THE TEACHING OF SCIENCE IN THE TRANSFORMATIVE ERA: UNDERSTANDING THE EXPERIENCES OF SENIOR HIGH SCHOOL SCIENCE TEACHERS

MA. GINA G. DIAZ

Institution   :   Institute of Graduate and Professional Studies
Lyceum-Northwestern University
Dagupan City

Abstract : The Covid-19 pandemic has taken aback everyone that led to living unexpectedly in an environment called the new normal. One of the sectors seriously affected by this health crisis is education. With no face-to-face classes until a vaccine has been discovered, the Department of Education-Philippines (DepEd) believed that education should continue in school year 2023-2024 through online and other alternative modalities. One of the subjects in the senior high school seriously affected in doing online teaching and learning is Science. This study aims to explore and understand the experiences and challenges of the senior high school Science teachers after several months of teaching in the new normal. The study found out that Science teachers were prepared and the curriculum was modified. Instructional materials were enhanced and various challenges were met like learner discipline, delivery and execution of learning tasks, limited time

Keywords: teaching science, challenges of online teaching, science teachers creativity, initiatives and opportunities

_____

INTRODUCTION

One of the most awaited activities during the year is the opening of classes. Children, teenagers, and even young adults are excited to go back to school after a two-month vacation. It is in school where their interests, knowledge, and skills are honed, and friendship begins. School life prepares every student to a bigger and challenging life particularly in pursuing one's career. As a student takes another step up the staircase, subjects are added in his studies. This is to make his academic and character formation more holistic and in-depth. From grade school to senior high school, Science and Mathematics are the constant subjects that can be found. Considered as the two most challenging but interesting subjects, lessons become more difficult as one progresses to the next level. Teachers are also challenged to make the Science and Math lessons interesting and engaging considering that the subjects are difficult by nature.

Between Math and Science, it is Science that requires laboratory work. Students are drawn more to Science because it involves a "real" application of theories learned in the classroom. The nature of science education involves students in scientific investigation. Scientific investigation includes the way thinking, attitude, and steps scientific activities to obtain products and knowledge of science. Students should be able to integrate between skills, knowledge and attitudes, to develop knowledge of conceptual understanding better. One of the most important basic skills in scientific inquiry is the skill of the science process. Scientific process skills are a set of skills used in conducting scientific activities, producing and using scientific information, and problem solving. Such skills can be a character in student's self if they have the opportunity to do so in either learning or laboratory activities. The opportunity can be given to students if the learning environment is arranged in such a way that they can engage in science activities to improve their science process skills (Safaah, Muslim, & Liliawati, 2017).

Science education is one of the most important subjects in school due to its relevance to students' lives and the universally applicable problem-solving and critical thinking skills it uses and develops. These are lifelong skills that allow students to generate ideas, weigh decisions intelligently and even understand the evidence behind public policy-making. Teaching technological literacy, critical thinking and problem solving through science education gives students the skills and knowledge they need to succeed in school and beyond.

Science education aims to develop scientific literacy among learners that will prepare them to be informed and participative citizens who are able to make judgments and decisions regarding applications of scientific knowledge that may

have social, health, or environmental impacts. The science curriculum recognizes the place of science and technology in everyday human affairs. It integrates science and technology in the social, economic, personal and ethical aspects of life. The science curriculum promotes a strong link between science and technology, including indigenous technology, thus preserving our country's cultural heritage. The K to 12 science curriculum is learner-centered and inquiry-based, emphasizing the use of evidence in constructing explanations. Concepts and skills in Life Sciences, Physics, Chemistry, and Earth Sciences are presented with increasing levels of complexity from one grade level to another in spiral progression, thus paving the way to a deeper understanding of core concepts. The integration across science topics and other disciplines will lead to a meaningful understanding of concepts and its application to real-life situations (Deped Science Curriculum, 2016).

Sadly, in a study about Science as a subject, it suggests that while there have been some positive changes, there are still many students who indicate that the science they experience in secondary school is irrelevant to their everyday life and to their future. It seems that the curiosity and wonder one would hope is associated with studying science is missing for a large proportion of students. It is clear that further actions need to be undertaken to transform this continuing situation (Danaia, Fitzgerald & McKinnon, 2013).

Science teachers are challenged to employ better methodologies and activities to make it more interesting. Teaching Science particularly in high school is not that easy because of the more complicated theories. Aside from it, experiments have to be carefully planned and prepared. In laboratories, Science teachers cannot do it alone because experiments may be harmful. To ensure safety, laboratory assistants provide guidance to students in the experiment processes. Preparing, discussing, and doing the experiments are the challenges that Science teachers experience in teaching. A science teacher is considered someone intellectual, a nature lover, and with great interest about the world. It takes a lot of training including involvement in experiments and travel to the most isolated and dangerous places to be able to find more data leading to knowledge that can greatly impact the world. However, teaching Science can be a very challenging task.

It is never easy to teach a subject that is always considered difficult though interesting. But with the right curricular program, it will make sense, easy, and more interesting. An article concluded that the re-orientation of the curriculum toward student-centeredness in this case had a positive effect on student performance, learning experience and subject evaluation. In particular, the use of student-centered techniques facilitated a strong social context for learning, and provided students with a common experiential framework from which to explore the technical aspects of the curriculum (Barraket, 2005). Science education is about teaching and learning that involves students in inquiry-based investigations in which they interact with their teachers and peers; establish connections between their current knowledge of science and scientific understandings; apply science concepts to new questions; engage in problem solving, planning, reasoning from evidence, and group discussions; and experience an active approach to learning science (Contant et al., 2018). Teaching Science involves exposure to the world outside the school campus. An exploratory analysis of student attendance at science museums finds that student achievement in science and mathematics is somewhat higher for those students who visited science museums frequently during the school year or summer. The strength of the association with cognitive achievement is sufficiently noteworthy to encourage further analysis of the role of informal activities such as museum attendance on cognitive learning (Suter, 2014).

The teachers play an important role in making Science interesting. If he/she is confident, credible, interested, and enthusiastic, it will make Science an interesting subject. Likewise, when the teacher self-efficacy is high among teachers in science classrooms, the students display good attitude, better motivation and achievement in science. It is concluded that good impartation of science knowledge on the part of the teacher self-efficacy; along with student's interest and motivation in the subject and the display of positive attitude as earlier pointed out, are influential factors which when combine together are suggested to lead to better academic achievement in science education in secondary and high schools. We posit that the findings of this study will provide the basis for future research on this topic of growing scholarly and practical importance. (Bal-Taştan et al., 2018).

Aside from self-efficacy, a close teaching and learning relationship with students also works in making Science exciting and very interesting. A study revealed that teachers with strongly student-centered practices tended to exhibit a more pronounced need to create learning opportunities with technology as a base for enhancing 21st century skills in students. Teachers indicated that external barriers do exist that impact technology integration, such as a lack of in-service training, a lack of available technology, and restricted curriculum, but that overcoming internal barriers, including personal investment in technology, attitude towards technology, and peer support, were a bigger indicator of success. Recommendations are made for restructuring professional development on strategies for contextualizing technology integration in the classroom. Teachers not only know the science content of the subjects they teach to these students. Teachers understand their students enough to reconstruct content knowledge and utilize teaching methods that will make the subject matter accessible to these younger learners. Furthermore, they understand and are familiar with knowledge gaps and preconceptions students bring to science class, and implement differentiated instructional strategies to help students learn. Science teachers also have knowledge of science curriculum choices and resources, and apply technological developments to enhance student learning (Hassard & Dias, 2013).

Aside from these factors in teaching Science, studies also found out that the use of technology has a positive effect to students. One study suggest that flipped instruction had a positive effect student achievement, with effect sizes ranging from +0.16 to +0.44. In addition, some students reported that they preferred watching video lectures outside of class and appreciated more active approaches to learning (Leo & Puzio, 2016). Another study confirmed that teaching science subjects with technology increased the student's interest in the learning process and improved the student's achievement scores and also helped the students to do their homework more easily compared to the traditional teaching methods (Nawzad, & Said, 2018).

For teachers and students, Science is both classroom and laboratory work. Through various methodologies and activities, Science becomes interesting and engaging. Students are amazed on scientific theories, findings, discoveries, and latest developments in the different branches of Science. In the laboratories, new things unfold right before their eyes. Amazing but challenging, Science continues to trigger the interests of students. Teaching and learning Science happen in the classrooms, laboratories, home, and sometimes in outdoor activities like field trips.

A private sectarian school in Manila which offers dual curricula (academic and technical) in the junior high school department gives importance to Science. Aside from having technologically-equipped classrooms and laboratories, Science teachers are highly engaged in the use of technology in teaching. Laboratory assistants provide support and guidance to students in the conduct of experiments. Every week, Science classes are held for five hours which include laboratory classes. However, when Covid-19 became a pandemic, it put to stop almost everything that people normally do like going to school. In the Philippines, classes were suspended on March 10 until it was decided that the remaining school days be carried through online modality. It was eventually decided by the government that there will be no face-to-face classes until a vaccine has been created. The school administrators decided to minimize the requirements which will be sufficient for the last term. Students received communication from school administrators and teachers through different ways like messenger, email, mobile phones, and landline phones.

In particular, the Covid-19 pandemic has forced Science teachers to become more creative, resourceful, and innovative. Few studies have suggested what can be done in teaching Science via online modality. A study showed that in getting a biology course online, it is recommended an incremental approach, beginning with a basic set of teaching and learning tools to provide content suited to the classes and the objectives of the course. The extent to which hands-on practical activities are included will vary depending on the nature and purpose of the course. There are several ways in which to incorporate such activities if they are considered appropriate.

The basic online biology course can be augmented and developed over time, as the course designer gains confidence and discovers useful and relevant materials. There is scope to tailor the online biology course so that it is highly student centered, with loops and links to suit students who struggle with particular aspects of the course, and other loops and links to extend those who move through the basic content easily. Links may take students outside the LMS to relevant sites, apps, and social media tools, many of which are available to course designers at no cost, but care should be taken to ensure that such additions augment, rather than distract from, the broader aims of the course. The online course is never complete, and the course designer has unlimited opportunities to refine the style, presentation, and the internet has been accessed during an examination.

Web-based video was recently reported as being utilized as an assessment tool for student performance in organic chemistry. Students made video responses to specific questions as part of the assessment process and were required to utilize a molecular modeling kit. The method of assessment allowed the instructor to see a student's higher order thinking, and the authors concluded that it appeared to be a viable additional tool for grading student performance. The internet opens up many possibilities for online learning opportunities. Recent innovations include a game-based approach to a physical chemistry course, multiplayer games, and a gaming program to resolve protein structures that have eluded researchers. The latter gaming program can be utilized as a problem-based learning assignment for the understanding of protein folding, interactions, and structure and allows student contributions to significant research. The ability to work on real research problems significantly increased student interest in the assignment (Moore, 2016).

Attitudes reflect an individual's positive or negative feeling, belief and behavior towards a situation (Eagly & Chaiken, 2007; Atkinson, Smith, Bem & Hoeksema, 2010). It is essential for science teachers because it shows their inner view for education. Science teachers' attitudes determine their success in achieving their set of goals. Their attitude to teaching is clearly seen through their scientific behavior, practices and values.

Scientific attitudes are the desire to know, understand, apply, verify an approach and consideration of consequences (Gardner, 1975; Osborne, Simon & Collins, 2003). It is a mental attitude characterized by willingness to search for truth and prejudice to change one's opinion based on new evidence. It affects the performance of science teachers in the classroom and how they plan for their lessons. It influences teacher's performance positively or negatively.

Teachers' performances reflect the teachers' roles, duties and responsibilities to administer, teach and advise their clientele. It is consequently a key element in the success of the school. It upholds the role of teachers as the most important human resource in an academic institution. The higher the performance of teachers in carrying out their duties and responsibilities, the higher the quality of graduates and the performance of the school in general (Hidayat & Zaini, 2017).

Schools' performances reflect the schools' organizational capacity to achieve its goals, and objectives set to serve its clientele (Lamas, 2007). It is the result of learning, prompted by the teaching activities of the teachers and manifested by the students. It is a measure of the indicative and responsive abilities that express, in an estimated way, what a person has learned as a result of the process of education. In the Philippines, school performance is regularly supported by the Department of Education through the introduction of responsive modalities of learning, one of which is the Modular Distance Learning especially during the period of pandemic.

Science teachers must lead laboratory works and "real" application of theories that involve students in Scientific Investigation. However, since public schools have completely no face-to-face classes particularly in science, it is interesting to know the science teachers' scientific attitude and performance during Modular Distance Learning Modality through their experiences in terms of preparation, teaching engagement, and challenges. And also determining which of science teachers' scientific attitudes and performances best influence the schools' organizational performances. It is beneficial not only for science teachers but also for school heads and education as a whole. Their attitudes and performances may affect school as an organization.

As an organization, school is a place where formal education takes place (Infoplus, The Scholars' Corner, 2017). It is a social system comprising of a group of people that interact together to achieve both school and individual goals. In this regard, a school must be a safe and organized place where clear set of general rules and school discipline are in order. It must be supportive where learners' and teachers' attitudes are focused on the teaching-learning process.

An individual's good or negative sensation, belief, and behavior toward an event, or situation can be described as attitudes (Eagly & Chaiken *et al.*, 2007). Furthermore, it can be described as acquired and psychological characteristics that influence an individual's behavior (Tavşancl *et al.*, 2014). Professional attitudes are a combination of an individual's emotions, conduct, and beliefs about the profession (Hammer, 2000). Teachers with good attitudes toward their job are likely to improve their competencies and perform better in their positions (Bozdoan, 2007).

There are three components to attitude. The first component is cognitive, which includes an individual's perception and belief. The affective component pertains to the individual's feelings about the object of attitude and emotion. Finally, there is the conative component, which includes the proclivity to respond or react to something in a specific way (Azwar, 2011; Meidha, 2017). People who agree on something have a good attitude, whereas those who disagree have a negative attitude (Meidha, 2017).

Attitudes governs behavior directed toward or away from an object or situation (Ekawati, 2017). It contains emotional content that fluctuates in strength and generality based on the items or events to which it has been applied. Positive attitude cultivators, both educators and pupils, are more effective in work (Mattern & Schau, 2002; Erdogan, 2017). The attitudes of science teachers toward teaching science affects their teaching, which in turn influences student achievement and interest (Harlen, 1997). It is a major predictor of a person's conduct that effects how a teacher interacts with students and, as a result, affects their students' academic and school's success.

Establishing behavioral expectations for students, faculty, and visitors that promote a positive and respectful outcome, as well as culture and school environment, are critical to maintaining a safe school community. As a result, good performance and a positive relationship between instructors, students, and parents will result in good organizational school performance (Infoplus, The Scholar' Corner, 2017).

Statement of the Problem

This study sought to assess the teaching of Science in the Transformative Era: Understanding the Experiences of Senior High School Science Teachers in the Second Congressional District of Pangasinan under Schools Division Office I Pangasinan for School Year 2023-2024.

Specifically, it sought to answer the following sub-problems:

1. How did you prepare for online teaching?
2. What did you do with the Science curriculum or lessons?
3. What methodologies did you use?
4. How did you prepare the instructional materials?
5. How did you conduct the assessments?
6. What are the challenges in teaching Science online?
7. What initiatives can you take to make the online teaching of Science more interesting and engaging?
8. What do you see as opportunities in teaching Science through online modality?
9. Based from the findings, what action plan can be proposed to improve the teaching of Science in the new normal?

METHODOLOGY

Research Design

The phenomenological Husserlian approach was used. Phenomenology understands and explores people's daily life experiences. To interpret these experiences, Colaizzi's method was used. For the research involved rigorous strategies for data collection and well-organized techniques for valid interpretations. Polit and Beck (2013) posit that phenomenology is characteristically exploratory and descriptive and the intention is to create not a generalization of findings but a deeper understanding of the experiences from the perspective of the study participants.

This study utilized a phenomenological method of research to determine the lived experiences of master teachers in monitoring modular distance learning teachers. It was mentioned by Giorgi (2009) that the phenomenological research culminates in the essence of the experiences for several individuals who have all experienced the phenomenon.

The sampling technique that was used is non-probability sampling, particularly the purposive sampling technique. The participants needed in the study were selected according to the needs of the study; they were the master teachers that teach different subjects.

The researcher made use of interview guide/ questionnaires in the Focal Group Discussion and semi-structured interview to seek in-depth information that revealed the current situation on how the informants responded to the newly implemented way of monitoring modular distance learning modality teachers.

After seeking help from the experts for the validation of guide questions used in the conduct of the study, the researcher sought permission to conduct the study from principals of the respondents. Upon approval, the purpose of the study was explained to the selected participants. Then, the time and date for the face-to-face interview and analysis of the document were set as agreed by the researcher and the participant. After the participants shared their stories, experiences, and challenges experienced in monitoring Modular Distance Learning teachers, the data were interpreted and analyzed.

In gathering the data, one of the participants showed an unwillingness to share her insights and experiences related to the study.

In the analysis of collected data, the researcher utilized the thematic data analysis, the steps introduced by Braun & Clarke, 2013 were applied. This includes transcribing, taking note of items of interest, coding across the entire data set, searching for themes, reviewing themes by mapping the provisional themes and their relationships, defining and naming themes, and the finalize analysis.

After following the phases of analyzing data, the outcome of the study was presented to the key informants/participants for the validation of their responses and the formulation of the action plan. The researcher sought assistance from the experts (internal and external validator) for the legitimacy of the themes used by the researcher anchored to the responses of the key informants.

Sources of Data

This study was conducted in the Second Congressional District of Pangasinan under Schools Division Office I Pangasinan using the Senior High School Science teachers as respondents of the study.

Instrumentation and Data Collection

To analyze the data gathered in the study, coding was used by the researchers. In coding, the researcher organizes data collected into segments and assigns a word or phrase to them as labels (Creswell, 2014). The researcher sought the permission of

the principal and learning area head before conducting the study. The purpose of the study was discussed to the academic heads and Science teachers. It was made clear that their responses will not affect their status in school and will be used to enhance the online teaching and learning of Science.

The interview was conducted in interview appropriate places in school campuses mutually agreed upon by both the study participants and the researcher. These places include the teachers' respective classrooms and faculty lounges.

Data collection was conducted systematically from May to July 2024. Before the interview proper, a brief description of the study, its purpose and objectives were explained to each participant clearly.

The participants were also asked to sign the informed consent form.

During the interview, clarifications of the thoughts of the participants, the use of prompts to direct discussion on imparting valuable information and the provision of signals to indicate that points were heard and understood, were given emphasis. The researcher ensured that audiotape recordings were transcribed within 48 hours after the interview. Then, the recordings and transcriptions were re-checked to ensure the accuracy of the transcription. Lastly, the participants were asked to sign an informed consent.

Tools for Data Analysis

As mentioned, Colaizzi's seven-step method was used in the study. With this the following steps are followed First, the researcher recorded all interviews in an audiotape device (cellular phone) and transcribed them verbatim. Second, significant statements or phrases were taken from the participants' transcripts pertaining directly to the research phenomenon. Third, formulated meanings were made from significant statements. Cornelia (2012) states that formulated meanings should faithfully reflect the intent of each statement. The third stage required conscientious bracketing that acknowledged any presuppositions; thus, misinterpretation of the participants' views was avoided.

Fourth, the formulated meanings were clustered into themes, which were consequently considered the emergent themes. These themes underwent constant counter-checking and refinement against the original transcripts to truly reflect the meaning of the experiences. Fifth, an exhaustive description of the lived experiences was made.

Sixth, the exhaustive description was validated by the participants themselves. Returning to the participants and conducting a possible further interview for validation ensured an accurate representation of their experiences. During the process, their comments were documented well. Lastly, if new data were presented by the participants after the validation, these were incorporated in the results.

RESULTS AND DISCUSSION

This chapter deals with the presentation, analysis and interpretation of the data gathered relative to sub-problems in the study.

The new normal in teaching and learning made all stakeholders imagine on what will happen in education after school year 2023-2024. Since everything is so fluid and the unexpected may come, it is better to be prepared by reflecting on the everyday experiences of teachers. The experiences of the junior high school Science teachers in online teaching after one term or three months of teaching will enable them to understand the issues and concerns, and identify initiatives to enhance online teaching.

In terms of preparation, the Science teachers just like other teachers had to prepare for the unknown. Upon learning that school year 2021-2022 will open, the Science teachers did personal preparations while waiting for the directives of the Department of Education (DepEd) and the school administration. Their personal preparations focused on two areas namely professional development and technology resources enhancement. In a study on preparation for online learning for school year 2023-2024, it revealed that three core themes related namely gathering resources and establishing practices, profiling learners, and capacity building for continuous learning and development. Preparation helps teachers to plan relevant course of actions prior to the implementation of distance learning. This manages teachers to equip themselves with sufficient knowledge and skills, attending the needs and understanding the status of learners, and acquiring relevant materials and resources (De Villa & Manalo, 2020).

Professional Development

Believing that they need to equip themselves with knowledge and skills in online teaching, they attended webinars, read articles, and studied online tutorials about Science, student discipline, conducting online classes, and using different online platforms. One participant shared:

"I attended webinars on how to conduct online teaching and learned from the things that I did during bridging program before the actual start of online classes."

Another participant said:

"I familiarized myself in different online teaching platforms like zoom and google classroom."

Technology Resources Enhancement

Since the school will hold synchronous classes, they ensured that their internet will be stable by subscribing to internet providers for home installation. They also upgraded their laptops by installing better hardware and necessary software. Some bought new laptops, headphones, cameras, pen tablet, and ring light. A participant said:

"First, I made sure that my internet connection at home is strong enough to conduct online classes. I bought some equipment needed for online meetings such as web camera and headphones."

When DepEd released its plans and preparation, the school administration immediately discussed the challenges, issues and concerns, and strengths of the institution for online instructional delivery. After the learning continuity plan has been created, the different learning areas in the junior high school met and planned for the upcoming school year. The junior high school Science teachers discussed their preparations in terms of curriculum, methodology, instructional materials, and assessment. The following is the discussion of the results of their preparations in terms of the following:

Curriculum

When Philippine President Rodrigo Duterte announced that classes will open through flexible learning modality (online and other alternatives) and no face-to-face classes until a vaccine has been created, DepEd mobilized and prepared immediately. One of the major preparations was on curriculum. It led to the creation of the Most Essential Learning Competencies (MELCs). Guided by this directive, the Science teachers prepared the curriculum by revising and condensing the curriculum by including the non-negotiable competencies. Based on the guidelines given by the school, they modified the curriculum by identifying only the most essential lessons. A participant pointed out:

"I also considered the things that we discuss in our vertical articulation last school year and remove some topics that are also being discussed in other subject/technical area (e.g. electromagnetism)."

DepEd issued the Guidelines on the Use of the Most Essential Learning Competencies (MELCs), and presented its rationale. Being seriously affected by the Covid-19 pandemic, it will not be unfazed in continuing education by ensuring the welfare of more than 27 million learners in the basic education which requires indomitable commitment especially amidst this crisis. If learning stops, we will lose human capital.' Thus, meeting the needs of the most vulnerable populations in these times is essential in achieving SDG4 (UNESCO, 2017). The Department echoes UNESCO's belief that educational quality, access, and system strengthening cannot be compromised in times of crisis (UNESCO, 2017) and doing the opposite will negatively affect human capital. Consequently, DepEd's Bureau of Curriculum Development ensures that learning standards are relevant and flexible to address the complex, disruptive, volatile, and ambiguous impact of Covid-19 in the Philippines particularly in the basic education sector.

Methodology

Engaging students in learning Science is always considered a challenge by teachers. Though Science may be perceived as difficult, it can be made interesting by teachers by applying the appropriate teaching methodology and designing activities. However, the online modality may prove to be more challenging because of its limitations. From their classroom experience and readings, they identified face-to-face methodologies that can applied in online teaching for a start. They perceived that inquiry-based learning incorporated with 5E's approach, student-centered approach, lecture and simple experiments, motivational activities, and feedbacking would be the most appropriate methodologies for online learning. Based on their experience in term 1, the aforementioned methodologies proved to be suitable. A participant said:

"I used inquiry-based learning and I incorporated 5E's approach. Inquiry-based is appropriate on this type of setting to ensure their participation during online learning by asking questions to them and through investigating and critiquing, they can come up with their own answers. I also group them to collaborate with each other and discuss a particular topic that they need to present."

Instructional Materials

The advent of technology brought the preparation of instructional materials to a different level. From the usual chalk and blackboard including flashcards, maps, and posters, technology-based instructional materials were created that made teaching and learning more visual and enticing. But the preparation of technology-based instructional materials may not be easy as it seems, a study on the integration of technology in teaching Science and Math concluded that teachers have the knowledge and skills in using technology for teaching and learning, but they need time to plan and prepare technology-based instructional materials.

To respond to the new environment in teaching and learning, Science teachers said that they prepared and used interactive classroom discussion aided by the different applications, multi-media presentations, e-books, youtube videos, google slides, article reviews (published in the internet) digital pen and tablet, and MS whiteboard. They added that these instructional materials are available in the internet and can be explored. A participant pointed out:

"Since all junior high school Science teachers are millennials and digital natives, it was easy for us to adapt to the challenges in preparing and using technology-based instructional materials like video-creation and internet-based applications."

Assessments

One of the concerns raised when the school administration was discussing the learning continuity plan for school year 2020-2021 is academic dishonesty. Online learning is certainly more prone to cheating because of the many limitations it presents. Students will be tempted to cheat since there is no teacher personally proctoring the test. Posing as a challenge to all teachers, the Science teachers prepared and conducted assessments by giving more practical questions supported by scientific principles,

observation, using the learning management system of the school called Genyo, google forms, and asking the students to make handwritten assignments. Since asking the students to submit assignments or requirements that are handwritten, a participant shared:

"Some of the assignments or seatwork of my students are handwritten so they just write their answers in a sheet of paper then they will take a picture of their output and send it to their respective google classrooms."

The participants agreed that the assessment must enhance the application skills of the students. Giving of multiple-choice questions is prone to cheating and the use of the learning management system helped a lot in giving assessments. Though challenging, they made it a point to monitor consistently their students in assessments through close observation. A study on preventing cheating in online engagement said that dealing with the risks of plagiarism and cheating in online courses is more challenging than in face-toface courses, but we have tried to show that online programs have both opportunities and challenges. Faculty and administrators have to be proactive in thinking about course and program design, as well as simply deciding what compromises to make when migrating existing pedagogy and assessment schemes.

The study further suggested that: (1) Students be given enough resources (reviews, etc.) that they are not tempted to cheat. (2) Explain to students often that they do not need to cheat or plagiarize to do well in your class. (3) Give them enough difficulty in assignments to build confidence in their abilities throughout the semester. (4) Prosecute each and every instance of academic dishonesty and encourage your peers to do the same. (5) Discuss penalties and the university process in the syllabus and the test instructions. (6) Make sure students understand that cheating will be prosecuted. (7) Give students explicit incentives to report cheating by others as required by the student code of conduct at most universities. (8) Have a very explicit statement in your syllabus that clearly articulates the penalty for cheating or plagiarism in your class. (9) Have students complete individual honor pledges for the class and/or each assignment (Michael & Williams, 2013).

Challenges in Online Teaching and Learning

Even before the start of school year 2020-2021, teachers have anticipated the real challenges in new normal in teaching and learning like academic dishonesty, attendance, internet connection, and participation. However, it is different when one experienced and encountered them. After one term or three months in online learning, expected and unexpected challenges surfaced. The junior high school Science teachers have encountered challenges that can be addressed next term. However, there are some challenges that can only be resolved in the real classroom. They shared that support of other stakeholders, student discipline, delivery and execution of learning tasks, limited time for the implementation of the competencies, student participation, and topics for real laboratory work are the main challenges they encountered. A participant clearly pointed out:

"The first challenge is, how can we show to our students the application and uses of some lessons since we cannot conduct any laboratory experiments. The second challenge is the implementation of all competencies on each year level per term since we have only two meetings per week unlike in face-to-face setting wherein we meet four times a week."

On laboratory work particularly topics that are for real laboratory, a participant lamented:

"There are some topics in Science that will be appreciated if done in a real Laboratory set-up. It is impossible for these topics to be discussed and done at home. There are risks involved and materials that are not available to students."

Initiatives for a Better Online Teaching and Learning

The preparation for the online teaching and learning modality may have provided a boost and confidence to Science teachers. With the challenges encountered, new ideas and realizations are drawn from these experiences paving the way for initiatives to be taken in the online modality that will assist in enhancing teaching and learning in the remaining months of school year 2020-2021. They said that providing interactive games, creativity in implementing the 5E's, engaging in more hands-on activities, lessening the activities and vlogging as initiatives in teaching Science. A participant shared:

"I thought that I am not good in vlogging. I tried doing it and used it to engage my students in class discussion. To my surprise, they liked it and I decided to continue vlogging. This is what I can do even after this pandemic."

Believing that one's creativity will be developed, a participant excitedly said:

"I will try constructivism approach wherein students will construct their own understanding of lessons based on their schema, drills or tasks and experiences. Also, I will include more online experiments in the lesson-discussion because their creativity works well when we do it."

To engage the students more in Science, a participant shared:

"By providing interactive games in Science via online, I expect that it will engage students to participate more in class."

Initiatives have to be taken to make education happen in a better way. Online education which can be considered distance learning will provide new initiatives based on experiences and challenges. In the education sector, it has enormous potential to help organizations address issues of access to learning, quality of the teaching learning process and management of education systems. In order to ensure the quality of education, the distance education institutions must be careful about the use of proper

technologies and media. We have to think about the uses of media and technology in regard to appropriateness and acceptability in the society as well as on the ability of the institution offering the program. The socio-economic and cultural background of a person influences their ability to learn from different media technology. In order to evolve a fully articulated education system and for the success of distance education and ODL must be seen as an equally responsible medium complementing the formal learning system.

Opportunities in Online Teaching and Learning

Many have been said about getting through these trying times and restarting our lives. Indeed, there is a silver lining in this health crisis most especially in education. Despite the limitations and challenges brought about by Covid-19 pandemic, education continued and found an ally in online learning and teaching. The junior high school Science teachers have seen creativity in teaching with no laboratory, discovering new things on their (students) own, exploring more ways to teach science online, using online published researches as instructional materials, realizing more opportunities for improvement, and becoming more confident in front of the camera. A participant who tried vlogging said:

"I see vlogging as an opportunity and it makes me more excited. I think I'm slowly becoming a vlogger rather than a teacher."

Another participant who saw how his students become more engaged in Science shared:

"Students are more interested to discover new things with their own. Especially if I give them activities that they need to make different models/realia related to our topic (e.g. Seafloor spreading model)"

Science teachers consider these opportunities as making them better Science teachers who can adapt to the challenges of the times. Trying new things may not sit well to many teachers but the present situation will force them to take the road less traveled. As they reach the end of the road, they will find out that there are still a lot of opportunities to make online teaching and learning better. It may prepare them when the world returns to a better normal world. A study found out that online learning generally has a lot of opportunities available but this time of crisis will allow online learning to boom as most academic institutions have switched to this model. Now, academic institutions can grab this opportunity by making their teachers teach and students learn via online methodology. The people have always been complacent and never tried some new modes of learning. This crisis will be a new phase for online learning and will allow people to look at the fruitful side of e-learning technologies. This is the time when there is a lot of scope in bringing out surprising innovations and digital developments.
Already, EdTech companies are doing their bit by helping us fighting the pandemic and not letting learning to be put at a halt. Teachers can practice technology and can design various flexible programs for students' better understanding. The usage of online learning will test both the educator and learners. It will enhance problem-solving skills, critical thinking abilities, and adaptability among the students. In this critical situation, users of any age can access the online tools and reap the benefits of time and location flexibility associated with online learning. Teachers can develop innovative pedagogical approaches in this panicky situation, now also termed as Panicgogy. EdTech Start-ups have plenty of opportunities to bring about radical transformations in nearly all the aspects associated with education ranging from, teaching, learning, evaluation, assessment, results, certification, degrees, and so on. Also, increasing market demand for e-learning is an amazing opportunity for EdTech start-ups to bring technological disruption in the education sector (Dhawan, 2020).

Recommendations
1. School heads should encourage teachers to attend science seminars regularly to further enhance the competency of the teachers in using the high level science processes.
2. The school should make provisions for science-oriented rooms for the science classes to be more conducive to the teaching-learning process.
3. The science teachers must try to explore all means to wisely make use the available materials to enhance the utilization of science processes by conducting workshop on the production of the improvised materials during summer vacation.
4. Teachers should be more aware of the learners' abilities, and disciplinary problems so that they could adopt measures to motivate he interest of the learners in science.
5. Similar study should be conducted in other division to validate the findings of the present study.

REFERENCES
Arrieta, G. S. (2020). Assessment of the ict integration in teaching math and science in high school: Basis for an ict integration program. *Jurnal Pendidikan MIPA*, *21*(1), 95–108.

Bal-Taştan, S., Davoudi, S. M. M., Masalimova, A. R., Bersanov, A. S., Kurbanov, R. A., Boiarchuk, A. V., & Pavlushin, A. A. (2018). The impacts of teacher's efficacy and motivation on student's academic achievement in science education among secondary and high school students. *Eurasia Journal of Mathematics, Science and Technology Education*, *14*(6), 2353-2366.

Barraket, J. (2005). Teaching research method using a student-centred approach?. Critical reflections on practice. *Journal of University Teaching & Learning Practice*, *2*(2) 65-74.

Cahapay, M. B. (2020). Rethinking education in the new normal post Covid-19 era: A curriculum studies perspective. *Aquademia*, *4*(2), 1-5.

Callo, E. C., & Yazon, A. D. (2020). Exploring the factors influencing the readiness of faculty and students on online teaching and learning as an alternative delivery mode for the new normal. *Universal Journal of Educational Research*, 8(8), 3509–3518.

Contant, T. L., Tweed, A. L., Bass, J. E., & Carin, A. A. (2018). Teaching inquiry through inquiry-based instruction. New York, NY: Pearson.

Creswell, J. W. (2013). Research Design: Qualitative Approach, Quantitative and Mixed. Yogyakarta: Student Library.

Danaia, L., Fitzgerald, M., & McKinnon, D. (2013). Students' perceptions of high school science: What has changed over the last decade?. *Research in Science Education*, 43(4), 1501-1515.

Department of Education. (2016). K to 12 Curriculum Guide Science (Grade 3 to Grade 10). https://www.deped.gov.ph/wp-content/uploads/2019/01/Science-CG_withtagged-sci-equipment_revised.pdf
Department of Education. (2020). Guidelines on the use of the most essential learning competencies (MELCs). https://commons.deped.gov.ph/MELCS-Guidelines.pdf

Dhawan, S. (2020). Online learning: A Panacea in the time of Covid-19 Crisis. *Journal of Educational Technology Systems*, 49(1), 5–22.

De la Rama, J., Sabasales, M., Antonio, A., Ricohermoso, C., Torres, J., Devanadera, A., & Alieto, E. (2020). Virtual teaching as the 'new norm': Analyzing science teachers' attitude toward online teaching, technological competence and access. *International Journal of Advanced Science and Technology*, 29(7), 12705-12715.

De Villa, J. A., & Manalo, F. K. B. (2020). Secondary teachers' preparation, challenges, and coping mechanism in the pre-implementation of distance learning in the new normal. *IOER International Multidisciplinary Research Journal*, 2(3), 144-154.

Dziuban, C., Graham, C. R., Moskal, P. D., Norberg, A., & Sicilia, N. (2018). Blended learning: The new normal and emerging technologies. *International Journal of Educational Technology in Higher Education*, 15(1). 1-16.

Hassard, J., & Dias, M. (2013). *The art of teaching science: Inquiry and innovation in middle school and high school*. Routledge. Koehler, M. (2012). *TPACK Explained [Webpage]*. TPACK ORG. http://www.tpack.org/

Leo, J., & Puzio, K. (2016). Flipped instruction in a high school science classroom. *Journal of Science Education and Technology*, 25(5), 775-781.

Michael, T. B., & Williams, M. A. (2013). Student equity: Discouraging cheating in online courses. *Administrative Issues Journal*, 3(2), 6.

Moore, M. G. (2016). Teaching science online: practical guidance for effective instruction and lab work. *Stylus Publishing, LLC*.

Nawzad, L., Rahim, D., & Said, K. (2018). The effectiveness of technology for improving the teaching of natural science subjects. *Indonesian Journal of Curriculum and Educational Technology Studies*, 6(1), 15-21.

Ruggiero, D., & Mong, C. J. (2015). The teacher technology integration experience: Practice and reflection in the classroom. *Journal of Information Technology Education Research*, 14, 161-178.

Rwodzi, C. (2018). *Exploring teacher initiatives on teaching digital literacies in English* (Doctoral dissertation, University of Pretoria).

Safaah, E. S., Muslim, M., & Liliawati, W. (2017). Teaching science process skills by using the 5-stage learning cycle in junior high school. *Journal of Physics: Conference Series*, 895, 1-6.

Simamora, R. M. (2020). The challenges of online learning during the Covid-19 pandemic: An essay analysis of performing arts education students. *Studies in Learning and Teaching*, 1(2), 86-103.

Suter, L. E. (2014). Visiting science museums during middle and high school: A longitudinal analysis of student performance in science. *Science Education*, 98(5), 815-839.

Tan, D. Y., & Chen, J. M. (2020). *Bringing physical physics classroom online-challenges of online teaching in the new normal*. arXiv preprint arXiv:2009.02705. Team, Y. (2020). Key initiatives in education. *Innovation in Education, 64*(2), 35.

The University of Texas at Arlington Academic Partnerships. (2017). *Importance of Science Education in Schools*. Retrieved from https://academicpartnerships.uta.edu/ articles/education/importance-of-science-education.aspx.