Perspectives, Challenges, and Opportunities: The Pandemic Teaching Experiences in Science Courses

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The shift to distance learning has created unique perspectives and challenges to educational stakeholders specifically among teachers who are tasked with keeping teaching and learning on track despite their professional, technical, and personal concerns, and inadequate familiarity to the new learning modality. While these realities have been challenging the capability of teachers, they also open the doors for opportunities of levelling up to a new education landscape and harnessing potentials which may be useful for the furtherance of the teaching practices. The present qualitative study aims to document Science teachers' perspectives, challenges and opportunities in the teaching of Science courses during the pandemic. It consists of the various insights, initiatives, coping strategies and actions, and opportunities of eight Filipino Science teachers towards securing a responsive and efficient learning management in the midst of the unforeseen challenges in the education sector brought by the impact of the COVID-19 pandemic.

Keywords: perspectives, challenges, opportunities, science teaching

INTRODUCTION

The transition from the traditional face to face teaching into remote and distance modality has brought up various concerns ranging from delivery to sustaining quality of education. This reality has become a concern of teachers who have been attuned to exploring approaches and strategies which are applicable only thru personal class meetings. Among the teachers who were challenged by this concern are those engaged in teaching laboratory classes? Like most of the other professional activities, daily in-campus teaching and laboratory courses are suspended in numerous schools worldwide (Ray & Srivastava, 2020). Science, which is a lecture and laboratory class, is one of the challenging subjects in the secondary level to be taught online. It often leaves a negative perception on students that science is complicated to learn and considered as exact subject as compared to social sciences. Difficulty not only lies among students but also among science teachers who are not technologically inclined and find the complexity of teaching the lessons in an online platform.

Challenges brought by the pandemic in teaching science paved way for teachers to adopt and learn technological devices used in online learning (Khadijah, 2021). While there have been concerns among the ICT capability of teachers, the continuance of education has suddenly focused on the use of online modality. For Esani (2020), this makes it more challenging for educators to create a sense of social presence. Making the online students feel as part of the learning community as well as assessing the level of student learning and regularly communicating with them has become a challenge. Clark (2018) noted that since the rise of the internet two decades ago, teachers' relationship with technology have had never been smooth for they have been slow in embracing digital ways of teaching and learning. Gaboy et al. (2020), suggested the need to devise innovative teacher training programs that will increase the ICT pedagogy awareness and integration of teacher education faculty members. Dhawan (2020) presented several problems related to online learning. These include difficulties and problems associated with modern technology ranging from downloading errors, installation issues, and login problems. Some of the arguments include accessibility, affordability, and flexibility, learning pedagogy, life-long learning and policy.

In the US context, Cano and Thompson (2020) noted that the shift to distance learning has created unique challenges (e.g., figuring out assignments on their own; understanding the teachers and learning materials; lack of home internet access) for learners and their parents, who are tasked with keeping learners on track despite their personal concerns and inadequate familiarity with the educational system. While these realities have been challenging the capability of Science teachers, they also open the doors for opportunities of levelling up to a new education landscape and harnessing potentials which may be useful for the furtherance of the teaching practices. Antonio et al. (2020 in Cabangcala et al., 2021) asserted that the popularity of distance learning and teaching and its extensive practice remains to be isolated in some countries, especially in developed ones; however, the case holds true in the Philippines. Noticeably, in general, the Philippine Educational System, prior the pandemic, favors so much the long-held traditional approach of education. It was only until recently that distance learning has been made known or introduced to the common public when it was considered as means for the continuation of the learning of the young. As such, it could be said that distance learning is at its infancy in the country.

Different agencies and institutions offer series of webinars and tutorials on how educators can successfully transfer their lessons using different mode and platforms especially science teachers that are used to doing laboratory activities to support abstract theories in science. This opportunity gave the teachers a more advanced approach to transfer knowledge to students despite of the challenges encountered at this times. Watkins et al. (2020) encourage science teacher professionals for a more responsive approach to facilitate scientific engagement online to further support future science teachers on their quest to deliver the lesson efficiently and effectively.

Most of the studies surveyed focused on documenting and reporting the practices and challenges encountered by teachers in the deployment of their online and offline classes and on the students' perceived benefits and challenges on synchronous online discussion. However, none so far explored teachers' perceived opportunities in teaching their respective subjects in the new normal. Apart from their practices and challenges encountered, it is equally important to note the opportunities teachers see out of the situation.

Thus, this study was undertaken to explore various dimensions of experiences which may deliver insights among educators to help them become more prepared and adaptable as to what lies ahead in the teaching of Science courses during the pandemic. Specifically, the present study aims to document Science teachers' perspectives, challenges and opportunities in the teaching of Science courses during the COVID-19 pandemic. For dela Rama et al. (2020), this line of study as regards Science teachers, who teach courses involving experimentation, observation and other activities difficult to be performed virtually, presents itself as a novel and essential investigation. The study aimed to determine Science teachers' perspectives, challenges and opportunities in the teaching of Science courses during the COVID-19 pandemic. Specifically, it answers the following questions:

1. What were the participants' initial thoughts on the conduct of classes during pandemic?
2. What were the preparations made by the participants for the conduct of classes during pandemic?
3. What were the challenges met by the participants in the teaching of science courses during pandemic?
4. How did the participants cope with the pedagogical challenges during pandemic?
5. What teaching strategies were considered effective and ineffective during the pandemic?
6. What opportunities in the teaching of science courses during pandemic were identified by the participants?

METHOD

This section discusses the methodology employed in the study. It has four sub-sections: research design, participants, data collection, and data analysis.

Research Design

Qualitative approach was adopted in order to answer the research questions. For Guba and Lincoln (1994), qualitative research interprets participants in its natural environment. Since the research questions require in-depth information on the various facets of the issue on the teaching of science courses during the pandemic, the qualitative approach was preferred. Further, this approach was utilized to accommodate answers in areas that could not be easily anticipated. Finally, as Kothoff (1996 in Ravago et al., 2020) emphasized, qualitative approach is useful in understanding how the participants reconstruct meanings, which in the present study may refer to their perspectives, challenges, and opportunities in teaching science courses during the pandemic.

Participants

Eight Science teachers (5 males, 3 females) pursuing advanced study in Science Education participated in the study. Seven of the participants were teaching in public secondary schools and only one was teaching in a State-University during the conduct of the study. Of the eight participants, only one rated himself as "highly prepared" on the use of technology for distance learning, while the rest rated themselves "prepared". Meanwhile, all the participants perceived themselves "prepared" in teaching during pandemic. In terms of the number of webinars attended as regards the teaching of Science during pandemic, five of the participants completed two webinars, and the remaining completed three, five and six webinars, respectively. Participants remained anonymous in the study and were coded as Participant 1 to Participant 8.

Data Collection and Tools

Prior to data collection, the researchers met the participants via online platform and discussed with them the purpose of the study as well as their extent of participation. Participants were also asked to sign a consent form expressing their voluntary participation in the study. Participants did not receive any compensation or grade incentive in exchange of their participation. Research data were collected via participants' written responses on the open-ended interview questions developed by the researchers. The interview form consists of two parts. In the first part, demographic information about the participants was

taken. The second part of the instrument contains open-ended questions about the participants' perspectives, challenges and opportunities in the teaching of science courses during the pandemic.

Data Analysis

The data were subjected to content analysis. For Yildirim and Simsek (2013), content analysis aims to reach the concepts and themes that can explain the collected data, to gather similar data within the framework of specific concepts and themes and discuss them in a manner the reader can comprehend. In this study, the researchers followed Sari and Nayir's (2020) approach to content analysis. First, researchers manually examined and combined similar statements. This is similar with the inter-coding technique observed by researchers (e.g., Astrero & Torres, 2020; Astrero & Flores, 2019; Torres et al., 2020, 2021; Torres & Flores, 2017; Torres & Medriano, 2020). The encoded data were combined, and themes were created by identifying common aspects. The last steps include explanation of codes and themes, and the discussion of findings.

RESULTS AND DISCUSSION

This section presents and discusses the findings of the study. It begins with the presentation of the participants' initial thoughts on the conduct of classes, preparations made for the delivery of learning, challenges in teaching science courses, and strategies in coping with the challenges. The latter part presents the effective and ineffective strategies in teaching science, and the opportunities in teaching science courses as reported by the participants.

Initial Thoughts on the Conduct of Classes

Table 1 presents the participants' initial thoughts on the conduct of science classes in the pandemic. The results are clustered into: students' welfare, teachers and school employees' concerns, parents' participation, and school administrators' concerns.

TABLE 1
INITIAL THOUGHTS ON THE CONDUCT OF CLASSES DURING PANDEMIC

1. Students' Welfare
a. Students may experience psychological, emotional and physical constraints
b. Some students may be forced to stop schooling
c. Students may be inclined to submit half-baked requirements
2. Teachers and School Employees' Concerns
a. There would be challenges on the monitoring and assessment of students' learning progress
b. Teachers would have opportunities to conduct research activities
c. Teachers would have opportunity to change and adopt appropriate teaching styles
3. Parents' Participation
a. Parents would have a hard time coping with the home-based schooling of their children
b. Parental roles would be emphasized in the process of home-based schooling
4. School Administrators' Concerns
a. School administrators would be challenged in the undertaking of the teaching and learning process
b. The change in learning modality may highlight inadequate resources and limited readiness of the schools

Students' Welfare

Prior to the actual teaching in the pandemic, participants have thought of students' welfare specifically the psychological, emotional and physical constraints posted by the abrupt changes in the mode of delivery

of instruction, of not attending physical classes, and the fear of doing school works alone. According to Participant 2:

> "I was thinking about the impact of the new system to the psychological, emotional and even the physical aspects of the students and teachers since demands for work time should be flexible".

The participants thought of how students may handle the new situation and how they may be able to adjust to it which might result in various emotions. Further, the participants thought that the demand of new normal may scare students to pursue their schooling. For Participant 5, "a lot of students, especially in public schools lack internet access and have very limited learning resources. So, if they are going to push the opening of classes, there would be many factors that will affect their learning, learning will not be efficient, and more students will be forced to stop schooling". Since it will be their first time to experience the new setup of teaching and learning participants feared that students may have apprehensions on whether to continue schooling or not. The distance between advantaged and less advantaged students in terms of Internet connectivity and unavailability of gadgets such as laptop and cellphone might pose distress and might lead not to pursue their education. Lack of information on how the school can extend assistance to students might also increase their reason from dropping. Furthermore, participants were also cognizant on the reality of submitting students' requirements that might be done half-baked. Being once a student and having knowledge on the nature, capability, and behavior of students with and without the supervision of teachers, participants somehow expected the possibility that their students may not able to comply with the regulations set by the schools.

Teachers and School Employees' Concerns

Participants were also concerned of the challenges the seasoned teachers might face in terms of monitoring and assessing students' learning. Assessment and feedback guide both the teachers and students on their teaching and learning process, respectively. Having recognized the importance of evaluation prior, during, and after the teaching-learning process made the participants wonder how assessment procedure can be done in the new normal considering that they were not properly trained and ready to assess their students in the new normal set up of teaching and learning.

Nevertheless, in spite of those challenges they faced, they were still optimistic that classes in the new normal might pave the way for new opportunities like conducting research activities and developing new teaching strategies. Moreover, teacher's creativity and critical thinking skills will be once again put to test and refine to adjust and make themselves relevant to the changing times. Hence, they need to retool and reinvent themselves to fit to the new situation.

Parents' Participation

Participants were also aware that students' parents could have a hard time coping with the home-based schooling of their children. Since parents are on work from home mode, their children's activities may interfere in their works. Parents are considered partners of teachers in achieving the learning goals of every program. They are expected to take the lead in students' learning process despite their limited preparation in doing it. Many responsibilities (e.g., getting the modules in the school, assisting and supervising their children complete the activities in the lesson, providing instant enabling learning environment at home, giving gadgets) that will facilitate in accomplishing the learning tasks of their children and returning the accomplished modules in the school, establishing close communication via social media with the teachers, and spending their time helping their children in their studies while simultaneously working from home are laid on their shoulders. The foregoing premise is supported by the response of Participant 7:

> "Another problem that alarmed me due to the implementation of the opening of classes this year was the parent's role on education [in which] parent would have to play an active role in the learning process. They would be the ones to facilitate and guide their children to the

modular lessons sent to students while doing distance learning. To be honest, there are parents who are no read, no write. They are sending their children to school because they don't want their children to be like them. Who would teach the students at home? This kind of modular learning is really difficult. Not all parents are capable of guiding their children".

School Administrators' Concerns

The participants also thought of the challenges the school administrators will have to face in order to ensure the continuity of the teaching and learning process. School administrators are on the lead in running the school. School administrators across the globe faced the challenge of setting the school's directions at the start of the lockdown. Learning institutions had to focus on managing the institution on challenging times, ensuring continuity of education, ensuring quality and excellence amidst pandemic, and moving on and moving forward. Being products of school and still immersed in the school, participants were aware of the inadequacy of resources and lack of school's preparation. Indeed there is no educational institution prepared for pandemic so it really upset and shocked every stakeholder in the educational institutions and even others from all walks of life.

Preparations on the Delivery of Learning in Terms of Development of Learning Materials and Conduct of Online and Offline Classes

Table 2 presents the preparations made by the participants for the delivery of learning starting from development of learning materials to the conduct of online and offline classes. As revealed in the results, the preparations ranged from personal and professional aspects.

TABLE 2
PREPARATIONS FOR THE DELIVERY OF LEARNING IN TERMS OF DEVELOPMENT OF LEARNING MATERIALS AND CONDUCT OF ONLINE AND OFFLINE CLASSES

Personal Preparation
a. Conditioned oneself to be physically, emotionally and socially fit
b. Spent time in a quiet place
c. Bought the necessary Personal Protective Equipment (PPE) and gadgets such as laptops, and secured internet connection
Professional Preparation
a. Designed and aligned Learning Plans to remote and distance learning
b. Explored the web for possible learning resources
c. Spent time in reading and watching learning videos as well as attending webinars, trainings and designing learning tasks for subject matter mastery

The sudden change in the educational system forged by the pandemic necessitated teachers to fleetingly prepare for new delivery of learning specifics in the development of learning materials and in the conduct of online and offline classes. The participants prepared themselves both in personal and professional aspects.

The participants' preparation started with conditioning themselves to be physically, emotionally, and socially fit. The importance of a moment of silence and quietness was indicated to be a ritual of preparation and focus. Participant 5 mentioned that, "At home, I usually go the place where the noise will be controlled so that during the classes, distraction may be avoided". For Participant 3, spending time in a quiet place prepares her for each day's activity. To a great majority, silence enhances deep thinking, focus, and calmness. The benefits of cultivating silence extend to professional and social life. Likewise, Participant 2 mentioned of his personal protective kits such as facemask and face shield to put premium to his health implying a sound mind and a sound body. Teachers' preparation likewise included buying material things like PPE, laptops, and securing stable internet connection.

The teachers' professional preparations are focused on concerns that elevate the quality of teaching-learning. Hagger and McIntyre (2000) explain that teacher's preparedness originates from teacher education which basically refers to the specific program aimed at helping the teacher in developing quality and effective strategies in teaching and learning process. Participants 3 and 4 emphasized that they spent a lot doing things like making and modifying the curriculum instruction, aligning the lesson plan to remote distance learning, and innovating instructional materials addressing to online and modular learning activities. Proper planning of design and alignment of learning to remote and distance learning were given attention as these modalities are the requirements during the pandemic and post-pandemic periods. The web also served as one of the resources in teaching as claimed by all the participants. They also spent time in reading and watching videos, and attended webinars and trainings. Designing learning tasks was a challenge the participants took, all for mastery of the subjects they teach.

Challenges in Teaching Science Courses During Pandemic

Table 3 presents the challenges identified by the participants in teaching science courses. Four categories emerged from their answers, including strategies, students' learning, modality preference and instructional materials preparation.

TABLE 3
CHALLENGES IN TEACHING SCIENCE COURSES DURING PANDEMIC

1. Strategies
a. Undertaking of performance-based tasks and compliance on the time -bounded submission of activities
b. Coping with students' virtual attendance and attitude
2. Students' Learning
Students' learning is not guaranteed; they are inclined to be passive
3. Modality Preference
Unfamiliarity with the different virtual platforms
4.Instructional Materials Preparation
a. Printing, sorting and retrieval of printed learning modules
b. Inadequacy of materials
c. Simplifying instructional materials preparation

Strategies

Science subjects require the need for process-based and product-based performance tasks. Experimentation, as one of the process-based and product-based performance tasks, helps the students in understanding concepts. According to Participant 8, "it is hard to conduct experimentation because activity like this should be under the guidance of the teacher for them to realize the implication to the conducted experiment". The other challenge they encountered was on students' virtual attendance and attitude. Synchronous mode of teaching is difficult to some students because of the fluctuating and unreliable internet connectivity. Likewise, students' motivation to join in the synchronous class had also become a problem since their attention were diverted to other concerns such as doing household chores and other emotional and physical distractions at their respective homes.

Students' Learning

Another challenge identified was student's learning was not guaranteed since they are inclined to be passive. For Participant 4, "Some of the activities on the module are left unanswered because they [students] do not understand the lesson well by learning on their own". In the Philippines, there are three modalities of teaching and learning during pandemic: modular, online and blended. In pure modular teaching, printed

materials are given to students and they are tasked to answer the activities on their own. Likewise, the lack of spontaneous interaction between the students and teachers in modular learning often leads to lessons left unexplained and students' inquiries left unanswered. One of the many roles and functions of the teacher is to ensure that learning takes place among students. During this pandemic, giving directions and monitoring the actual performances of the students through virtual was a challenge. The deadlines of submission of activities are not time-bounded due to poor internet connectivity and availability.

Modality Preference

Students' learning modality preference was another challenge identified by the participants. Since remote learning was just experienced in this time of pandemic, participants were not yet aware of the particular platform that is effective, efficient and appropriate to the needs of all students. Unlike in the face to face, teaching strategy can be adjusted depending on the response of students during interaction/discussion.

Instructional Materials Preparation

With the huge number and bulk of modules to be prepared, printed, sorted, and distributed, preparation of instructional materials was also identified as one of the challenges. One must have skill in the technical aspect of putting ink in the printer as well as troubleshooting if paper jam occurs. Further, sorting and distributing it to parents and learners added to the enormous work of teachers. Finally, retrieving the learning materials from the learners' parents, and waiting patiently to those who could not submit on time somehow adds up to the pile of challenges. Inadequacy of resources was also a challenge related to instructional materials preparation. Hence, teachers rely on donation from the different stakeholders. Lastly, with the bulk of knowledge available in print and online, simplifying the bulk of information to comprehensible bits of concepts in order to save time and effort without compromising the goal of facilitating the learning process of students becomes trial and error.

Coping With the Challenges in Teaching Science Courses in the Pandemic

Table 4 presents the coping mechanisms employed by the participants in coping with the challenges in teaching science courses during this pandemic. From their responses, four coping strategies were revealed: by peer support, by assisting students, by relying on ICT support, and by developing positive perspective.

TABLE 4
COPING WITH THE CHALLENGES IN TEACHING SCIENCE COURSES DURING PANDEMIC

By Peer Support
a. By collaborating with co-teachers and asking for help from them when needed such as in the sorting of modules and other concerns related to the use of ICT equipment such as paper jam, refilling of ink among others.
b. By soliciting support and guidance from family, friends, colleagues, classmates and God
c. By requesting students to share learnings to their classmates and reminding them this is not the time for competition
d. By establishing rapport and by communicating with parents
By Assisting Students
a. By asking students of their preferences and resources
b. By motivating students and providing enrichment activities
c. By modifying learning activities when necessary and giving the students due consideration
d. By focusing on essential learning targets, changing teaching strategies, and providing demonstrations

By Relying on ICT Support
a. By reaching students and parents thru Social Media
b. By undertaking online modular class
c. By enriching activities thru various educational resources from the internet such as videos, offline and online activities and assessments
By Developing Positive Perspective
a. By being resourceful, flexible and creative in teaching
c. By managing time practically
d. By being optimistic and having profound love of pun

During this pandemic, education is one of the social areas that faced the strongest challenges. Teachers, students, parents, schools, local communities, and the state were suddenly put in a position to change their rules of operation, and teaching techniques or examination methods overnight. Given these challenges, teacher-participants were asked on how they coped with the challenges in teaching science during this time.

By Peer Support

The pandemic brought anxiety and turmoil to everyone; however, participants surpassed the challenges by collaborating with their fellow teachers and requesting assistance from them when needed such as: sorting of modules and other concerns related to the use of ICT equipment (i.e., paper jam, refilling of ink). The foregoing findings reveal that difficult situation can be lightened once there is unity and cooperation. This pandemic unleashed how Filipinos still practice the "*balikatan*" (spirit of unity) value specifically in the education sector. Soliciting support and guidance from family, friends, colleagues, classmates and God was the other way of coping with the challenges. Close family ties is one of the positive values of Filipinos. In difficult times, family, relatives and friends lend their helping hands.

Requesting students to share their knowledge to their classmates and reminding them this is not the time for competition is the third coping mechanism used by participants. Having knowledge on the effectiveness of collaborative learning as a strategy, participants utilize peer teaching for they knew that students would benefit from it. They let their students recognized that this pandemic brought everyone hard times and explained to them that healthy competition is nice but with the current scenario it was discouraged as everyone needs cooperation. Establishing good rapport and close communication with parents were the other strategies used by the participants as well as maintaining close contact with the parents for effective and efficient teaching and learning to take place.

By Assisting Students

Another way employed by the participants in assisting their students is asking their students' learning modality preference and learning resources. The challenge of making teaching and learning process successful in the midst of pandemic is one of the sources of challenges by participants. To minimize the challenge, students' needs and capabilities should be prioritized. Participants solicited their students' preferences as regards the best teaching-learning platform that would be effective among their students. Participants also asked the students as regards their available materials or gadgets they may use in the distance learning. Motivating students and providing enrichment activities were the other strategies in assisting students to overcome the challenge of teaching Science. With the absence of face to face contact with the students, the assurance that learning has taken place has often left educators uncertainty and doubt to themselves as to whether they teaching became a success or not. Keeping the attention and interest of students by engaging them in actual activities to increase the bond or connection between the stimulus and the response for learning to take place was used. Based on S-R Theory, the higher the bond the higher the learning process will take place. Remote learning will be boring and difficult if students will just serve as passive learners so making them active learners hasten the goal of teacher of making teaching Science possible during pandemic.

Modifying the learning activities when necessary and giving the students due consideration was the other way of assisting students. Several unavoidable reasons might happen along the way to students in the process of participating or accomplishing or submitting their output to teachers so teachers must be flexible enough not to cause worry among students.

By Relying on ICT

Another coping strategy or mechanism used by participants in teaching Science was relying on ICT support. Reaching the students and parents thru social media, undertaking online modular class and enriching the activities thru various educational resources from the internet such as videos, offline and online activities and assessments are important. Recognizing the subsidized Facebook access in the Philippines, students would not need mobile data to read and access text-based messages in their class chat which can conserve their bandwidth connectivity and reserve it for their class requirements. The use of Facebook Messenger complements teacher-student communication via electronic mail or mobile phones.

As expected, technology utilization is considered as the most significant armament during pandemic. The demands of the new normal were responded by technology. It swiftly replaced the usual tasks, roles/functions and responsibilities of teachers. Technology serves as a lifesaving on the eyes of students as well as teachers. It temporarily made the teaching and learning convenient both for the teachers and students. Technology provided the materials as well as interactive environment needed by the students. Finally, technology is widely used regardless of social class.

By Developing Positive Perspective

The last coping mechanism used by the participants is developing positive perspective. This has been achieved by being resourceful, flexible and creative in teaching, by managing time practically, being optimistic and having profound love for humor amid pandemic. Almost all teachers were not ready to teach in an online setting especially teaching Science subject. To overcome the challenge of teaching science in remote learning, one must have an optimistic perspective towards the situation. One must be passionate in doing what one had sworn during his oath. Another is bringing out the genuine creativity of a teacher in handling students. Teachers were able to use the lingo of young minds to neutralize the situation and make teaching and learning fun and enjoyable.

Effective Strategies in Teaching Science

Shown in Table 5 are the effective teaching strategies found by the participants. Results were categorized under activity selection, technology utilization and support, modality preference, and instructional materials preparation.

TABLE 5
EFFECTIVE STRATEGIES IN TEACHING SCIENCE DURING PANDEMIC

1. Activity Selection
a. Use of interactive performance -based tasks, inquiry based and self-directed learning activities
2. Technology Utilization and Support
a. Use of science-based apps and other open educational resources which may be downloaded and used thru online links
b. Use of online office tools under google suite such as google form
3. Modality Preference
a. Use of online modality in teaching and learning and provision of digital copies of modules for parents and learners

4. Instructional Materials Preparation
a. Use of visual oriented materials such as flow chart, video clips, diagrams, drawings and figures, Power Point presentations
b. Use of games, polls, crosswords, word pool
c. Ensuring originality of instructional materials by avoiding use of copied information from textbooks
d. Refrain from including practical/ laboratory methods

Effective strategies in teaching science during pandemic require a lot of effort from all teachers. Varied approaches and techniques have to be innovated hastily to provide meaningful and fruitful learning process. Variety of instructional materials with the aid of technology was pulled up to its limit as well as the community resources were maximized to make teaching and learning possible despite its remote learning. The strategies found effective in teaching Science were categorized into four: activity selection, technology utilization and support, modality preference, and instructional materials preparation.

Activity Selection

Educators say that there is no single best method appropriate in teaching Science and the participants during this pandemic found several methods that are effective to use such as the use of interactive performance based-task, inquiry based and self-directed learning activities. These methods are illustrated in the responses of Participants 2 and 3.

> "Since students nowadays are at home, to ease their loneliness and boredom, I am giving assessment activities that promote excitement and enjoyment and at the same time they are also learning. I have printed crossword puzzle which is personally made and I'm also conducting online quiz through google forms which are preferable to students with internet connection. I also told them to download science-based apps available in the Google Playstore. And I instructed them to play the game and have the screenshots of their scores. Through these strategies I thought that they are still learning and attaining the prescribed competencies." (Participant 2)

> "Teaching Science this pandemic and in modular basis is so difficult but there are strategies in teaching that I find effective. These are visual clues wherein drawing, diagrams, and illustration in the module help the students to familiarize and visualize the content of the lesson; word games like cross word puzzle and word pool help the students to become engaging in activities found in the module; context-based learning where students can learn from their own; and virtual science lab, wherein there are links available on the module where can students watch experiment." (Participant 3)

Technology Utilization and Support

In terms of technology utilization and support, the use of science-based apps and other open educational resources, which may be downloaded and used thru online links, were done. Use of offline office tools under google suite such as google form was also effective.

Modality Preference

Another strategy found effective in teaching science is the modality preference of students. Participants' use of online modality in teaching and learning and provision of digital copies of modules for parents and learners were effective based on the participants. In comparing online and offline learning during pandemic, Participant 7 mentioned that, "online learning contributes more in delivering quality science education. Based on my observation, online teaching and online assessment were very effective in a sense that students were more engaged to it. Sadly, only the STEM students in MNHS-main experience this mode of learning,

other regular students. For Participant 8, "in offline learning, printed materials and the parents of the students will get those printed modules in the school. They will also submit their work to their teacher."

Instructional Materials Preparation

Other strategy which was found effective in teaching science is preparation of instructional materials. Participants used visual oriented materials such as flow chart, video clips, diagrams, drawings and figures, and power point presentations. They also used games, polls crosswords, word pool. They also ensure originality of materials by avoiding use of copied information from textbooks. Lastly, they refrain from including practical/laboratory method. Participant 8 mentioned:

> "Use of video as educational tool. It is important that the students have a correct transfer of learning about the topic to avoid misconception. Insertion of link for educational video clips on their module is a great help. In this way, the You Tube will serve as their teacher for the meantime. If there are questions that were not addressed by the video, they can message me on our group chats. This helps them also to enjoy learning since studies have shown that video clips increase the student's attitude towards learning science. Drawing and experimentation is effective tool for me in their activity. Based on their submitted output, they answered and drawn correctly their activity. So far, I have no problem with these activities. That's why, I recommend this activity for the students. I also used crossword puzzle; I know that they can finish the activity on their own. I know that they enjoyed it because it is a different activity. Problem solving activity is also an important activity that I considered on their modules. In this way, they could still enhance their higher order thinking skills. They can also apply here the concepts written on their modules."

Ineffective Strategies in Teaching Science During Pandemic

Table 6 presents the ineffective teaching strategies in teaching science courses during pandemic as identified by the participants in teaching science courses. Similarly, their responses were categorized into activity selection, technology utilization and support, modality preference, and instructional materials preparation.

TABLE 6
INEFFECTIVE STRATEGIES IN TEACHING SCIENCE DURING PANDEMIC

1. Activity Selection
a. Use of multiple choice test in the assessment of students' performance b. Use of laboratory activities such as experiments which are not practical to be undertaken at home c. Use of collaborative/group learning activities such as debates and role playing
2. Modality Preference
a. Use of printed module alone
3. Instructional Materials Preparation
a. Use of printed assessment materials for quizzes and examinations

Activity Selection

Some of the ineffective activities in teaching science courses during the pandemic as reported by the participants include: assessment of students' learning through multiple choice test, giving of laboratory activities using improvised laboratory equipment at home, and other collaborative activities particularly debates and role playing. Multiple choice test measures students' higher order thinking skills since it offers the student with more than two options per item to choose from. In the set of options there is correct or best option while all the others are considered distracters. The distracters are often chosen since they are

attractive to those who do not know the answer or are guessing but are unattractive to those who know the correct answer. Utilization of multiple choice test seems not much effective for it encourages guessing among students which may eventually defeat the purpose of assessment.

The cliché "Experience is the best teacher" still holds true today. Being able to experience the actual learning while studying in order to come up with conclusion and generalization based on direct experience is one of the objectives of laboratory activities. However, students' individual engagement to laboratory experiments at home was found ineffective by the participants. Laboratory activities require basic skills such as observing and analysing for students to formulate new concepts and understandings. But if teachers are not around, students may not be guided in connecting their previous knowledge to the present one. Students could not communicate their experience to others and vice versa. Teachers could not give their feedback, too.

Based on the interview, Participant 8 underscored why laboratory activities at home were considered ineffective. According to Participant 8, "it is hard to conduct experimentation because activity like this should be under the guidance of the teacher for them to realize the implication to the conducted experiment". Meanwhile, laboratory activities were also considered inefficient since students lack resources to conduct the activities. This was illustrated in the response of Participant 3, "some of my students cannot perform activities in their home because of lack of materials."

Debates and role playing are some of the collaborative activities that were found ineffective during pandemic especially in the modular type or offline mode of teaching. In these collaborative activities, teachers and students should be all ears and all eyes to students' verbal and non-verbal performance. However, the new learning modality limits both the teachers and students' chance to perceive verbal and non-verbal cues during the delivery. Role playing consists of enactment of students of a learning situation but in an offline and online learning, the enactment of real life problem situation is not elicited. This is also similar with debate.

Modality Preference

The use of printed module alone without the reinforcement and additional explanation from the teachers was reported ineffective by the participants. Most of the students, if not all, are alone in their journey in the acquisition and understanding of their lessons. With the instructional module alone, both the students and teachers are deprived with the opportunity to explain and ask for clarificatory questions. The usual set-up in most public schools, especially those in the modular learning, is that the parents are the ones who go to school to get instructional modules. After having received the instructional modules, parents will give the modules to their respective children. The latter will accomplish the modules within a week and parents will then return the modules to the schools. In such modality, teachers are not given the chance to interact with their students. Hence, the modality impeded teachers' opportunity to help students to have a deeper understanding of the lesson through the examples, anecdotes, illustrations, and additional insights - which were not captured in the instructional modules – that teachers usually share during the traditional face-to-face classes.

Instructional Materials Preparation

In the aspect of instructional materials preparation, the activity which the participants considered ineffective was the use of the traditional paper-pencil test during quizzes and examinations. The use of the traditional multiple-choice type of assessment was ineffective since it is prone to cheating among students. As such, this kind of assessment tool may not genuinely capture students' mastery of the lessons.

Opportunities in Teaching Science Courses

Table 7 reveals that despite the pandemic, opportunities surfaced in three categories under teachers' personal, teachers' professional, and students' opportunities.

TABLE 7
OPPORTUNITIES IN TEACHING SCIENCE COURSES DURING PANDEMIC

Teachers' Professional Opportunities
a. Engagement to more trainings to be informed of the trends in Science Education and for related professional development
b. Exploring the use and integration of information and communications technology in teaching and in the preparation of instructional materials.
c. Innovation of teaching strategies
d. Development of localized instructional materials thru the learning modules
e. Collaboration for a wider social communications network locally and abroad to improve strategies in teaching
Teachers' Personal Opportunities
a. Establishing harmonious collaboration with co-teachers
b. Developing flexibility in various facets
Students' Opportunities
a. Upgrading students' capability by being digital immigrants to becoming technology experts

Like other major crisis, the COVID-19 pandemic has generated not only significant risks, discrimination or costs, but also unanticipated opportunities in the field of education (Corlatean, 2020). The extent of damage to educational institutions ranges from school closure resulting in suspension of face-to-face classes because classrooms are not suitable for social distancing, lack of facilities to safety protocols, abrupt changes in the mode of teaching and delivery of instruction, as well as full reliance to technology. All these boil down to one realization, the limitation of the system in this unforeseen situation. Yet, the Filipino resiliency, especially teachers, is a thing to behold. The onset of the unforeseen situation prodded the participants to look for opportunities in order to sustain instruction. As Tuquero (2020) mentioned, global pandemic opened up opportunities to the country to upgrade its educational mode of delivery and transfer its attention to emerging technologies. In this study, all the participants, being on the same boat, recognized the value of harmonious collaboration with other teachers and their ability to adapt to changes as exercised by their flexibility in facing the various facets of T-L process. Likewise, the pandemic brought opportunities for teachers to learn and develop new skills by exploring the use and integration of information and communications technology in teaching and in the preparation of instructional materials through their engagement to more training to keep abreast with the trends in Science Education and for related professional development. Moreover, collaboration for a wider social communications network locally and abroad helped improve their strategies in teaching. This also prompted the students to upgrade their capability to becoming technology experts. Aside from technology, the teacher- respondents also learned how to rely on localized instructional materials thru the learning modules. Having identified these challenges which turned into opportunities, planning is deemed to strengthen preventive measures to mitigate the transmission of the infectious disease and continue delivering education in the university (Toquero, 2020). As in any major crisis situation, COVID-19 has generated not only significant risks, discrimination or costs, but also unanticipated opportunities, substantial human and technological progress platforms, including in the field of Education

CONCLUSION

The height of the pandemic left no place to hide for the members of the academic institution – particularly among basic education teachers who needed to push through and adapt to changes and to pursue the goals and objectives of educational institutions to rise to the challenge of the global pandemic. This trying time unleashed the best among teachers and tested how far they could go and deliver as long as effective and efficient teaching-learning is concerned. Since the country has been placed in ECQ in the first

quarter of 2020, teachers never stopped on contemplating on how teaching and learning would be responsive to the new normal. They have proven that academicians have always been the key agents in the utilization of any reform-based pedagogical innovations and are committed to uphold their sworn duty to safeguard and continuously nurture the community's intellectual and cultural heritage. Basic Education teachers always seek for a concrete solution. Amid the pandemic, they focus on improving the mode of delivery of instruction. More importantly, they see to it that the students satisfactorily receive the quality of education that they deserve. Being the center of the teaching-learning process, teachers guaranteed that unwavering instructional, emotional and social support are extended to the students. This has been realized by a number of professional and technical support given to students.

Challenges brought by the pandemic paved the way for the participants to adapt and learn technological tools used in distance learning. While there have been concerns on participants' ICT capability, the continuance of education has suddenly focused on the use of flexible learning modality. While these realities have been challenging the participants' capability, they also open the doors for opportunities of levelling up to a new education landscape and harnessing potentials which may be useful for the furtherance of the teaching practices. The onset of the unforeseen situation prodded the participants to look for opportunities in order to sustain instruction. The global pandemic opened up opportunities to the country in general and to the teacher in particular to upgrade the educational mode of delivery and focus the attention to emerging technologies.

Since the pandemic has brought anxiety and turmoil to everyone, especially among students, the participants acknowledged the need to be flexible in their respective instruction to lessen the effects of distance learning. The compassion and understanding extended by the participants to students are manifested on the former's unwavering instructional, professional, technical and personal support the latter received. Effective teaching strategies during pandemic require a lot of effort and hard work from all teachers. Hence, the participants developed innovative strategies to provide meaningful and fruitful learning process. Varieties of instructional materials with the aid of technology were pulled up to its limit. Likewise, the community resources were maximized to make teaching and learning possible despite its remote learning. The findings pose the need for the Department of Education and higher-education institutions to constantly acknowledge the norm of regularly training teachers as regards designing and implementing effective, efficient and transformative teaching-learning process for distance learning.

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