienced by teachers in planning, developing, and implementing authentic e-assessment.
	To come up with a sample authentic e-assessment on performance, project, and e-portfolio aligned with the principles of high-quality assessment and seven principles of effective e-assessment	Teachers are able to make authentic e-assessments which have high to very high alignment with the principles of high-quality assessment and seven principles of effective e-assessment	Evaluation Result using the researcher-made level of Authenticity of an authentic e-assessment instrument.	Authentic e-assessments made by teachers have high to very high authenticity level and are aligned with the principles of high-quality assessment and 7 principles of effective e-assessment. Increase students' motivation and provide better learning outcome.
Outputs / Results	Authentic E-Assessments, on performance, project, and e-portfolio, are aligned with the principles of high-quality assessments and seven principles	Teachers are able to make authentic e-assessments which are aligned with the principles of high-quality assessment and seven principles	Evaluation results of teacher-made authentic e-assessment on performance, project, and e-portfolio using the researcher-made level of	Teachers made high quality authentic e-assessments which are aligned with the principles of high-quality assessments and seven principles

	of effective e-assessments	of effective e-assessment	authenticity of authentic e-assessment instrument.	of effective e-assessments
Activities	To engage teachers in activities on developing and implementing high-quality authentic e-assessments.	Active participation in plenary discussions / Webinar Completion of 4 Modules: Module 1: Introduction to Authentic e-assessments Module 2: Developing an Authentic e-assessment Module 3: Implementation of Authentic e-assessment Module 4: Framing Authentic e-assessment within the larger context of	Observation checklist on teachers' active engagement in plenary discussions / Webinar. Modules Completion Report Modules Completion Report	Active participation of teachers is attained. Teachers will be equipped with essential knowledge in developing and implementing high-quality authentic e-assessments Teachers received a comprehensive training on the process of developing and implementing authentic e-assessments. Teachers will be equipped with essential knowledge in developing and implementing high-quality authentic e-assessments

		assessment system		
Inputs	Resources – Venue/online platform, Modules, Resource Speaker, Facilitators, Evaluators, ICT Institution partners Finance – DepEd regional and division offices may request funds from the DepEd Central Office on the budget needed for the training. Time – The program is expected to last for 3 days. The program can also be integrated in Inservice Training of teachers.			

Note. Table 5 shows the intervention strategy elements, objectively verifiable indications, means of verification, important assumptions, and inputs of the proposed teacher support program on the development and implementation of authentic e-assessments.

As shown in table 5, there were four modules, on the development and implementation of authentic e-assessment, that teachers needed to complete. Module 1 focuses on providing an introduction about authentic e-assessments, particularly on performance, project, and e-portfolio. The module prepares teachers to define authentic e-assessments, to articulate the main reasons for using performance, project and e-portfolio assessments, to know how to use authentic e-assessments, identify and correct concepts and misconceptions on authentic e-assessment, and to identify the relationship of e-assessments to content standards and performance standards of the education curriculum. Meanwhile, module 2 focuses on developing authentic e-assessment by identifying the students who are the recipients of e-assessment, specifying the assessment's purpose, unpacking content and performance standards, and ensuring alignment with the principles of high-quality assessment and 7 principles of effective e-assessment. Module 3 guides the teachers in the implementation of authentic e-assessment through designing and preparing an authentic e-assessment, creating a scoring rubric, and engaging students in that process and how to use the rubric to evaluate student work. Lastly, module 4 focuses on framing authentic e-assessment within the larger context of assessment system and discussing the role of authentic e-assessment in a comprehensive online assessment system. The module explores the types of evidence teachers can collect from performance, project, and e-portfolio assessments and offer ideas for how students, teachers, and school leaders can use the results.

Implications of the Research on Theory

Familiarity and mastery on different e-assessments is a hallmark of effective online teachers who know their subject and know to teach their subject to students. Although secondary mathematics teachers have high to very high authenticity level on their developed authentic e-assessments, they are less confident in their ability to be familiar and utilized different e-assessment tools. Teachers shared that there were situations where they were assisted by students during e-assessments. Furthermore, secondary mathematics teachers selected only e-assessment tools that they are familiar with even though they know it is not a proper tool for the assessment. With this, the curriculum of teacher education, on undergraduate level, can inspire the components, in including familiarity and application of authentic e-assessment in online learning, and creating guidelines on the use and interpretation of e-assessment to the educational assessment courses.

Evidence suggested that authentic e-assessment need to be aligned with school program-, and national instruction and assessment. Although it is challenging in the part of secondary mathematics teachers to modify e-assessments in the module, teachers still thrive to revise and create an e-assessment that is essential in the schools' curriculum program. Steps should be taken to better aide the teachers in planning and increasing the effectiveness of e-assessment based on different curriculum program of schools.

In addition, further research may be done on other factors that might affect the developed authentic e-assessments of secondary mathematics teachers in online learning. This may help in providing additional component for training and professional development of teachers.

Implications of the Research for Practice

Research indicates that teachers' concepts on authentic e-assessment directly affects teachers practices in the development and implementation of authentic e-assessments. As shown in secondary mathematics teachers' practices, teachers whose concepts on authentic e-assessment were mostly aligned with the principles of effective e-assessment and seven principles of effective e-assessments also achieved most of the principles in their practices. This was further validated by the result of the evaluation on level of authenticity of teacher-made authentic e-assessment. Teachers who conceived and practiced most the principles have high to very high level of authenticity in the teacher-made authentic e-assessments. Thus, it is critical and essential to establish the right concepts on authentic e-assessments among teachers in the context of online learning in order to improve e-assessment practices. With this, the need for providing trainings and seminars on the use of authentic e-assessment are highly needed.

Establishing the right concepts and practices on authentic e-assessment is correlated with high-quality authentic e-assessments. Teachers felt that some of their teaching skills in face-to-face classes became irrelevant in online platform. This perception suggests that teachers need to equip themselves with essential understanding and skills in online teaching and learning. With proper training, teachers can do better and become more confident and effective in delivering their instructions and assessments online. Despite teachers' high level of authenticity in their authentic e-assessments, there were misconceptions and challenges that should be addressed to empower teachers' practices in online platform.

According to the research, on the challenges experienced by teachers, a reasonable amount of time is critical for them to effectively develop and implement authentic e-assessments. The data indicates that teachers had very limited time to prepare and develop their assessments due to tantamount paperwork and sudden shift in online classes. Moreover, teachers had hard time collecting, checking, and giving feedback to students on their performances and projects. The paperwork teachers need to accomplish consumed their time intended for instruction and assessments. A focus to aide on these areas may improve teachers' effectiveness in practicing online instruction and assessment.

Chapter 4

Summary, Conclusions, and Recommendations

This chapter presents the summary, conclusion, and recommendations put forth by the researcher in the study. It includes the summary of the study, summary of findings, limitations, conclusions, and recommendations.

Summary of the Study

This multiple case study sought to understand the conceptions and practices of secondary mathematics teachers in Laguna on authentic e-assessment, particularly performance, project, and e-portfolio amidst COVID-19 pandemic. The research participants came from three curriculum categories of school namely science curriculum, science and technology, engineering mathematics (STEP) section- regular curriculum, and regular curriculum. This variation in curriculum became the basis of the researcher in classifying the three cases in this multiple case study. Specifically, it answered these statements: the conceptions and the practices of secondary mathematics teachers in developing authentic e-assessments on performance, project, and e-portfolio; the challenges teachers encountered in the development of authentic e-assessment on performance, project, and e-portfolio; the level of authenticity of teacher-made authentic e-assessment on performance, project, and e-portfolio. After holistic within-case and across-case analysis, the researcher prepared a teacher support program for the development and implementation of authentic e-assessment.

Ten secondary mathematics teachers from three divisions in the province of Laguna participated in the study. Two teachers were teaching in science high schools, another two teachers were teaching in science and technology, engineering, mathematics section – regular curriculum, while the remaining six teachers were teaching in high schools following regular curriculum. Data in the study came from multiple sources such as interviews, observations, open-ended questionnaires, and participants' submitted artifacts. Responses of which were coded and analyzed using holistic three-way within-case and across-case data analysis for multiple case study.

From the analysis of these data, it was found out that the majority of teachers developed authentic e-assessments are on the level "High Level of Authenticity" which meant that it was significantly aligned with the principles of high-quality assessment and seven principles of effective e-assessment. There were four performance authentic e-assessments were on the level "Very High Level of Authenticity" which indicated very high alignment with the principles of high-quality assessment and seven principles of effective e-assessments.

Meanwhile, the data showed that the majority of secondary mathematics teachers' concepts in developing authentic e-assessment, on performance, project, and e-portfolio, had significant alignment with the principles of high-quality assessment and seven principles of effective e-assessment. However, there were misconceptions identified like the use of e-portfolio as file repository and treating project e-assessment as biased assessment. Meanwhile, the majority of participants' practices on authentic e-assessment were significantly aligned with the principles of high-quality assessment and seven principles of effective e-assessment.

Lastly, the challenges identified in the study pertained to insufficient knowledge, lack of skills, and unavailability of tools in developing and implementing authentic e-assessments. These challenges and the results of the level of authenticity of teacher-made authentic e-assessments were the bases of the professional support program in the study.

Summary of Results

The following were the findings of the study:

1. **On the conceptions of secondary mathematics teachers in developing authentic e-assessment.**

1.1. Performance. Secondary mathematics teachers, from cases 1,2, and 3 perceived performance e-assessment as an assessment that demonstrates students acquired 21st century skills. Moreover, Performance e-assessment must be sensitive to students' needs and flexible given the challenges brought by the pandemic. However, it is unique that Case 2 teachers viewed performance assessment as a biased assessment that is advantageous only to students with available devices.

1.2. Project. Secondary mathematics teachers, from cases 1,2, and 3 perceived project e-assessment as concrete evidence of students learned 21st century skills. Moreover, Project-based assessment was viewed as an intricate assessment that needs systematic and careful planning. Furthermore, teachers agreed that projects must be economical to allow every student to do the assessment.

1.3. E-portfolio. Secondary mathematics teachers, from cases 1,2, and 3 perceived e-portfolio assessment as purposeful collection of students' creative outputs and activities online. Likewise, teachers emphasized that e-portfolio is evidence of students' achievement, tool for progress monitoring, and basis for improvement. However, it was unique that Cases 1 and 3 teachers viewed e-portfolio as students' file repository.

2. **On the practices of secondary mathematics teachers in developing authentic e-assessment.**

   2.1. Performance. Secondary mathematics teachers, from cases 1,2, and 3 practiced performance e-assessment by utilizing a communication system to inform, conducts follow-ups, and give encouraging feedback to students. Moreover, teachers recognized and reward best performance outputs of students. Furthermore, teachers utilized and revised performance assessment in DepEd module and scoring rubric. Meanwhile, it was unique that cases 1 and 3 were harmonizing performance assessment with other subjects.

   2.2. Project. Secondary mathematics teachers, from cases 1,2, and 3 practiced project e-assessment by applying a systematic and careful planning prior to the development of e-projects. Teachers also utilized a communication system to give instructions, conducts follow-ups, and give encouraging feedback to students. Moreover, teachers used a scoring rubric in assessing students' projects. Meanwhile, it was unique that cases 1 and 3 were providing positive reinforcement, like reward. Furthermore, only case 1 teacher was harmonizing project e-assessment with other subjects.

   2.3. E-portfolio. Secondary mathematics teachers, from cases 1,2, and 3 practiced e-portfolio assessment by utilizing a communication system to give instructions, conducts follow-ups, and give encouraging feedback to students. Moreover, teachers ensure that they evaluated students e-portfolios. Meanwhile, it was unique that cases 1 utilized e-portfolios as additional file repository.

3. On the challenges of secondary mathematics teachers in developing authentic e-assessment.

3.1. Performance. Secondary mathematics teachers, from cases 1,2, and 3 had difficulty in adjusting with the abrupt instruction shift. Likewise, teachers' limited familiarity with essential performance tools hindered them in selecting appropriate e-assessment. Lastly, external factors like intermittent internet connection and limited resources added to the challenges experienced by teachers.

3.2. Project. Secondary mathematics teachers, from cases 1,2, and 3 had difficulty in adjusting with the abrupt instruction shift. Moreover, teachers' lack of familiarity with essential project tools hindered them in selecting appropriate e-assessment. Lastly, scarcity of resources due to quarantine restrictions added to the challenges experienced by teachers.

3.3. E-portfolio. Secondary mathematics teachers, from cases 1,2, and 3 had difficulty in adjusting with the abrupt instruction shift. Furthermore, teachers' lack of familiarity with essential e-portfolio tools hindered them in selecting appropriate e-assessment.

4. On the Level of Authenticity of Teacher-Made Authentic E-Assessment.

4.1. Performance. Performance e-assessment of teacher 1 of case 1 and teachers 5, 6, and 7 of case 3, showed "Very High Level of Authenticity". Meanwhile, performance e-assessment of remaining teachers were interpreted as "High Level of Authenticity".

4.2. Project. Project e-assessments of secondary mathematics teachers, teaching in school with science curriculum, STEP section – regular curriculum, and regular curriculum manifested "High Level of Authenticity".

4.3. <u>E-portfolio.</u> E-portfolio assessment of secondary mathematics teachers, teaching in school with science curriculum, STEP section – regular curriculum, and regular curriculum manifested “High Level of Authenticity”.

5. **On the teacher support program for the development and implementation of authentic e-assessment.**

The study showed evidence of teachers’ misconceptions and incorrect practice of authentic e-assessment, particularly on e-portfolio. With this, researcher prepared a teacher support program planning matrix to increase teachers’ understanding on different authentic e-assessment, including the purpose, application, scoring process, and use of results (see Table 5). Moreover, the support program aims to correct misconceptions and practices of secondary mathematics in developing and implementing authentic e-assessment on performance, project, and e-portfolio.

Limitation of the Study

The study was conducted last April 2021 until July 2021. During this time, the Philippines and the rest of the countries worldwide were experiencing the COVID-19 pandemic. This affected all the people and it hindered close contact with everyone. With this, the researcher only utilized online platforms in data gathering such as online interviews and online class observations. Furthermore, there were only ten secondary mathematics teachers in Laguna, composed of two teachers teaching in science high school, two teachers teaching in STEP section - integrated school, and six teachers teaching in national high schools and integrated high schools, participated in the study. Less number of teachers from schools with science curriculum and STEP section were due to limited teachers who committed and spent time for the completion of the study.

Due to busy schedules of the teachers, online observations were limited to two. Recorded class videos while conducting authentic e-assessment were also considered as alternative for class observations. Likewise, three teachers submitted their responses on the short interview questions through electronic documents.

The study was limited only to determine secondary mathematics teachers' conceptions, practices, and level of authenticity of teacher-made authentic e-assessment on performance, project, and e-portfolio. Thus, only math teachers with online classes participated the study. Furthermore, respondents' conceptions, practices, and challenges encountered while developing and implementing authentic e-assessment were holistically analyzed to create a teacher support program for the development and implementation of authentic e-assessments.

Conclusions

The aforementioned discussion and results led the researcher to conclude that teachers' practices of authentic e-assessment on performance, project, and e-portfolio are directly influenced by their concepts. Moreover, teachers showed truthfulness to their commitment by learning new skills to ensure that their instruction and assessment are appropriate and effective in e-learning. Furthermore, secondary mathematics teachers, in this challenging time of COVID-19 pandemic, are thriving and showing resilience to deliver quality education to their students, aligned with the national standards. Lastly, the implementation of the teacher support program is highly needed to correct misconceptions and "wrong" practices of teachers and to lessen challenges teachers might encounter in developing and implementing authentic e-assessments.

Recommendations

In the light of the findings and conclusions drawn from the study, the following are recommended:

Supporting Professional Development. Since online distance learning is relatively new in the Philippines, teachers in Laguna encountered difficulty in developing, implementing, and assessing authentic e-assessment. With this, it is highly recommended that the Department of Education supports free teacher's professional development through attendance in seminars, trainings and workshops that would broaden knowledge and upskill teachers' competencies in delivering authentic e-assessment. With so many factors contributing to student's learning nowadays, electronic assessment quality should be given importance for it will indicate the degree of success students achieved in online learning. Moreover, enhancing the knowledge, values and skills of teachers should be a continuous commitment of education leaders in order to guarantee that the education system is at a competitive state. Likewise, professional development is an essential element in empowering teachers' commitment and satisfaction in their work. As a result, this would refuel their teaching passion and promote an inspiration beyond monetary and positional terms. The following were suggested to improve e-assessment instructions and practice.

a) **Building Partnerships**. Having necessary knowledge in technology-based web tools is vital to teachers in selecting and utilizing their authentic e-assessment. Based on the results of the level of authenticity of teacher-made authentic e-assessment instrument, it showed that some teachers have poor e-assessment methods and use inappropriate web tools on their authentic e-assessments. Building partnerships with different ICT-based education organizations would promote advancement towards teaching in online platforms among teachers. Currently, the Department of Education is in search of partnerships with private sectors to address certain deficiencies in classroom, textbooks, instructors, school work areas and sanitation facilities. This system could be improved by pursuing the "adopt a school program" among private or non-government organizations to public and non-public schools in every division. In the current school year, there are telecommunication companies and computer manufacturers who generously donated devices to help schools in their locality with their needs to deliver online distance learning. Truly, this future mutual partnership would bring better online education experience to our learners and thus, uplifts the quality of education as a whole.

b) **Mentoring / Buddy System**. Digitizing learning poses challenges not just to students but also to teachers who are not technology literate. Secondary mathematics teacher-participants shared that they were being guided by teachers, who are literate in using such web tools and devices, which is why they are able to deliver online distance learning confidently. Having this system be included in the program would promote cooperation and would enhance communication among teachers sharing common vision to give quality online education among learners. Moreover, to be able to have an online education mentor is essential in improving teachers' instruction and assessment practices and thus boosts their confidence in teaching.

Educators who were considered best in their field could be raised as "mentors" and could share useful input, conduct online training, and facilitate virtual demonstrations on instructions and assessment. Likewise, to supplement this system, school heads should facilitate a buddy system among their teachers to check the alignment with the guidelines of the implementation.

c) **In-Service Training.** According to researchers, it would take several years before everything will get back to normal physical classes. With this, it is important that education leaders would consider adding topics pertaining to current situations. Re-tooling on online instructions and giving of authentic e-assessments could be considered in modifying teachers' in-service training. This would serve as a venue for collaboration, reinforcement, motivation and enhancement among teachers nowadays.

Provide Reward or Recognition to Exemplary Authentic E-Assessments. Recognizing exemplary authentic e-assessments would motivate and inspire secondary mathematics teachers to develop assessments that would bring out the 21st century skills among learners. Department of Education – Division offices are encouraged to assess schools' authentic e-assessments in order to select and create a pool of best e-assessments. The pool of e-assessments could be modified to form a module that contains all best assessment tools and the necessary details in developing and implementing such authentic e-assessments. In this way, the system of e-assessment could be improved for the coming school years.

Teacher-Aide Assistance for Paperwork. One of the challenges pointed out by secondary mathematics teacher-participants were related to insufficient time they have for the development and implementation of authentic e-assessment. Moreover, they found it difficult to check and provide feedback to students' submissions. According to them, this was due to lots of paperwork participants needed to accomplish. With less paperwork to accomplish, participants believe that they could maximize the time to properly develop and conduct authentic e-assessment in their teaching.

Conduct Pilot Implementation of Teacher Support Program on Authentic E-Assessment. The study suggests that there is a need to conduct a teacher support program to correct the misconceptions and practices of teachers and to significantly increase their understanding of authentic e-assessment, including the purpose, application, scoring process, and use of results. With this, the researcher would recommend to conduct pilot testing of the teacher support program on development and implementation of authentic e-assessment using the logical program matrix shown in table 5. Moreover, a more comprehensive program can be crafted to address gaps and issues in the researcher-made program matrix.

Finally, further qualitative research studies might be done using other methods to explore teachers' concepts and practices of other online alternative e-assessments. Grounded theory approach can be utilized to develop a theorized model of professional e-learning process in authentic online learning environment Also, single case study can provide a more comprehensive teachers' experience of their online instruction and e-assessment. Furthermore, studies might be conducted to validate the results of the present study and to find out similarities or differences in the results. Lastly, similar research studies might be conducted on the different authentic e-assessments in the educational system as this would help in the process of selection, provide training, and require the professional development of new and experienced teachers.

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APPENDICES

APPENDIX A

Republic of the Philippines
Department of Education
Region 4A CALABARZON
SCHOOLS DIVISION OF CALAMBA CITY

1st INDORSEMENT
April 23, 2021

Respectfully returned to **Mr. CHRISTOFER C. CORONADO,** interposing no objection to administer interview and survey questionnaire to selected teachers in the Schools Division of Calamba City. This is for the completion of his research entitled **"Assessment of Mathematics Teacher's Conceptions and Practices of Authentic E-Assessment during COVID Pandemic: A Case Study".**

It is expected that adherence to DepEd's time-on-task policy shall be observed, ensuring that no disruption of classes will occur in the conduct of the said activity. It is also recommended that the interview and survey shall be administered online in line with the safety health protocols amidst COVID-19 pandemic. All the data gathered shall be used solely for the research purposes in compliance with Data Privacy Act 2012.

Requesting also that this office be furnished a copy of the results of the study.

SUSAN DL ORIBIANA
Schools Division Superintendent

DMP/Research Endorsement
E20210008/April 23, 2021

Address: City Hall Compound, Brgy. Real, Calamba City, Laguna
Telephone No: (049) 554-9830 to 34
Email Address: calamba.city@deped.gov.ph
Website: https://depedcalambacity.com.ph

Republic of the Philippines
Department of Education
REGION IV-A CALABARZON
CITY SCHOOLS DIVISION OF CABUYAO

DIVISION LETTER

To	:	**EDNA F. HEMEDEZ, EdD** Chief, Curriculum Implementation Division
Thru:	:	**ALBERTO LABIGAN** EPS - Mathematics
From	:	SCHOOLS DIVISION SUPERINTENDENT
Date	:	April 15, 2021

Attached herewith is a letter request from **CHRISTOPHER C. CORONADO,** Master of Arts in Educational Assessment and Evaluation student at the Philippine Normal University, Manila, to conduct a survey to selected mathematics teachers, relative to his research entitled ***"Assessment of Mathematics Teachers' Conceptions and Practices of Authentic E-Assessment during the COVID Pandemic: A Case Study"***.

Permission is hereby granted provided that it adheres with the following conditions:

1. strict observance of DepEd Time-on-Task Policy;
2. it must be in accordance with the Republic Act No. 10173 – Data Privacy Act of 2012;
3. participation of respondents must be via online and voluntary; and
4. the results of the study must be treated with utmost confidentiality and that this Office will be provided a copy/result of the research.

For your information..

Heriberto Jose D. Miranda

HEREBERTO JOSE D. MIRANDA, CESO VI
Schools Division Superintendent

2021-0415-21 OSDS-AAT

Address: Osmeña Street, Poblacion II, City of Cabuyao, Laguna
Telephone No.: (049) 545 4597 / (049) 545 4878
Email Address: division.cabuyao@deped.gov.ph
Website: depedcabuyao.ph

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

CITY SCHOOLS DIVISION OF CABUYAO
RECORDS UNIT
RECEIVED
Control No: 2021-0415-21
Date: APR.15,2021 By: GTF

April 15, 2021

MR. HEREBERTO JOSE D. MIRANDA CESO VI
Schools Division Superintendent
City Schools Division of Cabuyao
City of Cabuyao, Laguna

THRU: DR. EDNA F. HEMEDEZ
Chief, Curriculum and Implementation Division
City Schools Division of Cabuyao
City of Cabuyao, Laguna

RE: Permission to Conduct Research Study

Dear Dr. Miranda,

Greetings of peace and good health!

I am writing to request permission to conduct a research study at the City Schools Division of Cabuyao. I am currently enrolled in the program ***Master of Arts in Educational Assessment and Evaluation*** at the Philippine Normal University, Manila, and in the process of writing my Master's thesis. The study is entitled "***Assessment of Mathematics Teachers' Conceptions and Practices of Authentic E-Assessment during the COVID Pandemic: A Case Study***".

I hope that the city school division administration will allow me to recruit 10 secondary Mathematics teachers from different schools in the division of Cabuyao. Schools to participate are based on the recommendations of CID-Chief and EPS-Mathematics. Interested teachers, who volunteer to participate, or recommended by the school principal, will be given a consent form to be signed (*copy enclosed*) and returned to the primary researcher at the beginning of the research process.

Once approved, the research process will begin. Interview and administration of Perception on Authentic E-Assessment questionnaire should take no longer than 30 minutes. The results of interview and questionnaire will be pooled for the thesis project and individual results of this study will remain absolutely confidential and anonymous. Should this study be published, only pooled results will be documented. No costs will be incurred by either your department/school or the individual participants.

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

PHILIPPINE NORMAL UNIVERSITY
GRADUATE RESEARCH OFFICE

Your approval to conduct this study will be greatly appreciated. I will follow up with a telephone call next week and would be happy to answer any questions or concerns that you may have at that time. You may contact me at 09231086364 and my email address: coronado.cc@pnu.edu.ph.

If you agree, kindly attach your e-signature or sign below. Alternatively, kindly submit a signed letter of permission bearing your organization letter head acknowledging your consent and permission for me to conduct this study.

Sincerely,

Mr. Christofer C. Coronado
Researcher

Enclosures:

cc: Dr. Rosie L. Conde
Research Adviser

Approved by:

Ms. Edna F. Hemedez EdD
Chief, Curriculum and Implementation Division
City Schools Division of Cabuyao
City of Cabuyao, Laguna

Mr. Hereberto Jose D. Miranda CESO VI
Schools Division Superintendent
City Schools Division of Cabuyao
City of Cabuyao, Laguna

Republic of the Philippines
Department of Education
REGION IV-A CALABARZON
SCHOOLS DIVISION OFFICE OF SANTA ROSA CITY

April 20, 2021

CHRISTOPHER C. CORONADO
Researcher
Philippine Normal University

Dear researcher:

In response to your request letter for the conduct of your research study with the title, "Assessment of Mathematics Teachers' Conceptions and Practices of Authentic E-Assessment during the COVID Pandemic: A Case Study," this office hereby allows its conduct after reviewing the submitted copy of your research instrument for the necessary data gathering procedures to your target research participants and research locale.

It is also assumed that the observance of the minimum health protocols being implemented by the Department of Health (DOH) and the Inter-Agency Task Force (IATF) will be strictly followed.

In addition, the Planning and Research Section (PRS) of School Governance and Operations Division (SGOD) respectfully requests a copy of the full paper upon completing the conduct of the said research study in order to have additional research-based data which can also be utilized as basis in addressing other issues among the schools. You may send the soft copy through this link: bit.ly/SRCresearchportal. Likewise, for further improvement of the PRS services, kindly answer the feedback survey form through this link: bit.ly/FEEDBACK18. Thank you.

Very truly yours,

MANUELA S. TOLENTINO, CESO V
Schools Division Superintendent

21-04com-191

2nd Flr. Leon C. Arcillas Bld.g Brgy. Market Area, City of Santa Rosa, Laguna
(049) 534-5283
santarosa.city@deped.gov.ph www.depedsantarosa.ph

Republic of the Philippines
Department of Education
REGION IV-A CALABARZON
SCHOOLS DIVISION OFFICE OF SANTA ROSA CITY

1st Indorsement

April 20, 2021

Respectfully referred to **Public Elementary and Secondary School Heads**, Schools Division of Santa Rosa City, for information and appropriate action, the attached letter request received last April 20, 2021 from Christopher C. Coronado, a post-graduate student of Philippine Normal University, relative to the conduct of the research, "Assessment of Mathematics Teachers' Conceptions and Practices of Authentic E-Assessment during the COVID Pandemic: A Case Study."

Further, the schools are advised to strictly observe the "No Disruption of Classes Policy" (DepEd Order No. 09, s. 2005), applicable provisions of the Data Privacy Act of 2012 and minimum public health standards during the data gathering procedures.

MANUELA S. TOLENTINO, CESO V
Schools Division Superintendent

4/19/2021 Department of Education Mail - Permission to Conduct Research Study

DepED

DepEd Sta. Rosa City <santarosa.city@deped.gov.ph>

Department of Education
SCHOOLS DIVISION OF SANTA ROSA CITY
RECEIVED
Ref. No. 003171
Received by: mah Date: 4/19/21 :14

Permission to Conduct Research Study

2 messages

CORONADO, CHRISTOFER <coronado.cc@pnu.edu.ph> Thu, Apr 15, 2021 at 6:15 PM
To: santarosa.city@deped.gov.ph

Greetings of peace and good health!

Attached herewith is a letter of intent pertinent to my Masters Thesis.
Hoping for your favourable response in this important endeavor.

Enclosures: Data gathering instruments.

Appendix C: Perception on Authentic E-Assessment Questionnaire
Appendix E: Short Interview Guide Questions

3 attachments

Letter of Intent-SDO Santa Rosa (Thesis-Coronado).pdf
537K

(Appendix E) Interview Guide Questions.pdf
410K

(Appendix C) Perception on Authentic E-Assessment Questionnaire.pdf
419K

CORONADO, CHRISTOFER <coronado.cc@pnu.edu.ph> Mon, Apr 19, 2021 at 9:57 AM
To: santarosa.city@deped.gov.ph

Blessed Morning po. Update lang po sana regarding po sa sent email ko po last week (Re: Permission to Conduct Research Study). Thank you very much po and God Bless.
[Quoted text hidden]

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

PHILIPPINE NORMAL UNIVERSITY GRADUATE RESEARCH OFFICE

April 15, 2021

DR. MANUELA S. TOLENTINO, CESO V
Schools Division Superintendent
Schools Division Office of Santa Rosa City
Santa Rosa City, Laguna

RE: Permission to Conduct Research Study

Dear Dr. Tolentino,

Greetings of peace and good health!

I am writing to request permission to conduct a research study at the Schools Division Office of Santa Rosa City. I am currently enrolled in the program ***Master of Arts in Educational Assessment and Evaluation*** at the Philippine Normal University, Manila, and in the process of writing my Master's thesis. The study is entitled "***Assessment of Mathematics Teachers' Conceptions and Practices of Authentic E-Assessment during the COVID Pandemic: A Case Study***".

I hope that the city school division administration will allow me to recruit 3 secondary Mathematics teachers from different schools in the division of Santa Rosa City. Schools to participate are based on the recommendations of CID-Chief and EPS-Mathematics, preferably school with less than 1000 students, more than 1000 students, and science high school. Interested teachers, who volunteer to participate, or recommended by the school principal, will be given a consent form to be signed (*copy enclosed*) and returned to the primary researcher at the beginning of the research process.

Once approved, the research process will begin. Interview and administration of Perception on Authentic E-Assessment questionnaire should take no longer than 30 minutes. The results of interview and questionnaire will be pooled for the thesis project and individual results of this study will remain absolutely confidential and anonymous. Should this study be published, only pooled results will be documented. No costs will be incurred by either your department/school or the individual participants.

Your approval to conduct this study will be greatly appreciated. I will follow up with a telephone call next week and would be happy to answer any questions or concerns that you may have at that time. You may contact me at 09231086364 and my email address: coronado.cc@pnu.edu.ph.

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

PHILIPPINE NORMAL UNIVERSITY
GRADUATE RESEARCH OFFICE

If you agree, kindly attach your e-signature or sign below. Alternatively, kindly submit a signed letter of permission bearing your organization letter head acknowledging your consent and permission for me to conduct this study.

Sincerely,

Mr. Christoper C. Coronado
Researcher

Enclosures:

cc: Dr. Rosie L. Conde
Research Adviser

Approved by:

DR. MANUELA S. TOLENTINO, CESO V
Schools Division Superintendent
Schools Division Office of Santa Rosa City
Santa Rosa City, Laguna

APPENDIX B

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

April 29,2021

Dear Participant,

Greetings of peace and good health!

I would like to invite you to participate in my research study entitled "***Assessment of Mathematics Teachers' Conceptions and Practices of Authentic E-Assessment during the COVID Pandemic: A Case Study"***. I am currently enrolled in the program ***Master of Arts in Education specialized in Educational Assessment and Evaluation*** at the Philippine Normal University, Manila, and in the process of writing my Master's Thesis.

The main purpose of this study is to conduct an in-depth analysis on secondary mathematics teachers' conceptions and practices on authentic e-assessment during the COVID pandemic.

The enclosed perception on Authentic E-Assessment questionnaire has been designed to collect information on:

(a) Familiarity of teachers in authentic e-assessment.
(b) Conceptions and practices of teachers in developing authentic e-assessments.

Furthermore, to fully understand the participants' conceptions and practices, the researcher would like to ask permission for the following:

(1) Submit sample/samples of authentic e-assessment that you implemented in class or done by your students.
(2) Allow the researcher to conduct an online observation of your class conducting an authentic e-assessment or activity (*atleast twice*). The online observation will be followed by a short interview, not exceeding 30 minutes.
(3) Respond to the Self-Reflection instrument.

Your participation in this research study is completely voluntary. You may decline, or leave blank any question/s you don't wish to answer. There are no known risks to participation beyond those encountered in everyday life. The entire research process is guided by RA 10173 or the Data Privacy Act of 2012. Any personal information that you share will be kept confidential.

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

Data from this research will be kept under lock and key and reported only as a collective combined total study. No one, other than the researcher, will know your individual answers to interviews and instruments.

If you agree to participate in this research, please get in touch with the researcher at coronado.cc@pnu.edu.ph or 09231086364.

If you have any questions about this research, feel free to contact the researcher at indicated email and contact number. Thank you very much for your assistance and participation in this important endeavor.

Sincerely yours,

CHRISTOFER C. CORONADO
Researcher

Enclosures:

cc: **DR. ROSIE L. CONDE**
Research Adviser

I provide my consent to participate in this study.

[redacted] (Printed Name)

[redacted] (Signature)

May 7, 2021 (Date)

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

April 29,2021

Dear Participant,

Greetings of peace and good health!

I would like to invite you to participate in my research study entitled "***Assessment of Mathematics Teachers' Conceptions and Practices of Authentic E-Assessment during the COVID Pandemic: A Case Study"***. I am currently enrolled in the program ***Master of Arts in Education specialized in Educational Assessment and Evaluation*** at the Philippine Normal University, Manila, and in the process of writing my Master's Thesis.

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Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

PHILIPPINE NORMAL UNIVERSITY
GRADUATE RESEARCH OFFICE

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If you agree to participate in this research, please get in touch with the researcher at coronado.cc@pnu.edu.ph or 09231086364.

If you have any questions about this research, feel free to contact the researcher at indicated email and contact number. Thank you very much for your assistance and participation in this important endeavor.

Sincerely yours,

CHRISTOFER C. CORONADO
Researcher

Enclosures:

cc: **DR. ROSIE L. CONDE**
Research Adviser

I provide my consent to participate in this study.

[redacted]________________ (Printed Name)

[redacted]______________________ (Signature)

__May 5, 2021____________________________ (Date)

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

April 20, 2021

Dear Participant,

Greetings of peace and good health!

I would like to invite you to participate in my research study entitled "***Assessment of Mathematics Teachers' Conceptions and Practices of Authentic E-Assessment during the COVID Pandemic: A Case Study***". I am currently enrolled in the program ***Master of Arts in Education specialized in Educational Assessment and Evaluation*** at the Philippine Normal University, Manila, and in the process of writing my Master's Thesis.

The main purpose of this study is to conduct an in-depth analysis on secondary mathematics teachers' conceptions and practices on authentic e-assessment during the COVID pandemic.

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Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

combined total study. No one, other than the researcher, will know your individual answers to interviews and instruments.

If you agree to participate in this research, please get in touch with the researcher at coronado.cc@pnu.edu.ph or 09231086364.

If you have any questions about this research, feel free to contact the researcher at indicated email and contact number. Thank you very much for your assistance and participation in this important endeavor.

Sincerely yours,

CHRISTOFER C. CORONADO
Researcher

Enclosures:

cc: **DR. ROSIE L. CONDE**
Research Adviser

I provide my consent to participate in this study.

[redacted] (Printed Name)

[redacted] (Signature)

04-26-2021 (Date)

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

April 19, 2021

Dear Participant,

Greetings of peace and good health!

I would like to invite you to participate in a research study entitled "***Assessment of Mathematics Teachers' Conceptions and Practices of Authentic E-Assessment during the COVID Pandemic: A Case Study"***. I am currently enrolled in the program ***Master of Arts in Education specialized in Educational Assessment and Evaluation*** at the Philippine Normal University, Manila, and in the process of writing my Master's Thesis.

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National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

If you agree to participate in this research, please get in touch with the researcher at combined total. No one other than the researcher will know your individual answers to interviews and instruments.

coronado.cc@pnu.edu.ph or 09311764177

If you have any questions about this research, feel free to contact the researcher at indicated email and contact number. Thank you very much for your assistance and participation in this important endeavor.

Sincerely yours,

Mr. Christofer C. Coronado
Researcher

Enclosures:

cc: Dr. Rosie L. Conde
Research Adviser

I provide my consent to participate in this study.

[redacted] (Printed Name)

[redacted]________________________ (Signature)

APRIL 23, 2021 (Date)

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

April 29,2021

Dear Participant,

Greetings of peace and good health!

I would like to invite you to participate in my research study entitled "***Assessment of Mathematics Teachers' Conceptions and Practices of Authentic E-Assessment during the COVID Pandemic: A Case Study"***. I am currently enrolled in the program ***Master of Arts in Education specialized in Educational Assessment and Evaluation*** at the Philippine Normal University, Manila, and in the process of writing my Master's Thesis.

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Sincerely yours,

CHRISTOFER C. CORONADO
Researcher

Enclosures:

cc: **DR. ROSIE L. CONDE**
Research Adviser

I provide my consent to participate in this study.

[redacted] (Printed Name)

[redacted] (Signature)

April 30, 2021 (Date)

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

April 29,2021

Dear Participant,

Greetings of peace and good health!

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Philippine Normal University
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Sincerely yours,

CHRISTOFER C. CORONADO
Researcher

Enclosures:

cc: **DR. ROSIE L. CONDE**
Research Adviser

I provide my consent to participate in this study.

[redacted] (Printed Name)

[redacted] (Signature)

April 29, 2021 (Date)

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

April 29,2021

Dear Participant,

Greetings of peace and good health!

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Manila

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Sincerely yours,

CHRISTOFER C. CORONADO
Researcher

Enclosures:

cc: **DR. ROSIE L. CONDE**
Research Adviser

I provide my consent to participate in this study.

____________________[redacted](Printed Name)

___________________________[redacted] (Signature)

____________________________APRIL 29, 2021(Date)

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

April 29,2021

Dear Participant,

Greetings of peace and good health!

I would like to invite you to participate in my research study entitled "***Assessment of Mathematics Teachers' Conceptions and Practices of Authentic E-Assessment during the COVID Pandemic: A Case Study"***. I am currently enrolled in the program ***Master of Arts in Education specialized in Educational Assessment and Evaluation*** at the Philippine Normal University, Manila, and in the process of writing my Master's Thesis.

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Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

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Sincerely yours,

CHRISTOFER C. CORONADO
Researcher

Enclosures:

cc: **DR. ROSIE L. CONDE**
Research Adviser

I provide my consent to participate in this study.

________________ [redacted] (Printed Name)

________________ [redacted] (Signature)

________________ APRIL 29, 2021 (Date)

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

May 1,2021

Dear Participant,

Greetings of peace and good health!

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Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

PHILIPPINE NORMAL UNIVERSITY
GRADUATE RESEARCH OFFICE

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Sincerely yours,

CHRISTOFER C. CORONADO
Researcher

Enclosures:

cc: **DR. ROSIE L. CONDE**
Research Adviser

I provide my consent to participate in this study.

[redacted] (Printed Name)

[redacted] (Signature)

May 6, 2021 (Date)

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

May 1, 2021

Dear Participant,

Greetings of peace and good health!

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(b) Conceptions and practices of teachers in developing authentic e-assessments.

Furthermore, to fully understand the participants' conceptions and practices, the researcher would like to ask permission for the following:

(1) Submit sample/samples of authentic e-assessment that you implemented in class or done by your students.
(2) Allow the researcher to conduct an online observation of your class conducting an authentic e-assessment or activity (*atleast twice*). The online observation will be followed by a short interview, not exceeding 30 minutes.
(3) Respond to the Self-Reflection instrument.

Your participation in this research study is completely voluntary. You may decline, or leave blank any question/s you don't wish to answer. There are no known risks to participation beyond those encountered in everyday life. The entire research process is guided by RA 10173 or the Data Privacy Act of 2012. Any personal information that you share will be kept confidential.

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

Data from this research will be kept under lock and key and reported only as a collective combined total study. No one, other than the researcher, will know your individual answers to interviews and instruments.

If you agree to participate in this research, please get in touch with the researcher at coronado.cc@pnu.edu.ph or 09231086364.

If you have any questions about this research, feel free to contact the researcher at indicated email and contact number. Thank you very much for your assistance and participation in this important endeavor.

Sincerely yours,

CHRISTOFER C. CORONADO
Researcher

Enclosures:

cc: **DR. ROSIE L. CONDE**
Research Adviser

I provide my consent to participate in this study.

[redacted] (Printed Name)

[redacted] (Signature)

May 6,2021 (Date)

APPENDIX C

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

May 13, 2021

Dear Evaluator,

Greetings of peace and good health!

I would like to invite you to participate in a research study entitled "***Assessment of Mathematics Teachers' Conceptions and Practices of Authentic E-Assessment during the COVID Pandemic: A Case Study"***. I am currently enrolled in the program ***Master of Arts in Education specialized in Educational Assessment and Evaluation*** at the Philippine Normal University-Manila, and in the process of writing my master's thesis.

The main purpose of this study is to conduct an in-depth analysis on secondary mathematics teachers' conceptions and practices on authentic e-assessment during the COVID pandemic.

In this regard, the researcher would like to request your expertise to assess the authentic e-assessments developed by the respondents of the study. Attached in this letter is the ***"Level of Authenticity of an Authentic E-Assessment Instrument***" that you will be using in rating the authentic e-assessments. The instrument underwent face, content, and construct validity of experts in the field of assessment.

If you have any questions about the evaluation, feel free to contact the researcher at 09231086364 or coronado.cc@pnu.edu.ph.

Your shared expertise, assistance, and participation will be highly appreciated! Thank you very much and God Bless!

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

Very sincerely yours,

MR. CHRISTOFER C. CORONADO
Researcher

Enclosures:

cc: **DR. ROSIE L. CONDE**
Research Adviser
Faculty
College of Graduate Studies & Teacher Education Research
PNU- Manila

I provide my consent to participate in this study.

OSCAR DE LIVA

May 25, 2021

OSCAR DE LIVA

Teacher

Phone : 0956-529-8985 / E -mail : oscardeliva@gmail.com

EXPERIENCE

Public School Teacher II
June 2018 – Present

DEPARTMENT OF EDUCATION – DIVISION OF CALAMBA CITY
SAN JUAN ELEMENTARY SCHOOL

6th Grade Teacher handling all subjects such as English, Mathematics, Science, Filipino, Araling Panlipunan, Edukasyon sa Pagpapakatao, Technical and Livelihood Education, and MAPEH.
With the experience as a public school teacher, I also experienced lots of administrative work.
Coordinator for Adopt-A-School or things about Corporate Social Responsibility.
School Research Coordinator

Private School Teacher
June 2016 – April 2018

UNIVERSITY OF PERPETUAL HELP SYSTEM DALTA – CALAMBA CAMPUS

Computer Teacher for Kinder, Grades 1,2,3,4,5, and 6.
MAPEH Teacher for 2nd Grade Pupils.
Social Studies Teacher for 4th Grade Pupils.
Testing Coordinator
Sports Coordinator (Soccer)

Private School Teacher
June 2015 – April 2016

INFANT JESUS MONTESSORI CENTER – CABUYAO CAMPUS

Computer Teacher for Kinder, Grade 3, 4, 5, 6, and 10.
Taught basic computer literacy for elementary level and Web Design Basics for Grade 10 pupils.

EDUCATION

Master of Arts in Educational Assessment and Evaluation
June 2017 - Present

PHILIPPINE NORMAL UNIVERSITY – MANILA

Completed 42 units of Academic Requirements.
Passed the January 2021 comprehensive examination.

Bachelor of Elementary Education
June 2011 – May 15, 2015

CITY COLLEGE OF CALAMBA – CALAMBA CITY, LAGUNA

Deans' Academic Awardee for 3rd Year and 4th Year
Graduated on May 15, 2015.

TRAININGS, SEMINARS, AND ELIGIBILITY

ELIGIBILITY

Licensed Professional Teacher	Professional Regulations Commission	12/9/2015
Career Service Examinations (Professional)	Civil Service Commission	11/26/2015

TRAININGS AND SEMINARS

Visual Graphic Design - Adobe Photoshop	Power Skills Technical Center -	05/11/2017 –80hrs
Division Research Conference 2019	Division of Calamba City	10/08-09/2019
PHIL-GEPS Training for Buyers	Phil.Government Electronic Procurement System	09/17-18/2019
Partnership Building	Department of Education – Central office	09/19/2019
Open Educational Resources (Basic Program)	Department of Education - Ed EdTech Unit	04/22/2020
Open Educational Resources (Advanced Program)	Department of Education - Ed EdTech Unit	04/27-29/2020
Open Educational Resources (Proficiency Program)	Department of Education - Ed EdTech Unit	05/11-12/2020
Google Educators Group	Department of Education - Ed EdTech Unit	04/28/2020
Canva Digital Design Creation	Department of Education - Ed EdTech Unit	06/15/2020

REFERENCES

BEVERLY G. RONDILLA
School Head - (049) 545-9281

LEONARDO R. BELLO
Master Teacher – 0939-283-1973

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

May 13, 2021

Dear Evaluator,

Greetings of peace and good health!

I would like to invite you to participate in a research study entitled "***Assessment of Mathematics Teachers' Conceptions and Practices of Authentic E-Assessment during the COVID Pandemic: A Case Study***". I am currently enrolled in the program ***Master of Arts in Education specialized in Educational Assessment and Evaluation*** at the Philippine Normal University-Manila, and in the process of writing my master's thesis.

The main purpose of this study is to conduct an in-depth analysis on secondary mathematics teachers' conceptions and practices on authentic e-assessment during the COVID pandemic.

In this regard, the researcher would like to request your expertise to assess the authentic e-assessments developed by the respondents of the study. Attached in this letter is the ***"Level of Authenticity of an Authentic E-Assessment Instrument***" that you will be using in rating the authentic e-assessments. The instrument underwent face, content, and construct validity of experts in the field of assessment.

If you have any questions about the evaluation, feel free to contact the researcher at 09231086364 or coronado.cc@pnu.edu.ph.

Your shared expertise, assistance, and participation will be highly appreciated! Thank you very much and God Bless!

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

Very sincerely yours,

MR. CHRISTOFER C. CORONADO
Researcher

Enclosures:

cc: **DR. ROSIE L. CONDE**

Research Adviser
Faculty
College of Graduate Studies & Teacher Education Research
PNU- Manila

I provide my consent to participate in this study.

Rejoyce R. Tan (Printed Name)

(Signature)

May 13, 2021 (Date)

REJOYCE R. TAN

LICENSED PROFESSIONAL TEACHER

CONTACT ME AT

tan.rejoyce@gmail.com

+63906 498 5758

+63961 234 9466

SKILLS & EXPERTISE

- Innovative lesson planning
- Capable of organizing programs, activities, training, and seminars
- Proficient in Microsoft Offices
- Proficient in Google applications
- Able to communicate both Filipino and English language effectively
- Learning Style Assessment
- Classroom Management
- Assessment Design and Development
- Research Studies

PROFESSIONAL QUALIFICATIONS

- Licensed Professional Teacher
- Certified Google Educator (Level 1)
- Certified Apple Teacher

REFERENCES

Ms. Bianca Camille L. Guese
Subject Area Coordinator, English
Elizabeth Seton School

Mr. Iean F. Castellano
Subject Area Coordinator, Math
Elizabeth Seton School

Ms. Edilyn D. Chiao
Senior High School Teacher, Math
Elizabeth Seton School

PERSONAL PROFILE

I always teach my students with passion and enthusiasm. I am a professional worker and can work under pressure. Creating enjoyable and creative lessons is the kind of lesson I made for my students. I am trained to show mastery of the lessons presented to the students. Multiple tasks done at a time is one of my skills. My goal is to make Math more friendly for the students.

WORK EXPERIENCE

MATHEMATICS TEACHER

Elizabeth Seton School |June 2014 - present

- Adviser for 5 years for various grade levels (Grades 4, 5, and 8)
- Moderator for a group of students composed of various grade levels (Grades 7 - 12)
- Math trainer for math-advanced students (Grades 4, 5, and 7)
- Book Math writer
- Member and trainee of Mathematics Teacher Association of the Philippines (MTAP)

PART - TIME PHOTOGRAPHER

JAR Creatives | Jan 2016 - present

- Co-founder of JAR Creatives (Event photo and video coverage)

EDUCATIONAL HISTORY

Philippine Normal University - Taft Avenue

Bachelor of Science in Mathematics for Teachers
June 2009 - April 2014
Master of Arts in Educational Assessment and Evaluation
June 2017 - present

- Student assistant for 2 years
- Member of theater organization for 4 year
- Passed Comprehensive Examination (April 15, 2021)

APPENDIX D

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

Level of Authenticity of Authentic E-Assessment Instrument

(*Performance and Project*)

Instruction: Please evaluate the sample authentic e-assessment by encircling the number which best describes the manifestation level with each statement in the criteria. Encircle only 1 item using the rating interpretation: ***1 – Not manifested***, ***2 – Less manifested***, ***3 – Moderately manifested***, ***4 – Manifested***, ***5 – Highly manifested***.

No	***Criteria***	***Rating***				
1	Learning targets are clearly stated, specific, and centers on what is truly important.	1	2	3	4	5
2	The authentic e-assessment methods and tools are appropriate and require actual demonstration of skills or creation of products of learning.	1	2	3	4	5
3	The authentic e-assessment assesses what it is supposed to assess and is useful for a given purpose.	1	2	3	4	5
4	The authentic e-assessment yields consistent scores by the same student using the same/parallel instrument in comparison with students who took the same assessment.	1	2	3	4	5
5	The authentic e-assessment sets targets in cognitive, affective, and psychomotor domains of learning or domains of multiple intelligences by Howard Gardner (verbal-linguistic, visual spatial, bodily kinesthetic etc.)	1	2	3	4	5
6	The authentic e-assessment avoids bias based on personal characteristics such as students' gender, religion, ethnicity or economic status.	1	2	3	4	5
7	The materials and web tools for authentic e-assessment yield qualities of great worth and significance to students (i.e. motivates students to learn and help teachers improve their teaching effectiveness).	1	2	3	4	5
8	The task on authentic e-assessment considers teacher familiarity with the method, time required, complexity of the administration, ease of scoring and interpretation, and cost.	1	2	3	4	5
9	The authentic e-assessment does not discredit/embarrass or cast students in bad light and violating their right to confidentiality.	1	2	3	4	5
10	The authentic e-assessment can be modified/redesigned in other subjects.	1	2	3	4	5

11	The tasks on authentic e-assessment are similar to what students might encounter in real world as opposed to encountering only in school.	1	2	3	4	5
12	The authentic e-assessment communicates expectations of quality outputs or tasks which delineates criteria and procedure for scoring.	1	2	3	4	5
13	Students have a clear role in the work or authentic task.	1	2	3	4	5

Mean Score: ___________________ **Interpretation: __________________**

Authenticity Interpretation:

4.50 – 5.00 – Very high level of authenticity is manifested

3.50 – 4.49 – High level of authenticity is manifested

2.50 – 3.49 – Moderate level of authenticity is manifested

1.50 – 2.49 – Limited level of authenticity is manifested

1.00 – 1.49 – Authenticity is not manifested

Level of Authenticity of Authentic E-Assessment Instrument

(*E-portfolio*)

Instruction: Please evaluate the sample authentic e-assessment by encircling the number which best describes the manifestation level with each statement in the criteria. Encircle only 1 item using the rating interpretation: ***1 – Not manifested***, ***2 – Less manifested***, ***3 – Moderately manifested***, ***4 – Manifested***, ***5 – Highly manifested***.

No	***Criteria***	***Rating***				
1	Learning targets are clearly stated, specific, and centers on what is truly important.	1	2	3	4	5
2	The authentic e-assessment method and tool are appropriate and require purposeful artifacts that showcase student's learning progression, achievement, and evidence.	1	2	3	4	5
3	The authentic e-assessment assesses what it is supposed to assess and is useful for a given purpose.	1	2	3	4	5
4	The authentic e-assessment yields consistent scores by the same student using the same/parallel instrument in comparison with students who took the same assessment.	1	2	3	4	5
5	The authentic e-assessment avoids bias based on personal characteristics as students' gender, religion, ethnicity or economic status.	1	2	3	4	5
6	The materials and web tools for authentic e-assessment yield qualities of great worth and significance to students (i.e. motivates students to learn and help teachers improve their teaching effectiveness).	1	2	3	4	5
7	The task on authentic e-assessment considers teacher familiarity with the method, time required, complexity of the administration, ease of scoring and interpretation, and cost.	1	2	3	4	5
8	The authentic e-assessment does not discredit/embarrass or cast students in bad light and violating their right to confidentiality.	1	2	3	4	5
9	The authentic e-assessment can be modified/redesigned in other subjects.	1	2	3	4	5
10	The tasks on authentic e-assessment are similar to what students might encounter in real world as opposed to encountering only in school.	1	2	3	4	5
11	The authentic e-assessment communicates expectations of quality outputs or tasks which delineates criteria and procedure for scoring.	1	2	3	4	5
12	Students have a clear role in the work or authentic task.	1	2	3	4	5

Mean Score: ____________________ Interpretation: ____________________

Level of Authenticity of Authentic E-Assessment Instrument

The level of authenticity of authentic e-assessment instrument is a culmination of the principles of high quality assessments and 7 principles of effective e-assessments.

The principles of high quality assessment involve the following criteria: (1) Clarity of learning targets; (2) Appropriateness of assessment method; (3) Validity; (4) Reliability; (5) Balance; (6) Fairness; (7) Positive Consequences; (8) Practicality and Efficiency; and (9) Ethics.

Meanwhile, the 7 principles of effective e-assessment involve: (1) Accountability; (2) Articulation; (3) Alignment; (4) Affordance; (5) Authenticity; (6) Adaptation; and (7) Accreditation.

7 Principles of Effective E-Assessment

Adapted from: De Villiers, Larke, and Scott-Kennel 2016.

No	***INDICATORS***	***SUB-INDICATORS***
1	Clarity of Learning Targets /Articulation	Learning targets are clearly stated, specific, and centers on what is truly important.
2	Appropriateness of Assessment Method and Tools / Alignment	**Performance / Project** The authentic e-assessment methods and tools are appropriate and require actual demonstration of skills or creation of products of learning. **E-portfolio** The authentic e-assessment method and tool are appropriate and require purposeful artifacts that showcase student's learning progression, achievement, and evidence.
3	Validity	The authentic e-assessment assesses what it is supposed to assess and is useful for a given purpose.
4	Reliability	The authentic e-assessment yields consistent scores by the same student using the same/parallel instrument in comparison with students who took the same assessment.
5	Balance	The authentic e-assessment sets targets in cognitive, affective, and psychomotor domains of learning or domains of multiple intelligences by Howard Gardner (verbal-linguistic, visual spatial, bodily kinesthetic etc.)
6	Fairness	The authentic e-assessment avoids bias based on personal characteristics such as students' gender, religion, ethnicity or economic status.
7	Positive Consequences	The materials and web tools for authentic e-assessment yield qualities of great worth and significance to students (i.e. motivates students to learn and help teachers improve their teaching effectiveness).
8	Practicality and Efficiency / Affordance	The task on authentic e-assessment considers teacher familiarity with the method, time required, complexity of the administration, ease of scoring and interpretation, and cost.
9	Ethics	The authentic e-assessment does not discredit/embarrass or cast students in bad light and violating their right to confidentiality.

10	Adaptation	The authentic e-assessment can be modified/redesigned in other subjects.
11	Authenticity	The tasks on authentic e-assessment are similar to what students might encounter in real world as opposed to encountering only in school.
12	Accreditation	The authentic e-assessment communicates expectations of quality outputs or tasks which delineates criteria and procedure for scoring.
13	Accountability	Students have a clear role in the work or authentic task.

Authenticity Interpretation:

4.50 – 5.00 – Very high level of authenticity is manifested

3.50 – 4.49 – High level of authenticity is manifested

2.50 – 3.49 – Moderate level of authenticity is manifested

1.50 – 2.49 – Limited level of authenticity is manifested

1.00 – 1.49 – Authenticity is not manifested

APPENDIX E

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

Name of Teacher: ______________________

School: _____________________________

Grade level you are teaching: ____________

Perception on Authentic E-Assessment Questionnaire

The questionnaire aims to identify secondary mathematics teachers who are employing authentic e-assessments in teaching. Furthermore, the questionnaire seeks to know the conceptions and practices of the teacher-participants in developing authentic e-assessment on performance, project, and e-portfolio.

Note: The entire research process is guided by RA 10173 or the Data Privacy Act of 2012. Any personal information that will be shared will be kept confidential.

Direction: Based on your understanding and experiences, answer the questions below. For open-ended questions, kindly limit your answer for a maximum of 5 sentences.

1. Are you familiar with authentic e-assessment?

   If yes, proceed.

   No – Proceed to question no. 5. Thank you.

2. What are your concepts (*beliefs and ideas*) regarding authentic e-assessments? Particularly on performance, e-portfolio, and project?

   ____

   ____

3. Do you develop authentic e-assessment? How / Why not?

   ____

   ____

4. What are your experiences in developing authentic e-assessment? Particularly on performance, project, and e-portfolio?

____
____
____
____

5. As an educator, are you willing to learn about authentic e-assessment? Why or why not?

____
____

Kindly attach sample/s of authentic e-assessment (*with learning plan or target competencies if available*) that you used on, performance, project, or e-portfolio.

Thank you very much for your participation!

Mr. Christofer C. Coronado
Researcher

APPENDIX F

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

Short interview Questions

1. How aware are the students about the learning targets of the authentic e-assessment? Are they informed about what authentic task to do, how to do it, and when to submit?

2. How are these authentic e-assessment aligned with your pre-planned learning objectives? How are these authentic e-assessments set targets in all domains of learning or domains of intelligences (verbal-linguistic, visual spatial, bodily kinesthetic etc.)?

3. How do you think the authentic e-assessment is similar to what students might encounter in the real world? Do you think this authentic e-assessment can be modified/ redesigned in other subjects?

4. How do you give merit to student's outputs?

APPENDIX G

Philippine Normal University
National Center for Teacher Education
College of Graduate Studies and Teacher Education Research
Graduate Research Office
Manila

Self-Reflection Instrument

When planning and developing for an authentic e-assessment, I…

____

The challenge/s that I encountered in the practice of authentic e-assessment is/are… (*in terms of training, familiarity with software, support, time allocation, etc.)*

____

I suggest/recommend the following to strengthen or improve teachers' skills in developing and practicing authentic e-assessments…

____

<u>Name and Signature of the Respondent</u>
Respondent

APPENDIX H

Validation of Level of Authenticity of Authentic E-Assessment Instrument

(Performance, Project, E-Portfolio)

No.	Criteria	Content Validity Ratio
1	Learning targets are clearly stated, specific, and centers on what is truly important.	1.00
2	**Performance / Project** The authentic e-assessment methods and tools are appropriate and require actual demonstration of skills or creation of products of learning.	1.00
	E-portfolio The authentic e-assessment method and tool are appropriate and require purposeful artifacts that showcase student's learning progression, achievement, and evidence.	1.00
3	The authentic e-assessment assesses what it is supposed to assess and is useful for a given purpose.	1.00
4	The authentic e-assessment yields consistent scores by the same student using the same/parallel instrument in comparison with students who took the same assessment.	1.00
5	The authentic e-assessment sets targets in cognitive, affective, and psychomotor domains of learning or domains of multiple intelligences by Howard Gardner (verbal-linguistic, visual spatial, bodily kinesthetic etc.)	1.00
6	The authentic e-assessment avoids bias based on personal characteristics such as students' gender, religion, ethnicity or economic status.	1.00
7	The materials and web tools for authentic e-assessment yield qualities of great worth and significance to students (i.e. motivates students to learn and help teachers improve their teaching effectiveness).	1.00
8	The task on authentic e-assessment considers teacher familiarity with the method, time required, complexity of the administration, ease of scoring and interpretation, and cost.	1.00
9	The authentic e-assessment does not discredit/embarrass or cast students in bad light and violating their right to confidentiality.	1.00
10	The authentic e-assessment can be modified/redesigned in other subjects.	1.00
11	The tasks on authentic e-assessment are similar to what students might encounter in real world as opposed to encountering only in school.	1.00
12	The authentic e-assessment communicates expectations of quality outputs or tasks which delineates criteria and procedure for scoring.	1.00
13	Students have a clear role in the work or authentic task.	1.00

Dear Evaluator:

This content validation form is intended for use by expert evaluators to determine the validity of the level of authenticity of teacher-made authentic e-assessments. The instrument is aligned with the principles of high quality assessments namely: clarity of learning targets, appropriateness of assessment method, validity, reliability, balance, fairness, positive consequences, practicality and efficiency, and ethics. Moreover, with the seven principles of effective e-assessment namely: accountability, articulation, alignment, affordance, authenticity, adaptation, and accreditation.

It aims to help in the development of valid and reliable authentic e-assessment materials. Please tick on the appropriate cell if you think the statement or criteria is essential or not essential. Also, you may write your comments and suggestions for the improvement of each statement/criteria at the last column.

Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. Learning targets are clearly stated, specific, and centers on what is truly important.	/		
2. The authentic e-assessment methods and tools require actual demonstration of skills or creation of products of learning.	/		
3. The authentic e-assessment assesses what it is supposed to assess and useful for a given purpose.	/		
4. The authentic e-assessment yields consistent scores by the same student using the same/parallel instrument in comparison with students who took the same assessment.	/		
5. The authentic e-assessment sets targets in all domains of learning or domains of intelligences (verbal-linguistic, visual spatial, bodily kinesthetic etc.)	/		Indicate the three domains of learning (cognitive, affective, and psychomotor) to be more specific. You may include Howard Gardner as the proponent of the theory of multiple intelligences
6. The authentic e-assessment avoids bias based on personal characteristics as students' gender, religion, ethnicity or economic status.	/		
7. The materials and web tools for authentic e-assessment yield qualities of great worth and significance to students (i.e. motivates students to learn and help teachers improve their teaching effectiveness).	/		
8. The task on authentic e-assessment considers teacher familiarity with the method, time required, complexity of the administration, ease of scoring and interpretation, and cost.	/		
9. The authentic e-assessment does not discredit/embarrass or cast students in bad light and violating their right to confidentiality.	/		

10. The authentic e-assessment can be modified/redesigned in other subjects.	/		
11. The tasks on authentic e-assessment are similar to what students might encounter in real world as opposed to encountering only in school.	/		
12. The authentic e-assessment communicates expectations of quality outputs or tasks which delineates criteria and procedure for scoring.	/		This is similar with item 1. Focus on scoring procedures and interpretation)
13. Students have a clear role in the work or authentic task.	/		

Overall comments:

All statements/criteria above are essential as we expect that e-assessment materials must follow the principles of high-quality student assessment.

I suggest that you include statements/criteria for the following principles:

1. *Appropriateness of Assessment Methods.* It is possible that the chosen e-assessment is not aligned with or appropriate for the set standard.
2. *Continuity.* Is the e-assessment material continuous?
3. *Authenticity (Item 11).* Is the e-assessment material emphasizes metacognition or the students' awareness of their thought processes? How about self-evaluation? It is better if the e-assessment materials have self-check sections for direct and immediate feedback.

Notes:

- Coming up with an e-assessment material that possesses all the criteria in this instrument is very challenging. Is it possible that some criteria may not be appropriate for some e-assessment materials?

Romelie Anne B. Calapardo

(signature over printed name)

Dear Evaluator:

This content validation form is intended for use by expert evaluators to determine the validity of the level of authenticity of teacher-made authentic e-assessments. The instrument is aligned with the principles of high quality assessments namely: clarity of learning targets, appropriateness of assessment method, validity, reliability, balance, fairness, positive consequences, practicality and efficiency, and ethics. Moreover, with the seven principles of effective e-assessment namely: accountability, articulation, alignment, affordance, authenticity, adaptation, and accreditation.

It aims to help in the development of valid andreliable authentic e-assessment materials. Please tick on the appropriate cell if you think the statement or criteria is essential or not essential. Also, you may write your comments and suggestions for the improvement of each statement/criteria at the last column.

Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. The authentic e-assessment has clear criteria of when/why/how/what is being assessed.	/		Learning targets are clearly stated, specific, and centers on what is truly important.
2.a. Performance / Project The authentic e-assessment methods and tools are appropriate and require actual demonstration of skills or creation of products of learning.	/		
2.b E-portfolio The authentic e-assessment method and tool are appropriate and require purposeful artifacts that showcase student's learning progression, achievement, and evidence.	/		
3. The authentic e-assessment assesses what it is meant to be assessed.	/		The authentic e-assessment assesses what it is supposed to assess and useful for a given purpose.
4. The authentic e-assessment is a reliable measure of what it is supposed to measure.	/		The authentic e-assessment yields consistent scores by the same student using the same/parallel instrument in comparison with students who took the same assessment.
5. The authentic e-assessment sets targets in cognitive, affective, and psychomotor domains of learning or domains of multiple intelligences by Howard Gardner (verbal-linguistic, visual spatial, bodily kinesthetic etc.)	/		Balance here as one principle of high-quality

			assessment refers to using both traditional and non-traditional assessment. Learning is not only assessed using only one of the two, but both
6. The authentic e-assessment avoids bias based on personal characteristics as students' gender, religion, ethnicity or economic status.	/		
7. The material and web tool for authentic e-assessment develop students' self-confidence and independence.	/		The materials and web tools for authentic e-assessment yield qualities of great worth and significance to students (i.e. motivates students to learn and help teachers improve their teaching effectiveness
8. The task on authentic e-assessment considers teacher familiarity with the method, time required, complexity of the administration, ease of scoring and interpretation, and cost.	/		
9. The authentic e-assessment does not discredit/embarrass or cast students in bad light and violating their right to confidentiality.	/		
10. The authentic e-assessment can be contextualized in other subjects.	/		The authentic e-assessment can be modified/redesigned in other subjects.
11. The tasks on authentic e-assessment are similar to what students might encounter in real world as opposed to encountering only in school.	/		
12. The authentic e-assessment provides criteria for clear scoring system.	/		The authentic e-assessment communicates expectations of quality

			outputs or tasks which delineates criteria and procedure for scoring.
13. Students have a clear role in the work of authentic task.	/		Students have a clear role in the work.

Prof. Antonio G. Dacanay
Validator

Dear Evaluator:

This content validation form is intended for use by expert evaluators to determine the validity of the level of authenticity of teacher-made authentic e-assessments. The instrument is aligned with the principles of high quality assessments namely: clarity of learning targets, appropriateness of assessment method, validity, reliability, balance, fairness, positive consequences, practicality and efficiency, and ethics. Moreover, with the seven principles of effective e-assessment namely: accountability, articulation, alignment, affordance, authenticity, adaptation, and accreditation.

It aims to help in the development of valid and reliable authentic e-assessment materials. Please tick on the appropriate cell if you think the statement or criteria is essential or not essential. Also, you may write your comments and suggestions for the improvement of each statement/criteria at the last column.

Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. Learning targets are clearly stated, specific, and centers on what is truly important.	/		
2. The authentic e-assessment methods and tools require actual demonstration of skills or creation of products of learning.	/		
3. The authentic e-assessment assesses what it is supposed to assess and useful for a given purpose.	/		
4. The authentic e-assessment yields consistent scores by the same student using the same/parallel instrument in comparison with students who took the same assessment.	/		
5. The authentic e-assessment sets targets in all domains of learning or domains of intelligences (verbal-linguistic, visual spatial, bodily kinesthetic etc.)	/		
6. The authentic e-assessment avoids bias based on personal characteristics as students' gender, religion, ethnicity or economic status.	/		
7. The materials and web tools for authentic e-assessment yield qualities of great worth and significance to students (i.e. motivates students to learn and help teachers improve their teaching effectiveness).	/		
8. The task on authentic e-assessment considers teacher familiarity with the method, time required, complexity of the administration, ease of scoring and interpretation, and cost.	/		

9. The authentic e-assessment does not discredit/embarrass or cast students in bad light and violating their right to confidentiality.	/		
10. The authentic e-assessment can be modified/redesigned in other subjects.	/		
11. The tasks on authentic e-assessment are similar to what students might encounter in real world as opposed to encountering only in school.	/		
12. The authentic e-assessment communicates expectations of quality outputs or tasks which delineates criteria and procedure for scoring.	/		
13. Students have a clear role in the work or authentic task.	/		

Overall the instrument is valid and a good instrument on measuring level of authenticity of an authentic e-assessment. The indicators and factors, contributing to each question of the instrument, will measure the desired outputs aligned with the statement of purpose of the research study. There are no identified biases and ethical issues on the questions of the instrument. However, kindly remove the interpretation for the level of authenticity when administering to your respondents.

Hanzen M. Reyes

Prof. Hanzen M. Reyes, RPm, LPT, RPsy
Validator
Faculty
Graduate School- Laguna College of Business and Arts
Calamba, Laguna
Pamantasan ng Cabuyao
Katapatan Subd. Banay-banay, City of Cabuyo Laguna

Dear Evaluator:

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Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. Learning targets are clearly stated, specific, and centers on what is truly important	/		
2.a. Performance / Project The authentic e-assessment methods and tools are appropriate and require actual demonstration of skills or creation of products of learning.	/		
2.b E-portfolio The authentic e-assessment method and tool are appropriate and require purposeful artifacts that showcase student's learning progression, achievement, and evidence.	/		
3. The authentic e-assessment assesses what it is supposed to assess and useful for a given purpose.	/		The authentic e-assessment assesses what it is supposed to assess and is useful for a given purpose.
4. The authentic e-assessment yields consistent scores by the same student using the same/parallel instrument in comparison with students who took the same assessment.	/		
5. The authentic e-assessment sets targets in cognitive, affective, and psychomotor domains of learning or domains of multiple intelligences by Howard Gardner (verbal-linguistic, visual spatial, bodily kinesthetic etc.)	/		
6. The authentic e-assessment avoids bias based on personal characteristics as students' gender, religion, ethnicity or economic status.	/		The authentic e-assessment avoids bias based on personal characteristics such as students' gender, religion, ethnicity or economic status.
7. The materials and web tools for authentic e-assessment yield qualities of great worth and significance to	/		

students (i.e. motivates students to learn and help teachers improve their teaching effectiveness).			
8. The task on authentic e-assessment considers teacher familiarity with the method, time required, complexity of the administration, ease of scoring and interpretation, and cost.	/		
9. The authentic e-assessment does not discredit/embarrass or cast students in bad light and violate their right to confidentiality.	/		
10. The authentic e-assessment can be modified/redesigned in other subjects.	/		
11. The tasks on authentic e-assessment are similar to what students might encounter in real world as opposed to encountering only in school.	/		
12. The authentic e-assessment communicates expectations of quality outputs or tasks which delineates criteria and procedure for scoring.	/		
13. Students have a clear role in the work or authentic task.	/		

JOHN ARIS R. TRAZONA, EdD-CAR

Name and Signature of
Validator

Dear Evaluator:

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Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. Learning targets are clearly stated, specific, and centers on what is truly important	/		
2.a. Performance / Project The authentic e-assessment methods and tools are appropriate and require actual demonstration of skills or creation of products of learning.	/		
2.b E-portfolio The authentic e-assessment method and tool are appropriate and require purposeful artifacts that showcase student's learning progression, achievement, and evidence.	/		
3. The authentic e-assessment assesses what it is supposed to assess and useful for a given purpose.	/		
4. The authentic e-assessment yields consistent scores by the same student using the same/parallel instrument in comparison with students who took the same assessment.	/		
5. The authentic e-assessment sets targets in cognitive, affective, and psychomotor domains of learning or domains of multiple intelligences by Howard Gardner (verbal-linguistic, visual spatial, bodily kinesthetic etc.)	/		
6. The authentic e-assessment avoids bias based on personal characteristics as students' gender, religion, ethnicity or economic status.	/		
7. The materials and web tools for authentic e-assessment yield qualities of great worth and significance to students (i.e. motivates students to learn and help teachers improve their teaching effectiveness).	/		

8. The task on authentic e-assessment considers teacher familiarity with the method, time required, complexity of the administration, ease of scoring and interpretation, and cost.	/		
9. The authentic e-assessment does not discredit/embarrass or cast students in bad light and violating their right to confidentiality.	/		
10. The authentic e-assessment can be modified/redesigned in other subjects.	/		
11. The tasks on authentic e-assessment are similar to what students might encounter in real world as opposed to encountering only in school.	/		
12. The authentic e-assessment communicates expectations of quality outputs or tasks which delineates criteria and procedure for scoring.	/		
13. Students have a clear role in the work or authentic task.	/		

ROSIE L. CONDE, Ph. D.

Validator

Research Adviser

Faculty

College of Graduate Studies and Teacher Education Research

PNU - Manila

APPENDIX I

Validation of Perception on Authentic E-Assessment

Questionnaire

No.	**Criteria**	**Content Validity Ratio**
1	Are you familiar with authentic e-assessment? **If yes**, proceed. **No** – Proceed to question no. 5. Thank you.	1.00
2	What are your concepts (*beliefs and ideas*) regarding authentic e-assessments? Particularly on performance, e-portfolio, and project?	1.00
3	Do you develop authentic e-assessment? How / Why not?	1.00
4	What are your experiences in developing authentic e-assessment? Particularly on performance, project, and e-portfolio?	1.00
5	As an educator, are you willing to learn about authentic e-assessment? Why or why not?	1.00

Dear Evaluator:

This content validation form is intended for use by expert evaluators to determine the validity of the researcher-made perception on authentic e-assessments instrument. It aims to identify secondary mathematics teachers who are employing authentic e-assessments in teaching. Moreover, participants' beliefs, ideas, experiences, and practices of performance, e-portfolio and project will be identified.

Please tick on the appropriate cell if you think the statement or criteria is essential or not essential. Also, you may write your comments and suggestions for the improvement of each statement/criteria at the last column.

Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. Are you familiar with authentic e-assessment? Yes / No If yes, proceed. No – Thank you.	/		If not, proceed to question No. 5.
2. What are your conceptions (*beliefs and ideas*) regarding authentic e-assessments? Particularly on performance, e-portfolio, and project?	/		
3. Do you develop authentic e-assessment? How / Why not?	/		
4. What are your experiences in developing authentic e-assessment? Particularly on performance, e-portfolio, and project?	/		

5. *As an educator, are you willing to learn about…*

Romelie Anne B. Calapardo

(signature over printed name)

Dear Evaluator:

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Please tick on the appropriate cell if you think the statement or criteria is essential or not essential. Also, you may write your comments and suggestions for the improvement of each statement/criteria at the last column.

Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. Are you familiar with authentic e-assessment? Yes / No If yes, proceed. No – Thank you.	/		If Yes, please proceed. If No, thank you.
2. What are your conceptions (*beliefs and ideas*) regarding authentic e-assessments? Particularly on performance, e-portfolio, and project?	/		
3. Do you develop authentic e-assessment? How / Why not?	/		If Yes, how?
4. What are your experiences in developing authentic e-assessment? Particularly on performance, e-portfolio, and project?	/		

Hanzen M. Reyes

Prof. Hanzen M. Reyes, RPm, LPT, RPsy
Validator
Faculty
Graduate School- Laguna College of Business and Arts
Calamba, Laguna
Pamantasan ng Cabuyao
Katapatan Subd. Banay-banay, City of Cabuyo Laguna

Dear Evaluator:

This content validation form is intended for use by expert evaluators to determine the validity of the researcher-made perception on authentic e-assessment instruments. It aims to identify secondary mathematics teachers who are employing authentic e-assessments in teaching. Moreover, participants' beliefs, ideas, experiences, and practices of performance, e-portfolio and project will be identified.

Please tick on the appropriate cell if you think the statement or criteria is essential or not. You may also write your comments and suggestions for the improvement of each statement/criteria at the last column.

Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. Are you familiar with authentic e-assessment? Yes / No If yes, proceed. No – Proceed to Question no. 5. Thank you.	/		
2. What are your conceptions (*beliefs and ideas*) regarding authentic e-assessment? Particularly on performance, project, and e-portfolio?	/		What are your concepts (*beliefs and ideas*) regarding authentic e-assessments? Particularly on performance, e-portfolio, and project?
3. Do you develop authentic e-assessment? How / Why not?	/		
4. What are your experiences in developing authentic e-assessment? Particularly on performance, e-portfolio, and project?	/		
5. As an educator, are you willing to learn about authentic e-assessment? Why or why not?	/		

JOHN ARIS R. TRAZONA, EdD-CAR

Name and Signature of
Validator

Dear Evaluator:

This content validation form is intended for use by expert evaluators to determine the validity of the researcher-made perception on authentic e-assessments instrument. It aims to identify secondary mathematics teachers who are employing authentic e-assessments in teaching. Moreover, participants' beliefs, ideas, experiences, and practices of performance, e-portfolio and project will be identified.

Please tick on the appropriate cell if you think the statement or criteria is essential or not essential. Also, you may write your comments and suggestions for the improvement of each statement/criteria at the last column.

Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. Are you familiar with authentic e-assessment? Yes / No If yes, proceed. No – Proceed to Question no. 5. Thank you.	/		
2. What are your concepts (*beliefs and ideas*) regarding authentic e-assessments? Particularly on performance, e-portfolio, and project?	/		
3. Do you develop authentic e-assessment? How / Why not?	/		
4. What are your experiences in developing authentic e-assessment? Particularly on performance, e-portfolio, and project?	/		
5. As an educator, are you willing to learn about authentic e-assessment? Why or why not?	/		

ROSIE L. CONDE, Ph. D.

Validator

Research Adviser

Faculty

College of Graduate Studies and Teacher Education Research

PNU - Manila

APPENDIX J

Validation of Short Interview Questions

No.	Criteria	Content Validity Ratio
1	How aware are the students about the learning targets of the authentic e-assessment? Are they informed about what authentic task to do, how to do it, and when to submit?	1.00
2	How are these authentic e-assessment aligned with your pre-planned learning objectives? How are these authentic e-assessments set targets in all domains of learning or domains of intelligences (verbal-linguistic, visual spatial, bodily kinesthetic etc.)?	1.00
3	How do you think the authentic e-assessment is similar to what students might encounter in the real world? Do you think this authentic e-assessment can be modified/ redesigned in other subjects?	1.00
4	How do you give merit to student’s outputs?	1.00

Dear Evaluator:

This content validation form is intended for use by expert evaluators to determine the validity of the short interview questions. It aims to identify secondary mathematics teachers' conceptions and practices of authentic e-assessments in teaching. The instrument is aligned with the principles of high quality assessments namely: clarity of learning targets, appropriateness of assessment method, validity, reliability, balance, fairness, positive consequences, practicality and efficiency, and ethics. Moreover, with the seven principles of effective e-assessment namely: accountability, articulation, alignment, affordance, authenticity, adaptation, and accreditation.

Please tick on the appropriate cell if you think the statement or criteria is essential or not essential. Also, you may write your comments and suggestions for the improvement of each statement/criteria at the last column.

Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. How aware are the students about the learning targets of the authentic e-assessment? Are they informed about what authentic task to do, how to do it, and when to submit?	/		
2. How are these authentic e-assessments aligned with your pre-planned learning objectives? How are these authentic e-assessments set targets in all domains of learning or domains of intelligences (verbal-linguistic, visual spatial, bodily kinesthetic etc.)	/		
3. How do you think the authentic e-assessment is similar to what students might encounter in real world? Do you think this authentic e-assessment can be modified / redesigned in other subjects?	/		
4. How do you give merit to students' outputs?	/		

Romelie Anne B. Calapardo

(signature over printed name)

Dear Evaluator:

This content validation form is intended for use by expert evaluators to determine the validity of the short interview questions. It aims to identify secondary mathematics teachers' conceptions and practices of authentic e-assessments in teaching. The instrument is aligned with the principles of high quality assessments namely: clarity of learning targets, appropriateness of assessment method, validity, reliability, balance, fairness, positive consequences, practicality and efficiency, and ethics. Moreover, with the seven principles of effective e-assessment namely: accountability, articulation, alignment, affordance, authenticity, adaptation, and accreditation.

Please tick on the appropriate cell if you think the statement or criteria is essential or not essential. Also, you may write your comments and suggestions for the improvement of each statement/criteria at the last column.

Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. How aware are the students about the learning targets of the authentic e-assessment? Are they informed about what authentic task to do, how to do it, and when to submit?	/		
2. How are these authentic e-assessments aligned with your pre-planned learning objectives? How are these authentic e-assessments set targets in all domains of learning or domains of intelligences (verbal-linguistic, visual spatial, bodily kinesthetic etc.)	/		
3. How do you think the authentic e-assessment is similar to what students might encounter in real world? Do you think this authentic e-assessment can be modified / redesigned in other subjects?	/		Do you think this authentic e-assessment can be modified / redesigned in other subjects? How?
4. How do you give merit to students' outputs?	/		

Hanzen M. Reyes

Prof. Hanzen M. Reyes, RPm, LPT, RPsy
Validator
Faculty
Graduate School- Laguna College of Business and Arts
Calamba, Laguna
Pamantasan ng Cabuyao
Katapatan Subd. Banay-banay, City of Cabuyo Laguna

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Please tick on the appropriate cell if you think the statement or criteria is essential or not. You may also write your comments and suggestions for the improvement of each statement/criteria at the last column.

Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. How aware are the students about the learning targets of the authentic e-assessment? Are they informed about what authentic task to do, how to do it, and when to submit?	/		
2. How are these authentic e-assessments aligned with your pre-planned learning objectives? How are these authentic e-assessments set targets in all domains of learning or domains of intelligences (verbal-linguistic, visual spatial, bodily kinesthetic etc.)?	/		
3. How do you think the authentic e-assessment is similar to what students might encounter in real world? Do you think this authentic e-assessment can be modified / redesigned in other subjects?	/		How do you think the authentic e-assessment is similar to what students might encounter in the real world? Do you think this authentic e-assessment can be modified / redesigned in other subjects?
4. How do you give merit to students' outputs?	/		

JOHN ARIS R. TRAZONA, EdD-CAR

Name and signature of validator

Dear Evaluator:

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Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. How aware are the students about the learning targets of the authentic e-assessment? Are they informed about what authentic task to do, how to do it, and when to submit?	/		
2. How are these authentic e-assessments aligned with your pre-planned learning objectives? How are these authentic e-assessments set targets in all domains of learning or domains of intelligences (verbal-linguistic, visual spatial, bodily kinesthetic etc.)	/		
3. How do you think the authentic e-assessment is similar to what students might encounter in the real world? Do you think this authentic e-assessment can be modified / redesigned in other subjects?	/		
4. How do you give merit to students' outputs?	/		

ROSIE L. CONDE, Ph. D.

Validator
Research Adviser
Faculty
College of Graduate Studies and Teacher Education Research
PNU - Manila

APPENDIX K

Validation of Self-reflection Instrument

No.	Criteria	Content Validity Ratio
1	When planning and developing for an authentic e-assessment, I…	1.00
2	The challenge/s that I encountered in the practice of authentic e-assessment is/are… (*in terms of training, familiarity with software, support, time allocation, etc.)*	1.00
3	I suggest/recommend the following to strengthen or improve teachers' skills in developing and practicing authentic e-assessments…	1.00

Dear Evaluator:

This content validation form is intended for use by expert evaluators to determine the validity of the self-reflection instrument on the development of authentic e-assessment. It aims to determine secondary mathematics teachers' self-perceived practices and challenges participants encountered in the conduct of authentic e-assessments. Moreover, this instrument serves an avenue for the participants' to give suggestions or recommendations to improve or strengthen the practice of authentic e-assessment.

Please tick on the appropriate cell if you think the statement or criteria is essential or not essential. Also, you may write your comments and suggestions for the improvement of each statement/criteria at the last column.

Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. When planning and developing for an e-authentic assessment, I…	/		
2. The challenge/s that I encountered in the practice of authentic e-assessment is/are… (*in terms of training, familiarity with software, support, time allocation, etc.*)	/		
3. What suggestions/ recommendations can you propose to strengthen or improve teachers' skills when developing and practicing authentic e-assessments?	/		Inconsistent with the above statements. *I suggest/recommend the following to strengthen or improve…* -----open ended

Romelie Anne B. Calapardo

(signature over printed name)

Dear Evaluator:

This content validation form is intended for use by expert evaluators to determine the validity of the self-reflection instrument on the development of authentic e-assessment. It aims to determine secondary mathematics teachers' self-perceived practices and challenges participants encountered in the conduct of authentic e-assessments. Moreover, this instrument serves an avenue for the participants' to give suggestions or recommendations to improve or strengthen the practice of authentic e-assessment.

Please tick on the appropriate cell if you think the statement or criteria is essential or not essential. Also, you may write your comments and suggestions for the improvement of each statement/criteria at the last column.

Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. When planning and developing for an e-authentic assessment, I…	/		
2. The challenge/s that I encountered in the practice of authentic e-assessment is/are… (*in terms of training, familiarity with software, support, time allocation, etc.*)	/		*"Practice"* - could also be giving
3. What suggestions/ recommendations can you propose to strengthen or improve teachers' skills when developing and practicing authentic e-assessments?	/		

Hanzen M. Reyes

Prof. Hanzen M. Reyes, RPm, LPT, RPsy
Validator
Faculty
Graduate School- Laguna College of Business and Arts
Calamba, Laguna
Pamantasan ng Cabuyao
Katapatan Subd. Banay-banay, City of Cabuyo Laguna

Dear Evaluator,

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Please tick on the appropriate cell if you think the statement or criteria is essential or not. You may also write your comments and suggestions for the improvement of each statement/criteria at the last column.

Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. When planning and developing for an e-authentic assessment, I…	/		
2. The challenge/s that I encountered in the practice of authentic e-assessment is/are… (*in terms of training, familiarity with software, support, time allocation, etc.*)	/		
3. What suggestions/ recommendations can you propose to strengthen or improve teachers' skills when developing and practicing authentic e-assessments?	/		I suggest / recommend the following…

JOHN ARIS R. TRAZONA, EdD-CAR

(signature over printed name)

Dear Evaluator:

This content validation form is intended for use by expert evaluators to determine the validity of the self-reflection instrument on the development of authentic e-assessment. It aims to determine secondary mathematics teachers' self-perceived practices and challenges participants encountered in the conduct of authentic e-assessments. Moreover, this instrument serves an avenue for the participants' to give suggestions or recommendations to improve or strengthen the practice of authentic e-assessment.

Please tick on the appropriate cell if you think the statement or criteria is essential or not essential. Also, you may write your comments and suggestions for the improvement of each statement/criteria at the last column.

Statements / Criteria	*Essential*	*Not Essential*	*Comments/ Suggestions*
1. When planning and developing for an e-authentic assessment, I…	/		
2. The challenge/s that I encountered in the practice of authentic e-assessment is/are… (*in terms of training, familiarity with software, support, time allocation, etc.*)	/		
3. I suggest/recommend the following to strengthen or improve teachers' skills in developing and practicing authentic e-assessments…	/		

ROSIE L. CONDE, Ph. D.

Validator

Research Adviser

Faculty

College of Graduate Studies and Teacher Education Research

PNU - Manila

CURRICULUM

VITAE

CHRISTOFER C. CORONADO, LPT

B.28 L110 PH5, Mabuhay Subd., Mamatid, City of Cabuyao, Laguna
09311764177 / coronado.cc@pnu.edu.ph

Registered Professional Teacher License No. 1406255

Educational Background

2017-Present: Master of Arts in Educational Assessment and Evaluation (MA-EAE)

Philippine Normal University, Manila

Completed Academic Requirements – Currently Writing Thesis

2016: Food and Beverage NC II Certificate - Holder

Center for Competencies' Enhancement and Development

Chipeco Ave. Barangay II, Calamba City

2011-2015: Bachelor of Secondary Education Major in Mathematics (BSEd-Math)

Presidential Medal for Academic Excellence Awardee

Magna cum Laude

Best in Thesis

Best in Practice Teaching – Mathematics

Pamantasan ng Cabuyao

Banay-Banay, City of Cabuyao, Laguna

2007-2011: Pulo National High School

7th Honorable Mentioned

Pulo, Cabuyao, Laguna

2001-2007: Banlic Elementary School

3rd Honorable Mentioned

Banlic, Cabuyao, Laguna

Speaking Engagements

Mathematics for 21st Century Learners:

Making Math Easy through Technology-Aided Instruction — January 2019

(Calculator Technique and Microsoft Mathematics)

AMA Calamba, Campus

Mathematics Teachers Association of the Philippines (MTAP) — 2016 Present

Secondary Level – Trainer

Summer Mathematics Camp Speaker / Trainer — 2016 – Present

Secondary Mathematics Coach

Holy Redeemer School of Cabuyao, Laguna, Inc.

Seminar in Mathematics Problem Solving – Speaker — 2014

Pamantasan ng Cabuyao

Banay-Banay, City of Cabuyao, Laguna

Competition Achievements (As Mathematics Coach)

2021 ASMEPPS Regional Mathematics Trivia Quiz – Coach

Grade 7 – 8th place, Grade 8 – 3rd place, Grade 9 – 6th place, Grade 10 – 4th place

National Qualifiers

2nd Best Coach in Mathematics, Secondary Level – Regional Written Competition Coaches Category

2019 Metrobank MTAP DepEd Mathematics Challenge -Region IV-A. March 1, 2019

2019 Champion National Alliance of the Philippine Private Schools (NAPSPHIL)

Mathematics Competition – Secondary Level (Grades 7–10). January 31, 2019

2019 Champion Laguna Province Private Schools and Administrators Association

LAPPRISADA– Math Quiz Bee. Secondary Level (Grades 7 – 10). January 2019

2nd Runner up MCL Cup Intermediate Math Quiz Show. December 10, 2019

5th Place Regional Metrobank – MTAP – DepEd Mathematics Challenge (MMC)

Grades 9 – March 1, 2019 at Silang, Cavite

Regional Qualifier – Metrobank – MTAP – DepEd Mathematics Challenge (MMC)

Grades 9 and 10 – March 2018

9th Place – UPSELES Inter-Luzon Mathematics WEEZARDS Junior High School Category

2017 & 2018 Champion Metrobank – MTAP – DepEd Mathematics Challenge (MMC)

Grades 7 – 10 in the Division of Cabuyao

2017 & 2018 Champion Cabuyao Administrators Private Schools Association (CAPRISA)

Secondary Level (Grades 7 – 10)

2nd Place – Laguna Private Schools Administrators Association (LAPPRISADA)

Mathematics Academic Contest

Trainings and Seminars Attended

2021 Regional Research Conference on Educational Policy and Practice (RCEPP)

Philippine Normal University, Manila. December 12, 2021

2nd National Graduate Teacher Education Seminar - Workshop

Philippine Association of Graduate Students in Teacher Education, Inc. (PAGSTE), Philippine Normal University Graduate Student Council (PNU-GSC) and International Organization of Educators and Researchers, Inc. (IOER). May 2, 2021

International Graduate Teacher Education Summit 2021

Philippine Normal University (PNU) and International Organization of Educators and Researchers, Inc. (IOER). March 14, 2021

Online Course Design and Management Guide for Teachers without Borders Program (Modules 1-5)

PRC CPD Credit Units: 8 units

Private Education Assistance Committee, De La Salle University. August 8, 2020

Mathlete Clinic 2019 for Coaches (Philippine Mathematical Olympiad)

Dasmariñas, Cavite – October 12, 2019

Leadership Academy. In cooperation with Marshall Cavendish Institute and Principals Academy

Century Park Hotel, Manila - September 2 & 3, 2019

Casio Strategies + Technologies in teaching the least mastered skills. Mathematics Workshop

Malayan College Laguna – March 23, 2019

DepEd-PEAC In-Service Training for Junior High School Teachers – Mathematics

PRC CPD Credit Units: 15 units

Lyceum of the Philippines University: July 26 – 28, 2017

University Research Forum 2018, Philippine Normal University, Manila

January 27, 2018

Teaching Strategies for the 21st Century Learners, JO-ES PUBLISHING HOUSE, INC

June 3, 2015

2014 Mathematics Students' Convention, Mathematical Society of the Philippines

January 25, 2014

Embracing K-12 Curriculum: Developing Transferable Knowledge and Skills in the 21st Century

Pamantasan ng Cabuyao

February 28, 2015

Trends and Opportunities for Filipino Migrant Workers, CCED Consultancy, Research and Advanced Learning

April 28, 2016

Calamba City, Laguna

Mathematics Engaged! Flow, Transform, Ignite

Pamantasan ng Cabuyao

March 10, 2013

Solving Differential Equations: An Introduction

Pamantasan ng Cabuyao

March 12, 2013

Work Recognition

2019 Top Performing Teacher Awardee

Holy Redeemer School of Cabuyao, Laguna Inc.

March 23, 2019

Affiliations

Mathematics Teachers Association of the Philippines (MTAP) – CALABARZON

Former Member, Mathematics Society of the Philippines – CALABARZON Chapter (MSPC)

Others

Module Developer. My Desk: Learning Reimagined Modules June 2021

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