Urban and Remote Areas Science Online Pedagogy with Laboratory Activities in the COVID 19 Pandemic (Philippines New Normal): A Phenomenological Study

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Abstract

Having youth protection from COVID 19 onslaught and preventing them from being virus vectors, educators imposed worldwide classroom lockdowns. The Philippines, like other countries, switched from face to face to online with the aim to uphold education specifically in Science with laboratory activities. This study aimed to determine teachers' preparations, the challenges they met and solutions they made to address it and factors that affect Science education with laboratory activities in the pandemic. To gather data the research used online in - depth interview to eighteen teachers teaching science for not less than ten years. Nine teaching in the urban areas and nine from the rural areas are the respondents. There is coding done to generate themes from teachers' narrations and severity thru themes frequency compared using the cylinder graph. The themes showed teachers' concern to achieve quality science education from most to least frequent respectively: effective pedagogy in lecture, effective pedagogy in laboratory activities, learning competency, no one should be left behind, assessment integrity, giving feedback and learning modality. Connectivity is theme drawn as challenges met in the remote areas in which teachers gave solution. Both teachers in remote and advanced areas have challenges and had given solutions in the following themes drawn: distractions, safety of students, academic integrity, students' financial capacity; The factors which affect the effectiveness science education are connectivity, pedagogy to achieve lecture and laboratory activities competency, no one should be left behind, counteraction to distractions and academic integrity.

Keywords: COVID 19 pandemic pedagogy; laboratory activities; Science education; Science online pedagogy

1. Introduction:

One of the most challenging situations that education has to face in this COVID 19 pandemic are teachers' implementation of their pedagogy in the new normal specifically that of in teaching science with its laboratory activities. It aimed to pursue education in time of pandemic attained through online classes (Pokhrel and Chhetri, 2021). Teachers as the forefront of education in the COVID 19 pandemic were compelled to make all instructional components compliant to non - face to face teaching – learning condition. Changing face to face learning to online, modular, blended and other modes to meet health protocol in education sector brings challenges to overcome in achieving the target of competencies. They are endeavours that teachers should take into account as their responsibilities (Rasmitadila et al, 2020). Educators should note that teaching modalities in this pandemic has pros and cons that must be paid attention. As advantage there is flexibility and space but assessment of student outputs requires great discipline and organization as well as high degree of individualized follow up by teachers (Diaz et al, 2020). Online education is provided by open universities not only in the Philippines but in all other counties earlier to this pandemic. But online learning in the COVID 19 induced time became massive challenge to look into. For successful implementation of this educational change set up implications needs to be addressed (Mishra; Gupta; Shree, 2020).

Science subject is an important channel of knowledge. It generates solutions for everyday life and helps us to answer the great mysteries of the universe. Educators should pursue science and its application in technology and innovation for more equitable and sustainable development (UNESCO, 2019). Since the ancient times, Science is part of the living and non - living, of biological and physical, of the lives of the ones from lowest form of organism to thinking human beings. It is embedded in simple hunting activities of the ancient people to intricate technology of the present human beings. Through science as basis, people can produce devices that could make their lives presumably easy and call it a "development". But it is also through science that they could analyse, realize and discover the adverse destructive effects to them, to other forms of organisms and to their environment of the device they have (Laudencia, 2019).

Furthermore, students must master the arts of critical thinking and sophisticated problem in order to navigate job markets in the twenty first century, as the future labor force is reliant on these abilities (Karloy and Panis, 2004). Employers in the twenty first century want workers to have stronger cognitive talents, such as the ability to solve complicated issues on their own (Costelo, 2017). As a result educational institutions around the world are putting on the greater focus on the 21st - century abilities.

Moreover, teachers find science teaching more distinctively perplexing than teaching other subjects. To make learners to understand the concepts, the teachers should use devices in laboratory activities. Science laboratory activities enables the learners have the first - hand experience of the concepts taught by teachers (Babincakova; Bernard, 2020; Sparks, 2021). The students engaged in the process of learning through laboratory activities have activated a sense of inquiry to a greater degree than other subjects needed in developing students understanding. Laboratory activities clears out abstractions in concepts brought in lectures and readings. The sensorimotor nature of the experiences of laboratory activity contributes positively to learning. There are five groups of objectives achieved in using laboratory in science classes. These skills include manipulative, inquiry, investigative, organizational and communicative. It also include concepts, theories and taxonomical categories. There is also inclusion of cognitive abilities such as critical thinking, problem solving, application, analysis and synthesis. There is also understanding the nature of science endeavors which include scientific enterprise and scientific method, interrelationships between science and technology; attitudes which include curiosity, interest in science, risk taking, objectivity, precision, confidence, perseverance, satisfaction, responsibility, concensus and collaboration (Shulman and Tamir as cited by NARST, 1990). An effective science classroom as characterized with inductive approach using

instructional materials in varied activities where elicits high level of thought, learning experiences and outcomes based rather than in deductive (NARST, 1990). Studies showed that percentage of learning is elicited from use the following senses: sight 74%, hearing 14%, touch 8%, taste and smell 5%. The more the senses are involved in learning the more and better the learning is (Salandanan, 2012). Conducting experiments, analysing findings to arrive at conclusions provide the students opportunity to construct their knowledge and metacognitive activities (Hofstein, 2021).

On March 17, 2020, Proclamation number 929 signed by President Rodrigo Duterte placed the entire Philippines under the state of calamity on account of the COVID 19. Health protocols of avoiding spaces that are close, crowded that involve close contact where outbreaks have been reported in restaurants, choir practices, fitness classes, nightclubs, offices, churches and school classes where there are people gathering in crowded indoor setting where they talk, shout and breath were prohibited. The risks of COVID 19 contamination is higher in crowded and inadequately ventilated spaces where infection will happen in close proximity. These environments are where the virus appears to spread by respiratory droplets of aerosols efficiently more which should be taken much into consideration https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public. This condition brought stoppage of face to face classes in the educational system.

Torn between predicament of pursuing education and abide to health protocols of physical distancing to keep health of education stakeholders to safety in midst of COVID 19 pandemic, online teaching and learning is pursued in accordance of the CMO (CHED Memorandum Order) number 4 entitled Guidelines in the implementation of flexible learning. This CMO states that there is an urgent need to explore learning modalities that will facilitate change from face to face to flexible teaching and learning options. Variation of learners in terms of time, pace and place could be bases of options in the modification of learning delivery modes responsive to students need to access quality education. Teachers should give the students option to choose the learning mode convenient to them as early as the time of their enrolment. The implementation of flexible learning shall be guided by the following rules: flexible learning is a learner centered approach that is deeply rooted in the needs of the students, the students should be provided most flexibility on the learning content, schedules, access and innovative assessment, making use of the digital and non-digital tools.

Notwithstanding, experiments play remarkable role in science education. In the COVID 19 pandemic outbreak the world educators are challenged to conduct online classes. Specifically on science teachers in particular where they have tough situations of transferring experiments and laboratory activities in online environment. Teachers can introduce experiments in the following forms: written descriptions and procedures assisted with photos; video recorded demonstrations; live interactive demonstrations; live demonstrations of experiments with date logging system. As an option experiments can be carried out by students at their homes using safety household substances or reagents sent to them by teachers. Studies showed that students learning performance is similar on whether experiments were done online or face to face which suggest that teachers use virtual experiments in learning science. Chemistry/science teachers were in a particularly tough situation because they have to organize teaching of not only theoretical knowledge but also practical aspects, and therefore, they needed to transfer experiments and laboratory activities to an online environment. Technical progress and the development of modern information and communication technologies (ICTs) created a wealth of opportunities to introduce students to practical aspects of chemistry during distance learning lessons (Babincakova; Bernard, 2020; NARST, 2021). However, it had been found out that there is lack of hands on activities and experiments in transforming from wet lab in face to face and laboratory activities in online classes. Students learning experiences as close as science teachers lack competencies in fostering student teacher interaction in the online classroom. Teachers have to give real chance in making students learning experiences as close as to face to face mode. Educators could do this by giving student centered learning in

which student could feel motivated and comfortable in the learning process (Darayseh, 2020).

Educators have frequently used many educational settings prior to COVID 19 pandemic, online techniques in teaching Science with laboratory activities in open universities. Teachers give instructions in the pre laboratory on web based overview lecture, a series of web delivered slide specific micro lectures and set of virtual slides the teachers introduce in the traditional laboratory experiments. Online manuals for interactive, dynamic science laboratory activities were already developed. It has been reported also that performance in examinations that virtual laboratory tools were as equally effective as traditional laboratory classes but high quality virtual laboratory tools. According to the report, the performance in examinations revealed that the virtual laboratory tools (Gamage et al, 2020). However, looking at the students' feedback, teachers should consider using multiple approaches to laboratory experiments. Students find hard time in having videos and synchronized classes in zoom or google meet due to poor internet connection. But they look forward for having the experiments. Moreover, students have problems with understanding materials during online classes (Babincakova, Maria; Pawet, Bernard, 2020).

Accessibility, cost, flexibility, pedagogy and educational policy are all are all problems the e learning (Murgatrotd, 2020 as cited by Pokhrel and Chhetri, 2021). Many countries face major challenges in the internet connection and access to digital gadgets. Broadly identified challenges with e-learning are accessibility, affordability, flexibility, learning pedagogy, life-long learning and educational policy (Murgatrotd, 2020). Many countries have substantial issues with a reliable Internet connection and access to digital devices. While, in many developing countries, the economically backward children are unable to afford online learning devices, the online education poses a risk of exposure to increased screen time for the learner. Therefore, it has become essential for students to engage in offline activities and self-exploratory learning. Lack of parental guidance, especially for young learners, is another challenge, as both parents are working. There are practical issues around physical workspaces conducive to different ways of learning (Zalat, Ahmed and Bolbol, 2021).

With the presented importance of the subject science, its complexity in terms of teaching involving hands on and minds on attained through laboratory activities beset in the current situation of the COVID 19 pandemic teaching Science is truly a challenge to surpass for teachers to attain quality Science education. A totally no face to face classes particularly in science are only done now. This makes interesting to find out the experience of science teachers in terms of their preparation, teaching engagement and challenges in the online teaching and the learning process of the students. This study aims to find out the preparations made by teachers in terms of curriculum, methodology, instructional materials and assessment. What challenges, initiatives, opportunities they as teachers and their students have encountered and realized in the learning process and its assessment. By means of this study opportunities as well as problems and concerns will be identified and will be addressed through initiatives. Through it online Science teaching and learning will be enhanced.

Research Problems

The central purpose of this study is to determine the preparations and experiences of the teachers in science with laboratory activities pedagogy in the pandemic in the remote areas and advanced areas.

Specifically, this study aims to answer the following questions:

a. What aspects of preparations did the teachers have in teaching the subject Science with its laboratory activities in the new normal?

b. What are the challenges encountered in their teaching experiences in the new normal online Science class with laboratory activities and the teachers' solution to these challenges in the following situations: remote areas and advanced areas?
c. What factors that affect the effectiveness to achieve quality science education in the new normal online science class this research could draw from the transcripts?

Significance of the Study

The data gathered will serve as documentation of the experiences of teachers in their Science teaching in the New Normal. The problems encountered in their experiences will be a basis of planning by the government agencies in funding to address it. Narratives of strategies and methods of the teachers used in this this study could be a benchmark of other teachers in their classes in addressing the problems in their classes. Educators could pinpoint factors that cause problems of teachers in their classes and it would be a venue to make plans in addressing it. The comparison of experiences of teachers in every area could be a basis of enhancing the strategies of those from the remote areas to that of the advanced areas and vice versa.

Methodology

The research design used in this study is phenomenological. Phenomenology is an approach to qualitative research that focuses on the commonality of a lived experience within a particular group. The fundamental goal of the approach is to arrive at a description of the nature of the particular phenomenon (Creswell, 2013). The researcher conducted interviews with a group of individuals who have first-hand knowledge of an event, situation or experience. The interview(s) attempts to answer two broad questions (Moustakas, 1994): What have you experienced in terms of the phenomenon? What contexts or situation has typically influenced your experiences of the phenomenon (Creswell, 2013)? Other forms of data such as documents, observations and art may also be used. The data is then read and reread and culled for like phrases and themes that are then grouped to form clusters of meaning (Creswell, 2013). Through this process the researcher may construct the universal meaning of the event, situation or experience and arrive at a more profound understanding of the phenomenon. Phenomenological methods are particularly effective at bringing to the fore the experiences and perceptions of individuals from their own perspectives, and therefore at challenging structural or normative assumptions. Adding an interpretive dimension to phenomenological research, enabling it to be used as the basis for practical theory, allows it to inform, support or challenge policy and action.

There were eighteen participants in this study. The research purposively elected the participants to fit the description of teachers teaching in remote places and advanced places. The participants are expert science teachers who had been teaching science for not less than ten years. Researcher use purposeful sampling in this study. It is a technique widely used in qualitative research for the identification and selection of information-rich cases for the most effective use of limited resources (Patton, 2002). This involves identifying and selecting individuals or groups of individuals that are especially knowledgeable about or experienced with a phenomenon of interest (Cresswell & Plano Clark, 2011). In addition to knowledge and experience, Bernard (2002) and Spradley (1979) note the importance of availability and willingness to participate, and the ability to communicate experiences and opinions in an articulate, expressive, and reflective manner. In contrast, probabilistic or random sampling is used to ensure the generalizability of findings by minimizing the potential for bias in selection and to control for the potential influence of known and unknown confounders. The research secured the informed consent agreement to gain informed consent from the teacher participants

The research gave the eighteen teachers in depth interview. Seven teachers of whom are from Mindoro State University Bongabong Campus and Alcate, Victoria Campus all teaching Science in the tertiary level. Two teachers are faculty of a College of remote areas in Mindoro. Teachers teaching in the advanced areas are from the following places, five teacher participants came from exclusive universities in Manila, two from Laguna and two from Batangas all teaching Biology, Physics and Chemistry who are included in the advanced places category. The researcher also asked the teacher participants of their experiences pertaining to the students' adaptive measures in the problems encountered in the new normal. The sample size used in qualitative research methods is often smaller than that used in quantitative research methods. This is because qualitative research methods are often concerned with garnering an in-depth understanding of a phenomenon or are focused on meaning (and heterogeneities in meaning)—which are often centered on the how and why of a particular issue, process, situation, subculture, scene or set of social interactions. In-depth interview work is not as concerned with making generalizations to a larger population of interest and does not tend to rely on hypothesis testing but rather is more inductive and emergent in its process. As such, the aim of grounded theory and in-depth interviews is to create "categories from the data and then to analyze relationships between categories" while attending to how the "lived experience" of research participants can be understood (Charmaz, 1990, p. 1162 as cited by).

Letter as an informed consent agreement asking their consent to participate in the on line in depth interview were sent one week before the interview for them would be pursued were given to the potential participants. The letter asking for consent contains the nature of the research, methodology and that their willingness to participate allows the interviewer of having them as their participant. The data gathered from the participant were treated with utmost confidentiality (Arksey & Knight, 1999; Bless & Higson-Smith, 2000; Kvale, 1996, Street, 1998 as cited by Groenewald, 2004) as being stated in the letter as an informed consent agreement. Openness and being not judgmental must be maintained throughout the interview, treating each interviewee with fairness and impartiality irrespective of the points given by the interviewee are not in consonant of the interviewer (Hycner R H,1985).

The researcher used online platforms online platforms in the data gathering. The researcher sent the data gathering instruments to participants via google form in messenger. There is follow up interview of the researcher through zoom meeting with participants for clarification of the narrative data.

The instrument used in this study were self – made in depth interview questions which were being checked and rechecked by expert researchers. The questions are the following:

1. What preparations did you have for the Science class with its laboratory activities in the new normal?
2. What are your experiences in Science teaching do you have?
3. What challenges have you encountered?
4. What have you done to address these challenges?
5. What experiences did your students have in your class?
6. What problems did your students have in your class?
7. What did your students have done to address these problems?
8. What do you think are the factors that affect teaching – learning situation in science class in the new normal?

In presenting phenomenological is to describe the occurrence as accurately as possible in which pre given framework is refrained but remaining true to the facts. The phenomenologists are concerned with understanding the social and psychological phenomena from the perspective of the people involved. Researcher should avoid data analysis because according to Hycner analysis it has dangerous implications for phenomenology in which parts of the data are broken which often loss the whole phenomenon. There will have transformation of the data through researcher's interpretation. There should have explicit treatment of

the data. These involves five steps. First step is bracketing and reduction is the process in which the researcher should avoid in having bias in the judgment in entering the unique world of the informant. Second step is that there should have careful scrutiny of relevant data. Third step is that there should have grouping of units data of similar meaning to make themes summarize. Fourth step is that there should have modification and validation of each interview. Fifth step is that the researcher should go back to the informant to ask if the summarization had been captured (Hycner, 1999 as cited by Groenewald, 2004).

With the aim that the documentation of the preparation of the teachers be realized for benchmarking as stated in the significance of this study. As revealed in the findings of Plummer et al, 2021 that collaboration among teachers should be done. Experiences that were able to give each other tips what worked and did not worked learning from each other in teaching in this pandemic should be shared to ease hardships that teaching in the pandemic could have in his/her profession (Plummer et al, 2021). The researcher wrote them in vivo and shaded the themes in color coding. The research establish color code highlights in the texts to distinguish each meaning unit in the original transcript (Burnard, 1991, 1995 as cited by Bengtsson, 2016). There is consideration of the unmarked whether to be included or not. A valid qualitative study is the one that truthfully reflects the phenomena studied and reliable in the sense that same results will be obtained if study will be replicated (Morse &Richards, 2002). There is a risk that different researches draw dissimilar conclusions from the data. To increase the validity, analysis should be done by at least two investigators and convene their results (Burnard,1991, Graneheim&Lundman,2004). This is also a form of triangulation which could be done also using different sources and data collection to confirm the results (Catanzaro,1988; Patton,2002; Rolfe,2006 as cited by Bengsston, 2016).

To ensure the validity of the coding two teacher experts who are not informants of this research were asked to do the coding of these transcripts and convened the results (Morse &Richards,2002 as cited by Bengtsson, 2016). A valid qualitative study is the one that truthfully reflects the phenomena studied and reliable in the sense that a researcher will obtain the same results if study will be replicated (Morse &Richards, 2002). There is a risk that different researches draw dissimilar conclusions from the data. To increase the validity, analysis should be done by at least two investigators and convene their results (Burnard,1991, Graneheim&Lundman,2004). This is also a form of triangulation which could be done also using different sources and data collection to confirm the results (Catanzaro,1988; Patton,2002; Rolfe,2006 as cited by Bengsston).

Before this research was done the informants have already classes in the midterm of the second semester in face to face in which they were able to incorporate in their preparation for the next school year. The researcher, being a Science teacher herself teaching Science subjects which requires laboratory activities, have already familiarization of the data gathered to obtain sense of the whole and learn what was going on is deemed effective in breaking the data down into smaller meaning units (Bengtsson, 2016). The research identified the level unit with code identities as the open coding process in the literature (Bengtsson, 2016).

Definition of Terms:

Advanced place – in this study refers to the location of the HEI with their students and faculty are located in areas where there is ample internet connection specifically in urban areas.

New normal – in this study refers to the policy of CHED and DepEd for the planning and implementation of the sustenance and provision of quality education despite lockdown and community quarantine to contain health of learners and educators against COVID 19 in the pandemic.

Remote place – in this study refers to the location of the HEI with their students and faculty are

located in areas where there is minimal, slow or no internet connection specifically in rural areas.

Results and Discussion

First semester in Philippine HEIs started in August 2020 and ends in December 2020 while the second semester started in January 2021 and ends in May 2021. The outbreak of the COVID 19 pandemic in the Philippines the HEIs are on its midterm of the second semester. Due to health protocol mandate of people gathering in crowded indoor setting prohibition, school classes that require face to face setup were suspended. To continue the semester, lectures, activities and assessments were given on blended, synchronous online web on either google meet and zoom and asynchronous by sending modules online and hard copy in drop places.

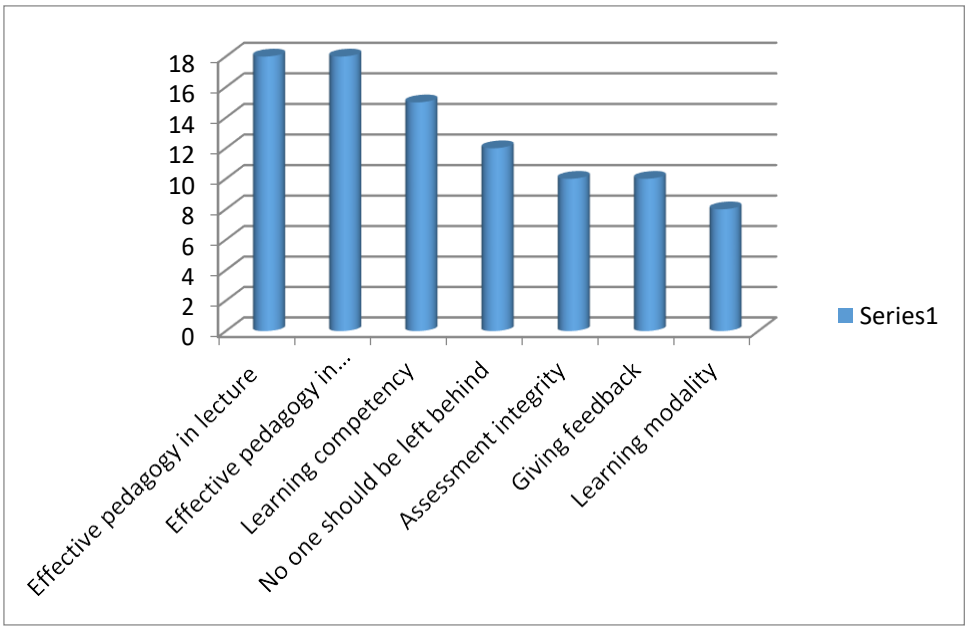
The data gathered to achieve the objective to determine the preparations done by the teachers to effectively teach the subject science online with its laboratory activities came up to have the following themes: effective pedagogy in lecture, effective pedagogy in laboratory activities, learning competency, no one should be left behind, assessment integrity, giving feedback, learning modality.

The research did data analysis by tallying the frequency in the description of the theme that occurred in the interview narration of the teacher participants then determine the severity of the particular themes in compared to that of the other themes using the cylinder graph.

a. Preparations done by the teachers in order to teach the subject science with its laboratory activities.

The graphical presentation below is the result of the frequency in themes and codes drawn from the transcripts written in vivo from the narration of the teacher informants when the researcher had in depth interview with the teacher informants of the question to attain objectives to determine the preparations done by the teacher respondents. This is to accomplish the first objectives to determine the preparations done by the teachers in order to effectively teach the subject science with its laboratory activities, the researcher had drawn from the teacher informants of the main question “What preparations did you have for the Science class with its laboratory activities in the new normal”?

Figure 1.
Frequency in themes from the transcripts on the preparations done by the teacher respondents in laboratory activities in the new normal



Note. Frequency in themes from the transcripts on the preparations done by the teacher respondents in laboratory activities in the new normal

1. **Effective teaching - learning in lecture**

Effective teaching - learning in lecture is the theme first in rank in terms of most frequency to determine the preparations done by the teachers to be able to have effective teaching of the subject science with its laboratory activities. This means that the teachers are most concerned of the strategies that they will employ in their teaching to have their students have effective learning. As what the three teachers have stated in these narrations:

"In order for my students to be interested in the activities and lectures in the module I give them motivation in a video link such as chemical reactions."

"I give my students instances that could relate them to the concepts as motivation to lectures and activities".

"I make visuals and pictures of the concepts to make it understandable to students. Text words are also lesser to enhances their interest in the lecture and in answering the activities".

"To make the students study their lessons I indicate in the modules that exams will be given to them".

"All instructional materials are textual and prepared with motivation of the relevance of the concept with pictures and visuals in such a way that concepts be easily understood in a glance without the learners have tedious reading for easy facilitation of effective learning of the competencies needed".

"I record power point lecture done by me for my students to enhance their learning of the concepts."

"I attach video links to those concepts which need clarification."

This ways of the teachers is an answer to the findings that in order for the teaching process to take place online efficiently, a balance between theory and practical tasks according to the amount of available time students have is necessary. 71.4% of students mentioned that courses contained too much task that they no longer have same free time they had when teaching took place in the face to face mode of learning (Coman, 2020). Teacher should plan student's learning experiences, arranged in logical order decide the format of the module to best achieved the learning objectives. Modules should be tested on slow, average and fast learners and revise it according to the result of the obtained test. The module's design process should meet the need of should meet the need of the students (Rao, 1981). There should have defined five elements as situation, learned capacity, object, action, tools or other constraints (Sadiq & Zamir, 2014).

2. Effective teaching - learning in laboratory activities

Effective teaching – learning in laboratory activities is the theme second in rank code in the in terms of most frequency to determine the preparations done by the teachers in order to teach effectively the subject science with laboratory activities. Since Science concepts the students could most effectively learned in first - hand experience of the concepts achieved through laboratory activities then it is important to note this findings. The teachers despite of the pandemic that made them hard to as what all of the teachers informant had noted also that it is hard for the preparing science modules with laboratory activities to cope up:

"It is hard really for us preparing lessons with laboratory activities during these online classes without the hands on activities that could be done in face to face classes". These are the narrations the teachers have in their preparation to effective teach laboratory activities in Science:

"The module I prepared for them have incorporation of laboratory activities for them to have the first - hand experience of the concepts needed for them to learn as required. I see to it that each laboratory activities required materials that are available at home or their localities example vinegar, eggshells, milk, vegetable extracts".

"In laboratory activities that need materials which could not be substituted with materials at home reagents which are safe to be used at home will be given to students through drop stations in retrieving modules with the assistance of the subject teacher". This is in order that the students could still avail the first - hand experience of the concept".

"Procedures in the laboratory activities I prepared are direct to the point precise and concise aided with pictures for easy understanding of the students to learn the science concepts needed to be learned". I see to it that the students could easily understand the procedures of the activity by stating it in simplest language."

"On lessons on mole concepts, titration, finding excess reagents that need apparatuses such as platform balance, burette and other apparatuses which not be available at home, video clips done by teacher or downloaded from websites are prepared".

"I ask my students if they have problems in doing the activity and clarifications in the group chat of the class".

"All instructional materials are textual and prepared with motivation of the relevance of the concept with pictures and visuals in such a way that concepts be easily understood in a glance without the learners have tedious reading for easy facilitation of effective learning of the competencies needed".

The review how universities are currently introducing laboratory based practical experiments to students, how they were delivered and introduced in the pre COVID 19 period to maintain high quality educational experiences. It states that there is several distance education now that extensively use web based activities and have blended approaches to support teaching and learning activities in laboratory activities. This is in accordance to the findings of Babincakova, Bernard, Sparks and NARST.

3. Learning competency

Learning competency is the theme third in rank in terms of most frequency to determine the preparations done by the teachers with the aim to teach effectively the subject science with its laboratory activities. In spite of unpreparedness of education as pointed by UNESCO in the COVID 19 pandemic, teachers make effort in their preparation of the instructional materials in the up keeping of the desired learning competencies of the courses assigned for them to teach. The frequency of the following statements gathered from the informants reveal the theme of "learning competency':

"Learning activities are infused in the lecture in such a way that students' have a deepened learning of the concepts in the competencies.
"The instructional materials I prepare are guided by the desired learning competencies signified by the CHED Memorandum Order and DepEd with the aid of the reference books and valid academic sites science concepts could be found".
"The instructional materials are prepared one subject at a time. I take time finishing instructional material before starting with the other subject. Preparing the instructional module one at a time enables me to have focus in the subject. Coherence in the lesson is achieved if material is prepared one subject at a time".
"Timetable for every competency is assigned and achieved through indicating submission deadlines for specific chapters in the modules".

4. No one should be left behind

No one should be left behind is theme fourth in rank in terms of most frequency to determine the preparations done by the teachers in order to effectively teach the subject science with its laboratory activity.

This means that the teachers are most concerned of the strategies that they employ in their teaching in such a way that no one should be left behind in having their students have effective learning. The teacher informants see to it that learning opportunities availed by students with ample connectivity be availed also by those students who are deficient in connectivity. As what the three teachers have stated in these narrations:

"Hard copies of the instructional materials are given to those without internet connectivity".
"I see to it that even if they could not attend synchronous classes due to connectivity hindrances still they could learn effectively the concept in the way that those who can attend do".
"For availability of all students so I sent them soft copies in google classrooms and group chat for them to download the soft copies in available place where they could download".
"I also prepared hard copy for those who have no means to avail it online".

The COVID-19 crisis revealed the unpreparedness of education systems, infrastructure, educators and learners for distance learning, and the fragility of adult literacy programs. It hit the already marginalized the hardest including the 773 million non literate adults and young people. Two thirds of whom are women and 617 million children and adolescents who are failing to acquire basic reading and numeracy skills even before the crisis. This connotes that teachers' acknowledge the importance having laboratory activities in the pursuit of quality education in science.

As pointed out undergraduate science subjects such as Anatomy and Physiology classes. Effective biology pedagogy could be effective through anatomical dissection. Likewise that of Chemistry which could be learned in experiments using reagents, equipment and apparatuses both biological and physical sciences are dependent on practical laboratory classes, often entailing small groups, in an aim to replicate real-world

laboratory conditions (Rice et al as cited by Anderton, Ryan et al).

For instance, in undergraduate anatomy and physiology classes, student learning is often centered around anatomical dissections and practical classes, which are often peer- or group-based in nature. Similarly, both biological and physical sciences are dependent on practical laboratory classes, often entailing small groups, in an aim to replicate real-world laboratory conditions (Rice et al., 2009).

5. Assessment integrity

Assessment integrity is the fifth in rank theme in terms of most frequency to determine the preparations done by the teachers in order to effectively teach the subject science with its laboratory activity. Revealed in this theme are two codes that are integrity and monitoring students output in activities and examinations. As foreseen by the teachers to ensure integrity in the students output are these narrations of them:

"While working on my module come another challenge in teaching in this pandemic on how should integrity in the assessment of my students learning ensured. I am thinking of formulating a pact of rules and regulations with them on in such a way that they would abide in it because they are included in the formulation of such pact".

"I have foreseen that honesty in the outputs of my students could be an issue so in their outputs I let them have it handwritten".

6. Giving feedback

Giving feedback is the sixth in rank theme revealed in the preparation of the teacher in Science teaching with laboratory activities. Teachers did preparations to reach out more effectively with the students as depicted in the following narration:

"Checking students output in online classes and letting them know if their answers are correct as a way of checking if what they learned is correct could be harder if compared to that of checking outputs in the face to face".

"In every end of the lesson generalization of the concepts taken are given to students. The students will be given short quiz through google form". Correct answer of the exams will be given to the students in the platform most accessible for their connectivity in the messenger". "Hard copy of the correct answers to the exams given will be given to those who cannot have the answers".

7. Learning modalities

Learning modalities is the theme seventh in rank revealed in the preparation of the teacher in Science teaching with laboratory activities. Preparations had been done by the teachers to reach out more effectively with the students as depicted in the following narration of the teachers:

"I upgraded my laptop and bandwidth to a one that it could reach out my students"

'I tested which of the platform in which I could be best to communicate to my students online such as messenger, google classroom and text".

"In asynchronous, offline and modular I give my students hardcopy of my modules".

b. Challenges encountered and solutions done by teachers in the new normal science class in the following situations: remote areas and advanced areas

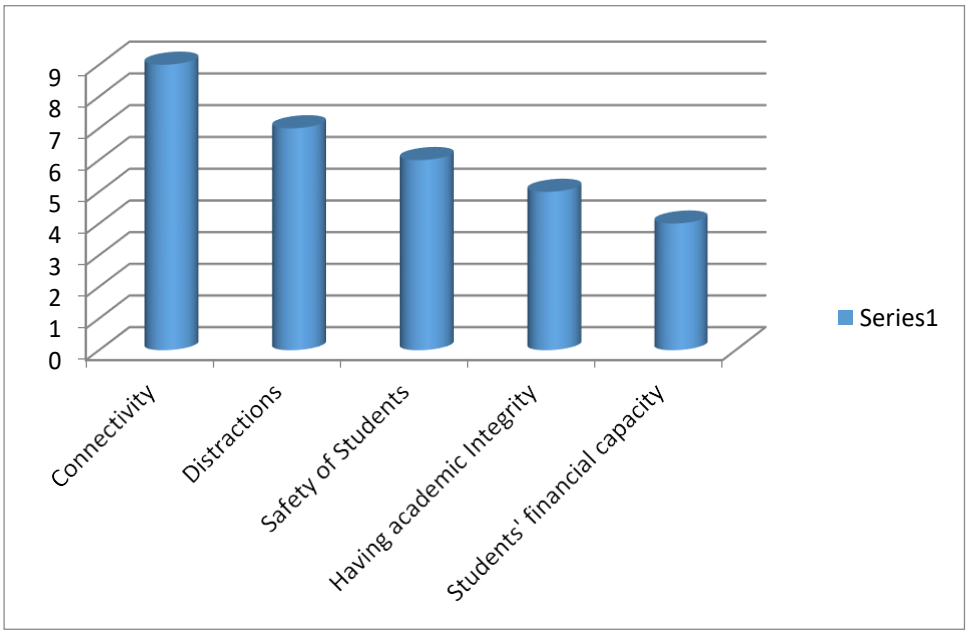
This is to accomplish objective number two to determine the challenges encountered in the new normal science class by teachers and students and solutions done in the following situations: remote areas and

advanced areas. This research identified the challenges encountered in the science with laboratory activities pedagogy and solutions to address these challenges in the new normal science class. The researcher asked the teacher informants of the following in - depth interview questions. What are your experiences in Science teaching do you have?; What problems have you encountered?; What have you done to address these problems?; What experiences did your students have in your class?; What problems did your students have in your class?; What did your students have done to address these problems?

Challenges encountered in the new normal science class in remote areas

When the research tallied the frequency of the transcripts written in vivo from the narration of the teacher informants in the remote areas, this is the result. Below are the graphical presentation of the frequency of the themes mentioned by teacher respondents.

Figure 2.
Frequency of the themes mentioned by teacher respondents in the challenges encountered by teachers in the new normal with laboratory activities science class in remote areas



Note. Frequency of the themes mentioned by teacher respondents in the challenges encountered by teachers in the new normal with laboratory activities science class in remote areas

The problem most encountered by the teacher informants in their science with laboratory experiments pedagogy in the remote areas as stated in their narrations written in vivo from most number of frequencies to least:

1. **Connectivity is the first most challenge encountered by teachers in laboratory activity in science pedagogy in remote areas.**

"Almost one third of number of my students cannot attend synchronized classes and in my other classes almost one fourth of the total number of my students are the ones who can attend due to minimal connectivity.

"During our class schedule many would be present at the start but as the class goes some are disconnected and reconnected until when class ends there are few only who will be present".
"Not all students have ample connectivity at home to avail the instructional materials online".

What do the teacher informants do to address challenge in connectivity?

"For my students who have no ample connectivity at home to be able to cope up with the class I give them the hard copy of the instructional materials".
"I inform my students to be ready for the synchronized class to be able for them to secure ways to have connectivity by buying load to have data".
"I instruct my students to find places where to download the instructional materials but guide them in doing so".
"If my students can download in places away from home I tell them to have downloading in places that are safe only".
"Hard copy of the learning materials will be given to those students who have no means and not safe for them to avail it online".

2. **Distraction is the second most challenge encountered by teachers in science laboratory activity pedagogy in remote areas.**

"Due to unstructured time of the online class other students tend to work for earnings and this robs their time in working for their activities in the course".
"There are students who are parents that they should also find time helping their children do their school works and tutoring them".
"Other media in the internet not related to the lessons given by teachers tend to distract some of my students".

What do the teacher informants do to address challenge in distractions?

"I tell my students that they should find ample time in accomplishing their school works".
"The teacher's competitor really in making students be focused on the lessons is the social media. I let my activities go with it example I let them make tiktok"

3. **Safety of students is the third most challenge of teachers in the Science laboratory pedagogy in remote areas.**
    - **Safety problem in connecting online**

"Those students having no ample connectivity attending synchronized classes find ways to connect to be able to attend by going to the places that pose danger such as in high altitude area in mountains and rivers which are forested and some tend to climb trees and buildings.
"To avail the instructional materials online some students who have poor connectivity at home go to places that may pose danger to them such as in high altitude forested areas".

What do the teacher informants do to address challenge in safety in connecting online and performing laboratory activities at home?

"For my students who have no ample connectivity at home to be able to cope up with the class I give them the hard copy of the instructional materials".
"I inform my students to be ready for the synchronized class to be able for them to secure ways to have connectivity by buying load to have data".
"I instruct my students to find places where to download the instructional materials but guide them in doing so".
"If my students can download in places away from home I tell them to have downloading in places that are

safe only".
"But if it is not safe for the students to avail the learning materials online then I tell them that hard copy will just be given to them".
"Some students who could not download go to the houses of their class mates who have downloaded the materials and copy them which could be instances of virus spreader the purpose of school lockdown is defeated".

- **Safety problems in performing laboratory activities at home**

"In the performance of the experiments students might use home chemicals such as hydrochloric acid which if not performed carefully could do harm to them".

What do the teacher informants do to address challenge in safety of students in performing laboratory activities at home.

"I do not indicate use of dangerous and toxic materials in the laboratory activity that I am assigning my students to work at home. I just indicate only those mild ones such as vinegar and others which could do no harm on them".
"I assigned materials that could readily be found only on their household and the vicinity of their household".
"I tell my students to wear goggles, mask and have hair tacked in performing the experiments".

4. **In having academic integrity is the fourth most challenge of teachers in the Science laboratory pedagogy in remote areas.**

"There is possibility of students cheating in the exams I am giving".
"I doubt the integrity of the activity outputs of my students".

What do the teacher informants do to address challenge in academic integrity?
"I shuffle the numbering of my exams and make three sets of it in which each set is assigned to specific groups. The students are informed that they are taking exams in sets different from one another".
"I let my students have their output be all handwritten the send its picture in the google classroom or any platform we agreed upon. This is to avoid copy and pasting of outputs".

5. **Students' financial capacity is the fifth most challenge of teachers in the Science laboratory pedagogy in remote areas.**

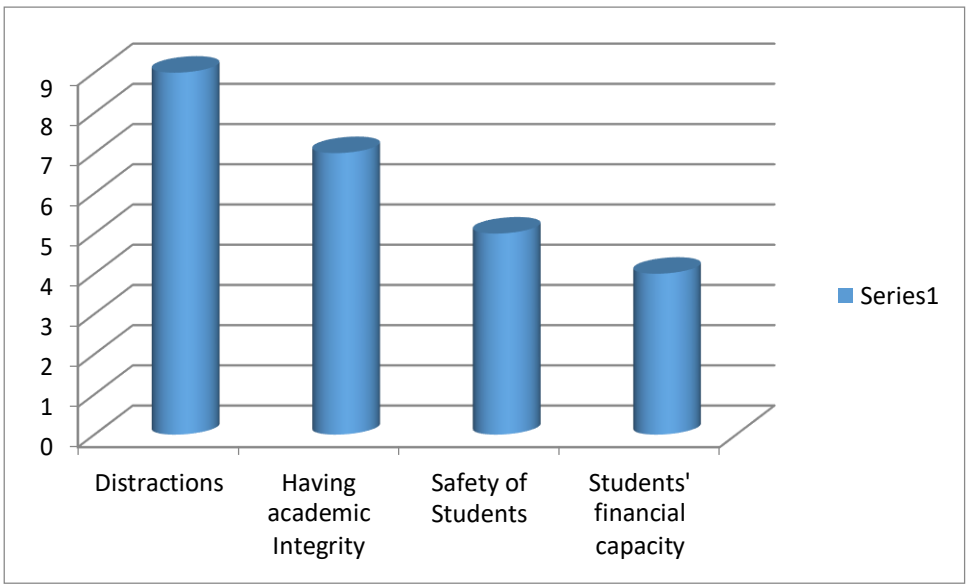
"Having no gadgets such as cell phone is the reason why some of my students could not attend to the needs of online class".
"Video clips which are supposed to make concepts more understandable to the students to enhance their achievement of the subject could not be pursued due to lack of gadget and connectivity of my other students".
"Some of my students have no amount to buy load to have data for connectivity".
"My students have no financial capacity to buy the materials needed in the experiment assigned for them to do".

What do the teacher informants do to address challenge in students' financial capacity?
"To those who have no gadgets such as cell phone to be used in the online class hard copy of the material is provided".
"I assigned materials that could readily be found only on their household and the vicinity of their household".

Challenges encountered in the new normal science class in the advanced areas

Shown below is the graphical presentation of the frequency of the transcripts from respondents in the themes the researcher wrote in vivo from the narration of the teacher informants in the advanced areas.

Figure 3.
Frequency of the themes mentioned by respondents drawn from the transcripts in challenges encountered in the new normal science class in the advanced areas



Note. Frequency of the themes mentioned by respondents drawn from the transcripts in challenges encountered in the new normal science class in the advanced areas

The problem most encountered by the teacher informants in their science with laboratory experiments pedagogy. It is from most number of frequencies to least in the advanced areas as stated in their narrations written in vivo:

1. **Distraction is the first most challenge encountered by teachers in science laboratory activity pedagogy in advanced areas.**

"Whenever I check the outputs of some of my students I have found out that they have not yet submitted even if it is already past the deadline when I can see that connectivity is not a problem to them, they are always online. When asked about why they have not yet submitted their outputs, some admitted that they indulged in online entertainments".
"Some of my students could not be able to attend synchronized classes, others could not be able to submit their outputs on time and when asked about it tell that they are having work to earn for a living".
"Some of the students I have are less focused on the lessons given because they cannot be able to submit their outputs on time because their parents ask them to to run for an errand".

What do the teacher informants do to address challenges in distractions?
"I give my students motivation in every activity that I let my students work on to enhance their interest in

working for it".
"I give my students from time to time reminders in the submission of their outputs".
"My activities are made more interesting to students".

2. **In having academic integrity is the second most challenge encountered by teachers in science laboratory activity pedagogy in advanced areas.**

"Some of my students have many gadgets and ample connectivity which enables them to be accessible to cheating in working for their activity and during examinations".
What do the teacher informants do to address challenges in having academic integrity?
"Before the start of the semester classroom rules and regulations, together with the rules to have academic integrity is being formulated by the class also signed by each member of the class. The classroom rules and regulation are being posted always in their google classroom as reminder".
"I shuffle the numbering of my exams and make three sets of it in which each set is assigned to specific groups. The students are informed that they are taking exams in sets different from one another".
"I let my students have their output be all handwritten the send its picture in the google classroom or any platform we agreed upon".

3. **Safety of students in performing laboratory experiments at home is the third most challenges encountered by teachers in science laboratory activity pedagogy in advanced areas.**

"In the performance of laboratory experiments at home the use of home chemicals that are toxic and corrosive such as hydrochloric acid which if not performed carefully could do harm to students".
What do the teacher informants do to address challenges in safety of students in performing laboratory experiments at home?
"The reagents that are indicated in the laboratory activities are those non corrosive and non -toxic that could pose no harm to the students".
"I do not indicate use of dangerous and toxic materials in the laboratory activity that I am assigning my students to work at home. I just indicate only those mild ones such as vinegar and others which could do no harm on them".
"I assigned materials that could readily be found only on their household and the vicinity of their household".
"I tell my students to wear goggles, mask and have hair tacked in performing the experiments".

4. **Students' financial capacity to buy materials for the activity, the fourth most challenge encountered by teachers in science laboratory activity pedagogy in advanced areas.**

"Many of my students could not be able buy materials needed in the laboratory activity".

What do the teacher informants do to address challenges in students' financial capacity to buy materials for the activity?
"I assigned materials that could readily be found only on their household and the vicinity of their household".

Objectives number three to identify the factors that affect the effectiveness to achieve quality science education in the new normal science class.
The factors which affect the effectiveness to achieve quality science education in the on line new normal science class are connectivity, pedagogy to achieve lecture and laboratory activities desired learning competency, attainment of no one should be left behind, counteraction to distractions and academic integrity.

Conclusion:

Based on the themes drawn from the gathered in – depth interview for phenomenological method the following conclusions are drawn:

1. The teachers have high regard in the maintenance of high quality education in the time of school lockdowns in the COVID 19 pandemic as in themes of their narrations affective pedagogy in lecture and laboratory activities, learning competency, no one should be left behind, assessment integrity, giving feedback and learning modality.
2. The challenges met and solutions given by teachers in the remote areas and advanced areas are almost the same but differ only in severity.
3. Connectivity is the main problem met by teachers in remote areas but not in advanced areas. This is the main reason why students in remote areas cannot avail synchronized classes in zoom or google meet. This situation makes the teachers in the remote areas to prepare instructional material distributed online hardly. The teachers should see to it that the learning materials they will give be interactive and comprehensive in such a way that even if students could not attend synchronous class to achieve effective learning.
4. Distraction is a challenge common to both remote and advanced areas that concern on students'. One of the distractions is succumbing to work to earn for a living having classes not as rigid as that of the face to face classes. Teachers find their students also do household errands one of which is helping in doing modules of their children and other family members that distract them from doing their own. Other distractions include students indulging to media for entertainment.
5. Safety of students is another challenge both met by teachers. In remote areas teachers' problems on their students is the concern on going to areas for connectivity that may be away from the safe of their homes that may endanger the students. Both in remote and advanced areas teacher's challenges are having safety in laboratory works done by students at home.
6. Other challenges met by teachers they address in the onset of their classes are academic integrity in exams and activity output.
7. There is also challenge on financial capacity of student to buy gadgets such as cell phone for online class and materials for laboratory activities are challenges that the teacher gave solutions.

Recommendations:

1. There should have enhancement of online connectivity specially in remote areas.
2. There should have national budget allotment for those families to avail gadgets for the online classes.
3. Teachers on the remote areas who could not have their students be present in their synchronized classes should be given enhancement on how to make interactive and comprehensive instructional materials in hard copy and online to uplift quality Science education of their students.

Limitations of the study:

This study is limited only to eighteen teacher participants.

Way for future study

There should also be researches on the students' perspective of the online pedagogy specifically in Science with laboratory activity studies like this to gather more insights. Difference in students Science achievement on the online and face to face should also be studied. There should also be studies that lead to measures how to make enhanced online pedagogy in teaching Science with laboratory activities.

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