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Research Article

A Case Study of Secondary Science Teachers in Utilizing Online Tools in Blended Modality

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ABSTRACT

Educational institutions are keeping up with changes in time. When COVID-19 hindered the traditional face-to-face classroom set-up, several forms of education, including blended learning, had to be implemented. Blended learning was possible due to the current advancement in science and technology. Applications and online tools are available for teachers and learners to ascertain the continuity of education. Hence, this study explores the online tools and applications utilized by science teachers, challenges encountered, and coping mechanisms teachers utilize to counter challenges. Moreover, this study employs a case study approach to ascertain that the data gathered are contextualized and specific. The results revealed that teachers utilized online tools like Class Point, Quizziz, E-class (Moodle), Kahoot, and Peer Deck. Challenges encountered by teachers include Lack of Digital Competence, Incompatibility of the application to the gadget used, Unstable internet connection, Lack of access to online tools premium features, and Lack of student engagement and direct supervision. Moreover, the teachers' coping mechanisms include Using differentiated and collaborative activities and emphasizing authentic submission of outputs. To effectively develop and implement these tools, it is necessary to comprehend and attend to the needs of secondary science teachers who have shared their experiences using online tools in a blended modality.

Keywords: *Blended learning modality, Online tools, Science education*

Introduction

The COVID-19 pandemic has forced academic institutions and administrators to shift to other distant learning modalities, including blended learning modalities, to ascertain the continuity of education (Donnelly et al., 2021;

Bozkurt et al., 2022; Taghap, 2023). Blended learning modalities have become popular in education, particularly in science subjects. This is because blended learning significantly improves science achievement than traditional learning (Khader, 2016; Utami, 2017). Blended

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learning combines traditional face-to-face and online learning (Oliver & Trigwell, 2005; Dziuban & Moskal, 2004; Staker & Horn, 2012; Hoic-Bozic et al., 2016). As the demand for blended learning becomes a trend, education has continuously embraced innovations by leveraging technology (Kintu et al., 2017). Studies (Hoic-Bozic et al., 2016; Siew-Eng & Muuk, 2015) have shown that integrating web tools in the teaching and learning process has improved the preparation and facilitation of learning. Using computer-based and web-based learning modalities provides more relevant approaches for a more pragmatic learning environment, making students feel the realities of this world (Chandini, 2016).

As the world transitions to blended learning modalities and as it gains popularity among science teachers, it also brings with it several challenges, particularly in terms of technicalities and instructional deliveries (Wang, 2023). Studies (Mendoza, 2023; Wang, 2023; and Leon & Matolo, 2022) have shown that the major limiting factor for science teachers in integrating technology is their inadequate training in blended learning modalities.

Implementing blended learning poses serious challenges (Hussain et al., 2019; Manes et al., 2022). However, some studies (Hoic-Bozic et al., 2016; Hussain et al., 2019; Manes et al., 2022; Paje et al., 2022) have not considered the challenges blended learning poses, especially in facilitating instructions with the aid of web tools effectively and efficiently in a case of a private institution. Moreover, teachers need to know what coping mechanisms they may utilize to ease the effects of the challenges faced to formulate the proper solution to the problem. Hence, a knowledge gap must be addressed as blended learning is now being utilized worldwide.

This study explores the challenges science teachers face at a private institution in utilizing web tools in a blended modality and provides insights into how these challenges can be addressed.

It specifically seeks to answer the following questions:

1. What are the online tools used by secondary science teachers?

2. What are the challenges faced by secondary Science teachers in blended learning modality?
3. What are the coping mechanisms of teachers to the identified challenges?

Methods

Research Design

The research design employed in this study is a qualitative approach and a descriptive case study design. This approach allows an in-depth exploration of science teachers' challenges at a private institution utilizing web tools in the blended modality. Qualitative research is well-suited for capturing rich and detailed data, enabling a comprehensive understanding of the participants' experiences and perspectives.

Sample/Respondents

The participants for this study were chosen from the population of science-tenured teachers at private institutions using a purposive sampling method. There will be four participants. To give premium in the proper selection of participants of the study, the researcher follows the criteria:

1. Teachers should be employed as science teachers in institutions.
2. Teachers who experienced teaching in blended learning modality.

Instruments

The primary instrument used in this study was a semi-structured interview. The interview questions were designed to explore the challenges faced by science teachers in utilizing web tools within the blended modality. The interview questions were developed based on a thorough review of relevant literature and the research objectives. The validity of the interview questions was ensured through expert review and pilot testing.

Data Collection

Data collection was conducted through individual interviews with the selected tenured science teachers. The interviews were conducted one-on-one to create a comfortable and confidential environment for the participants to share their experiences openly. The inter-

views were audio-recorded with the participants' consent to capture their responses accurately. Each interview session lasted approximately 20 to 30 minutes, allowing for a comprehensive exploration of the challenges faced by science teachers.

Data Analysis

The participants for this study were chosen. The collected data underwent thematic analysis inductively using Braun and Clarke's (2013) thematic analysis. Codes were organized, and themes were produced. This involved systematically identifying patterns and themes within the participants' responses. The audio recordings of the interviews were transcribed verbatim. The transcripts were then coded and organized into meaningful categories based on recurring ideas, concepts, and experiences. The coded data were analyzed to identify common themes and patterns. This thematic analysis allowed for a comprehensive interpretation of the challenges faced by science teachers in utilizing web tools in the blended modality. The findings from the data analysis were presented in a narrative form, providing a coherent and insightful understanding of the research topic.

Result and Discussion

Online Tools Used by Science Secondary Teachers

The new normal brought innovative modalities to address the learning demands of Filipino learners better. When integrated in a meaningful way, new technologies will enhance knowledge production and the communication and dissemination of ideas (Gayeta, 2019). These emerging technologies were listed in the study of Darayseh (2020), which included digital tools and software applications that were a great help in supporting teachers in teaching science courses in a government school in the United Arab Emirates.

Implementing the blended learning modality in the Philippine educational setting also brought about innovative teaching strategies. The teacher participants in this study agreed that they employed several online tools in teaching Science subjects during the blended modality. As reflected in Matrix 1, the common online tools they used were Class Point, Quizzis, E- Class (Moodle), Kahoot, and Peer Deck.

Table 1. Online Tools Used by Secondary Science Teachers

Participant	Transcript	Labels/ Initial Codes	Theme and Sub-themes
1	One of them is Peer Deck. We also have Class Points, Quizzes, Kahoot, Wizer, Padlet, and the like. And these are the materials that we used. Yes, the school has provided us a learning management system called E -Class that is made by Moodle.	<i>Peer Deck, Class Points, Quizzes, Kahoot, Wizer, Padlet, E-Class</i>	<i>Online Tool Used:</i>
2	These are the jump board, mentimeter, quizzes, Kahoot, and especially the E -Class.	<i>Jump Board, Mentimeter, quizzes, kahoot, E-class</i>	<i>Class Point, Quizzis, E-Class, Kahoot, Peer Deck</i>
3	I used Canva, Mentimeter, Kahoot, Peer Deck, Zoom, Google Meet. I also use Wheel of Names, TikTok, Quiziz, E -Class.	<i>Canva, Mentimeter, Peer Deck, Zoom, Google Meet, Wheel of Names, Tiktok, Quizzis, E-Class</i>	
4	In teaching grade 10 students, I used ClassPoint	<i>Class Point</i>	

It can be gleaned that all four (4) interviewed participants mentioned five (5) common online tools. It was stressed that the school used E-class as the main web application during the blended learning modality.

“One of them is Peer Deck. We also have Class Points, Quizzis, Kahoot, Wizer, Padlet, and the like. And these are the materials that we used. Yes, the school has provided us a learning management system called E-Class that is made by Moodle.” - Participant 1

“I used Canva, Mentimeter, Kahoot, Peer Deck, Zoom, and Google Meet. I also use Wheel of Names, TikTok, Quiziz, E -Class.” - Participant 3

During the pandemic, several online tools were used by the participants during the blended learning classes. One of which is the ClassPoint. It is a Classroom Response System that allows users to turn their existing slides into an interactive presentation and quiz questions within PowerPoint without switching to another application during teaching. It also has features that add unlimited whiteboards during slides, it can also allow students to use their smartphone or computer-based devices to participate in the quizzes and follow along with the instructor's slide presentation. In the study of Bong (2021), the findings showed that ClassPoint was an efficient platform for increasing student involvement and participation in class.

Another is the Quizziz, a game-based learning tool that engages students in answering quizzes in different and challenging manners (Kharbach, 2022). Other than that, this online tool provides a powerful grading system that can generate performance reports for the teachers to use as a basis in their remedial sessions. Parents also automatically get the progress of their children.

Kahoot! is also commonly used by the participants in this study. According to Lunden (2018), it is also a game-based learning platform that can be used during formative assessments that is used by half of American K to 12 students. Vick (2019) added that as of 2019, almost 3 billion people globally played Kahoot!.

Lastly is Peerdeck. It is an online tool, a Google Slides add-on aimed at assisting educators in producing interesting slide-show-style content for the classroom and distance learning (Edwards, 2022). It enhances blended learning by promoting active student engagement, fostering a sense of community, facilitating assessment and feedback, supporting differentiated instruction, and promoting critical thinking skills. In the study of Gross (2023), the study's findings revealed that the Pear Deck group did much better on the accomplishment assessment.

Challenges Faced by Science Secondary Teachers

With the sudden change in learning modality because of the pandemic, it is normal that teachers will face problems in adjusting. According to Wang (2023), these challenges can be in terms of technicalities and instructional deliveries.

Through a one-on-one interview with the selected four (4) science secondary teachers as the participants, they revealed the challenges they face while using the online tools during the blended learning modality. As reflected in Matrix 2, five sub-themes describe the challenges they experienced: Lack of Training Using the Application, Unstable internet connection, Incompatibility of the application to the gadget used, Lack of Access to online tools features, and Lack of Students Engagement and Direct Supervision.

Table 2. Challenges Faced by Secondary Science Teachers in Blended Learning Modality

Participant	Transcript	Labels/ Initial Codes	Theme and Sub-themes
1	Connectivity problem is not really something that has been solved yet. Also, web tools want you to purchase a premium account. So, we are lacking in time because at the same time we are learning, at the same time they are learning how to use the tool and then they are also learning the topic that I'm teaching. So, there are some time constraints. So there's this kind of gap in which sometimes my students are better in handling technology than I am. And of course, I think we need more training on how to use this tool so that we become more familiar and we know how to navigate into the web tools.	<p><i>Limitation in using the application because it is not a premium account</i></p> <p><i>*Time Constraint</i></p> <p><i>Age gap</i></p> <p><i>Lack of training in using the application</i></p>	<p><i>Lack of Digital Competence</i></p>
2	First, the compatibility of the given tool to my device. I also encountered problems with internet connection. Limitation would be the knowledge because I don't have the clear grasp on how to use, restrictions in terms of the subscription. I cannot maximize all features present in that particular platform. Aside from that, we have the training but it was insufficient because it was congested in a particular day or week.	<p><i>Compatibility of the tool to the device used</i></p> <p><i>Internet connectivity</i></p> <p><i>Insufficient training</i></p>	<p><i>Incompatibility of the application to gadget used</i></p> <p><i>Unstable internet connection</i></p> <p><i>Lack of Access to online tools premium features</i></p>
3	The major problem that I had with doing online sessions is unstable internet connection. Another would be limited access to the use...In the use of the application, such as we needed to have a premium account in order to actually use it and it's a bit pricey to actually get one. And another would be the incompatibility with the desktop or the laptop specs, both on the student and on the teacher side. And you know, the interaction is less in online learning because cameras are off. And then accessibility of students. Since I have some students who are living in far-flung areas that doesn't have a stable internet connection.	<p><i>Unstable internet connection</i></p> <p><i>Limited Access to the application</i></p> <p><i>Incompatibility of the app to the laptop spec</i></p> <p><i>Less interaction</i></p>	<p><i>Lack of Students' Engagement and Direct Supervision</i></p>

Participant	Transcript	Labels/ Initial Codes	Theme and Sub-themes
4	I believe connectivity is the first one. The second one is I have to make sure that my students are oriented on how to use this application because if they don't know how to use it, they will have a hard time responding to the questions and that would take a lot of time from my class. Most of the students have only limited resources when it comes to technology because some of them, their laptops are used by also their siblings. I think that is very much of a concern during the online class because we are not sure if it is the student who really answered the exam...teachers can also feel that the students are just copy and pasting from the internet most likely because they are just left alone.	<p><i>Connectivity</i></p> <p><i>Lack of access to other features in the app</i></p> <p><i>Limited knowledge of students</i></p> <p><i>Lack of gadgets for students</i></p> <p><i>Answers in the activities were copy pasted from the internet</i></p> <p><i>Lack of interaction</i></p>	

Sub-Theme 1: Lack of Digital Competence due to lack of training

Three out of four participants aired their lack of adequate training on the use of web applications.

“And of course, I think we need more training on how to use this tool so that we become more familiar and we know how to navigate into the web tools.” -Participant 1

“Aside from that, we have the training but it was insufficient because it was congested in a particular day or week.” - Participant 2

Participant 3 added that it is not only the teachers who lack the proper training but all the students using the online tool. According to Participant 3, “The second one is I have to make sure that my students are oriented on how to use this application because if they don't know how to use it, they will have a hard time responding to the questions, and that would take a lot of time from my class.”

Inadequate training, as revealed by the participants, is also apparent in other studies (Mendoza, 2023; Wang, 2023; Leon & Matolo, 2022). The sudden change in the learning environment gave teachers difficulties adjusting

and adapting to blended learning (Mendoza, 2023; Wang, 2023 ; Leon & Matolo, 2022). This includes the unfamiliarity of the user interface of interactive virtual classrooms. It is unfortunate to note that administrators, education specialists, and as well as the government assumed that students and teachers have a reasonable level of competence with computers in the implementation of blended learning. Anyone who does not have adequate computer skills will more than likely struggle with blended learning models.

The lack of time to study the online tools had results to teachers and students having difficulty in manipulating it. Because of the age gap, teachers struggled most in understanding the functions of the applications. Some of them forgot how to manipulate the different online tools. The generational gap is also a problem seen by Baterna and Rogayan (2020) during the onset of the COVID-19 pandemic. Most of the respondents in the said study belonged to millennials, mainly teachers from ages 25 to 30 years old. These respondents admitted that they are not well versed in using technological software, not to mention using basic computers. This is due to the rare use of computer-based technology in science teaching (Paje et al., 2022).

Sub-Theme 2: Unstable internet connection

Another very pressing challenge they faced was the unstable internet connection. It was not only the teachers who experienced it but also the students. Participants 1 and 3 mentioned that the unstable internet connection affected their online classes.

“Connectivity problem is not really something that has been solved yet.” -Participant 1

“The major problem that I had with doing online sessions was an unstable internet connection. Another would be limited access to the use.” -Participant 3

It was also noted that with some of the students living in the far-flung barangays, it became difficult for them to connect to the internet. Not only were those living in remote, far-flung, and isolated locations, but teachers in the central business districts were also confronted with erratic internet connectivity (Baterna & Rogayan, 2020). Moreover, the Philippines is the only ASEAN country with poor internet connectivity (Baterna & Rogayan, 2020). Connectivity plays an important role in teacher’s accessibility and efficiency. In addition, another challenge faced by the teachers is the unreliability of electricity. Another limit of computers and other technologies today, particularly in isolated places, is insufficient power supplies. Frequent power outages can cause very low efficiency among teachers (Ken, 1998 in Paje et al., 2022). These problems may affect laboratories that need electricity to run the equipment and apparatus.

Sub-Theme 3: Incompatibility of the Application to Gadget Used

During the pandemic, the use of technology in the classroom has become increasingly widespread. However, technology cannot be effective in the classroom without teachers who are knowledgeable about the technology and its implementation to meet educational goals. Another point is that there is a need to have a compatible gadget for the required online tools (DeCoito & Richardson, 2018).

In this study, the participants noted that their laptops and gadgets were incompatible

with their applications during the blended learning modality.

“First, the compatibility of the given tool to my device.” - Participant 2

“And another would be the incompatibility with the desktop or the laptop specs, both on the student and on the teacher side.” - Participant 3

It can be interpreted that most of the laptops and gadgets used by the teachers in teaching were out-modeled, making them incompatible with the new online tools, which are very recent and demand a bigger capacity to operate smoothly. Without compatibility, teachers will be restricted from using applications that can provide interactive and digital learning materials in their lessons. Likewise, without compatibility, teachers felt frustrated and demotivated to continue using technology in the classroom. It is, therefore, important that the school administration should consider providing teachers with the needed resources and gadgets.

Sub-Theme 4: Lack of Access to Online Tool Features

Another challenge that the science teachers faced was the lack of access to online tool features. This happened because they were using the trial version, not the premium account.

According to Participant 1, “Also, web tools want you to purchase a premium account.” Participant 2 added that there is a restriction in terms of the subscription and that they cannot maximize all features present in that particular platform. Moreover, the participant added that the trial version restricted them from performing their optimum performance because, then again, they could not maximize all features present in that particular platform.

Although a trial version of a web application can offer features for science teachers, they have limited access and potential time limits, which can hinder the ability to fully use the online tool and integrate it into their teaching. Utilizing the premium version of the course can offer a comprehensive experience for science teachers. They can leverage the full range of features and resources to design interactive

lessons and create virtual experiments that suit the needs of the learners. The enhanced support and continuous access offered by a premium account promote wider access, which is important to fully engage students. In summary, trial versions serve as a testing ground for a web product. In contrast, premium versions can provide educators with a robust set of tools and resources to enhance the learning environment.

One of the leading causes that hamper blended learning is the inadequacy of ICT Materials, which causes deficiencies in ICT Literacy. This may include a trial version, which limits teachers' usage. In Chile, as reported by Johnson et al. (2016), extrinsic factors limiting teachers in teaching science include very little to no access to resources, lack of support and training from their academic institutions, and the problem with technological integration because of its limited access. On the other hand, it is also found that not all teachers and students are comfortable using computers (in and out of the classroom).

Sub-Theme 5: Lack of Students' Engagement and Direct Supervision

From traditional classrooms to virtual environments, educators face unique challenges in ensuring students' active participation and maintaining academic integrity. Addressing these issues requires measures that foster student engagement and authentic student outputs, especially in blending learning.

Teacher participants revealed this challenge during the blended learning modality. Participant 4 said, "I think that is very much of a concern during the online class because we are not sure if it is the student who really answered the exam...teachers can also feel that the students are just copy and pasting from the

internet most likely because they are just left alone." Also, Participant 3 also commented, "And you know, the interaction is less in online learning because cameras are off."

Participant 4 expressed concern about the potential for students to commit academic dishonesty. It is because, during blended learning, they observed that students resort to copying and pasting information from the internet, possibly due to a lack of supervision and accountability. Similarly, Participant 3 emphasized the lack of interaction in online learning, which may be because students often keep their cameras off, which contributes to the challenges of monitoring and engaging with students effectively in the virtual environment.

However, in the study conducted by Thomas (2021), it was found that digital support better-engaged students because it satisfies their needs. Also, the teacher's support was related to student engagement. It was also deduced that student's engagement is dependent on the kind of support they receive from their teachers. Therefore, educators must employ strategies that will measure the authenticity of students' outputs. They also need to integrate different activities that will engage students more.

Theme 3: Coping Mechanisms of Teachers to the Identified Challenges

In response to the different challenges faced by science teachers, they developed coping mechanisms to manage these difficulties. As Barañaño et al. (2022) stressed, recognizing these challenges is the first step to coping with them. Matrix 3 reflects the coping mechanisms to address the issues encountered by Science teachers in integrating technologies during blended learning.

Table 3. Challenges Faced by Secondary Science Teachers in Blended Learning Modality

Participant	Transcript	Labels/ Initial Codes	Theme and Sub-themes
1	Some learners would like it to learn better if they are going to do the activity in their home. I provide them a laboratory or home-based laboratory. Some learners would also just sit down and watch videos. I prepare also a video about the same laboratory, the	Teacher's provide different activities to students.	Using differentiated and collaborative activities

Participant	Transcript	Labels/ Initial Codes	Theme and Sub-themes
	same topic. So either way they will still be learning the same way. So this is somehow similar to differentiated learning. Basically, differentiated learning has been a very good strategy in blended learning modality.		<i>Emphasizing Authentic Submission of outputs</i>
2	Based from my students, they highly recommend collaborative activities because they have the time to talk with their classmates, especially during pandemic time. With that, they have engagement within their group because there are times, they are shy or they stick themselves talking to teachers because they have the sense of authority. If they collaborate with their group mates or classmates, they find it more comforting, fun and memorable. Perhaps, I think it will be more on the collaborative side.	<i>Teachers used collaborative activities.</i>	
3	Since I have a lot of students who have problems with internet connectivity, what I do, I do polls or surveys through messenger. So what I do, I do a 10 item assessment through Kahoot or I will be uploading this through our E -Class where what they have to do is just to download it or they could answer it on E -Class itself.	<i>Teachers do surveys and polls</i>	
4	I have to make sure that I give a clear out instructions to them with that if in case I found out that they just copy and pasted their output from someone else's output or they just got it from an AI -generated response then I mentioned to my students that I will give them a zero remark and that I use apps such as Grammarly to check the percentage of plagiarism in their output and also Turnitin to help me facilitate and make sure that their outputs are authentic.	<i>Teachers give clear instructions. Check for AI generated output and plagiarism content</i>	

Sub-Theme 1: Using Differentiated and Collaborative Activities

One of the strategies that teachers use to cope with the challenges they face is through the use of differentiated and collaborative activities. This sub-theme explains how teachers adapt their instructional approaches and create a supportive virtual classroom environment, as mentioned by two participants.

“Some learners would like to learn better if they are going to do the activity in their home. I

provide them with a laboratory or home-based laboratory. Some learners would also just sit down and watch videos. I prepare also a video about the same laboratory, the same topic. So either way they will still be learning the same way. So this is somehow similar to differentiated learning. Basically, differentiated learning has been a very good strategy in blended learning modality.” - Participant 1

“Based on my students, highly recommend collaborative activities because they have the time to talk with their classmates, especially during pandemic time. With that, they have engagement within their group because there are times when they are shy or they stick themselves talking to teachers because they have a sense of authority. If they collaborate with their group mates or classmates, they find it more comforting, fun, and memorable. Perhaps, I think it will be more on the collaborative side.” - Participant 2

“Since I have a lot of students who have problems with internet connectivity, what do I do, I do polls or surveys through messenger. So what I do, I do a 10-item assessment through Kahoot or I will be uploading this through our E-Class where what they have to do is just to download it or they could answer it on E - Class itself.” - Participant 3

Hence, the teacher participants address learners' learning styles by providing differentiated learning activities. It was done through the provision of instructional videos and home-based laboratory activities. Participant 2 mentions that collaborative activities, where students talk with their classmates, were also used. These activities were found to be fun, memorable, and comforting during the pandemic. Also, Participant 3 added that for those students with limited internet connectivity, the teacher provided activities using messaging platforms.

Differentiated Instruction (DI) and collaborative activities have been used in education and proven effective (Faber et al., 2018). In the investigation of DI for learners' mathematical self-efficacy, Onyishi and Sefotho (2021) found that the approach was helping students. Likewise, Kamarulzaman, et al. (2021) investigated the impact of online DI on students' motivation and academic performance during the pandemic. The findings showed that DI is feasible and that an appropriate combination of differentiated activities may lead to motivation and better academic performance.

Sub-Theme 2: Emphasizing Authentic Submission of Outputs

It is the goal of education to assess the achievement of students through their outputs. However, true abilities and skills should be ensured by submitting an authentic output. Authentic outputs promote critical thinking, creativity, and application of concepts. But, because of the availability of data online, students tend to be tempted to copy and paste data as their output. Some of the science teachers observed plagiarism in students' work and found ways to correct it.

According to Participant 4, “I have to make sure that I give clear out instructions to them with that if in case I found out that they just copy and pasted their output from someone else's output or they just got it from an AI-generated response then I mentioned to my students that I will give them a zero remark and that I use apps such as Grammarly to check the percentage of plagiarism in their output and also Turnitin to help me facilitate and make sure that their outputs are authentic.”

In this statement, Participant 4 stressed the need for clear imposition of rules to ensure that students turn authentic outputs. It can be noted that the teacher observed plagiarized reports or AI-generated outputs. To address this, the participant informed the students that any plagiarized work would result in a zero score.

Authentic assessment should provide long-term student engagement with learning (New South Wales, 2023). Authentic assessment should be based on environment settings where students could work or learn after the task is complete. When students are comfortable collaborating and working on less sharply defined problems, they can be observed.

Authentic assessment plays a very important function in education because it provides meaningful evaluation of students' performance while in school. Unlike traditional assessment which focused on rote memory, assessments during the pandemic were changed. It is now centered on collaboration and student engagement. Their outputs were based on personal realization and group discussions. Authentic assessment allows students to demonstrate their understanding practically and

meaningfully, thus preparing them to be problem solvers in the future.

Authentic evaluation serves as the basis for decision-making. It will be used as a guide in developing interventions and remediation, especially during blended learning modality. As a whole, reliable assessment enhances learning experiences, encourages deeper understanding, and promotes appropriate plans for learners' welfare and educational competence.

Conclusion

The teacher participants in this study employed several online tools in teaching Science subjects during the blended modality like Class Point, Quizzis, E- Class, Kahoot, and Peer Deck.

The challenges experienced by the participants were lack of training using the application, unstable internet connection, incompatibility of the application to gadget used, Lack of access to online tools features, and lack of student engagement and direct supervision.

The teacher participants cope through using differentiated and collaborative activities and emphasizing authentic submission of outputs.

Based on the generated initial codes from the challenges of secondary science teachers in utilizing online tools in blended modality, the resulting themes are (a) Online Tools Used by Secondary Science Teachers, (b) Challenges Faced by Science Secondary Teachers in Blended Learning Modality; and (c) Coping Mechanisms of Teachers to The Identified Challenges. In order to effectively develop and implement these tools, it is necessary to comprehend and attend to the needs of secondary science teachers who have shared their experiences using online tools in a blended modality.

Meanwhile, the following are the recommendations of the researcher based on the findings of the study:

1. For the school to provide teachers with premium accounts on the use of school-prescribed online tools and for the science teachers to continue using Class Point, Quizzis, E- Class, Kahoot, Peer Deck, and other online applications in teaching science.

2. For the school to provide resources like a stable internet connection for blended learning modality.
3. To conduct action research to investigate the effectiveness of blended learning modality.
4. To conduct training and workshops for teachers to be fully equipped with the needed skills in the use of different online tools in teaching science.
5. For the school to conduct a year-end evaluation on the use of online tools.
6. To share the result of the study with teachers in other departments using blended learning modality.

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