A Phenomenological Study on Students' Experiences in Learning Physics in an Online Class

Justine C. Mercado (✉ jcmmercado@ndmu.edu.ph)

Notre Dame of Marbel University <https://orcid.org/0000-0001-9625-8986>

Research Article

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Abstract

Online learning keeps on growing and being explored in this time of the pandemic. Most of the tertiary institutions here in the Philippines have shifted from face-to-face to online instructions in all courses, especially in physics subjects. The conduct of physics classes through virtual classroom has its advantages and presents some challenges that why it is important to understand the perspective and experiences of students. This study aims to describe the experiences of students in learning physics in a virtual classroom, specifically their experiences in preparation, learning management, and opportunities and the challenges they have encountered. This study used a descriptive phenomenological research design to explore the lived experiences of BSED Science students who have taken physics subjects in an online class which is chosen purposively. There are four themes that emerged in this study Technological Preparations, Self-Preparations, Challenges in Online Learning, and Learning Management and Opportunities. It was realized in this study that students are prepared to take online classes in both technological and personal aspects. Despite their preparations, they have encountered challenges such as network issues, time constraints, and distractions in the learning environment at home. However, students were optimistic, so, they have seen opportunities in these challenges to improve their technological skills, time management, and maximize online resources for a better understanding of physics concepts.

Introduction

The growth of online learning has increased drastically due to the COVID-19 pandemic caused by the virus SARS-COV-2. This pandemic has challenged the educational system across the world and forced higher education institutions (HEIs) to shift from traditional pedagogical methods to online teaching and learning. During the earlier months of the outbreak here in the Philippines, the Commission on Higher Education released a memorandum ordering HEIs to exercise academic freedom and take necessary actions to secure the students' safety (CHED, 2020). Hence, schools were forced to suspend face-to-face classes and close temporarily and opt for a flexible learning approach. This shift in the education instructional delivery was caused by the fear of HEIs to lose the whole ongoing semester or even more in the coming future. Due to this sudden change, the educators and students adjusted a lot to adapt to this new normal education, affecting their performances, day-to-day life, and even their education perceptions, especially in science education.

Science education is one of the most critical subjects at the secondary and tertiary level due to its relevance to students' lives and the universally applicable problem solving and critical thinking skills it uses and develops (Arrieta, Dancel, & Agbisit, 2020). These lifelong skills that allow students especially science majors to generate ideas, weigh decision intelligently and understand the concepts and theory behind certain phenomena and be able to share it to other. Teaching problem-solving skills and critical thinking skills to students will help them succeed in school and beyond. Science education, mainly Physics education, is about teaching and learning that involves students in an inquiry-based investigation in which they interact with teachers, peers; establish connections between current knowledge and scientific understanding and apply them through experimentation; engage in problem-solving, planning, and reasoning from evidence and enables students to experience an active learning approach to learn science (Contant et al., 2018).

Physics learning is better when there is an exposure of students to the outside or classroom premises. Through these exposures of students to the outside world and performing laboratory experimentations, students can apply and better grasp physics concepts (Mercado, 2020). However, in this pandemic, these exposures to the outside world and actual laboratory experimentation were not allowed as advised by CHED. Also, this is a safety measure of the institutions to protect their student and employees from being exposed and infected by the SARS-COV-2 virus. Hence, the conduct of the physics classes and Science classes, in general, was done through different modalities such as Modular distance learning, Television/radio-based instructions, Blended Learning, and Online distance learning (Philippine Information Agency, 2020).

Online education and e-learning is not a new approach in the field of education. It addresses many issues in delivering instruction, such as geographical remoteness, a limited offering by institutions, and students' complex lives (Clarke & Rowe, 2008) even before the pandemic. Learning science in an online environment offers an "anytime and anywhere" education for both students and teachers pursuing graduate programs (Obbink & Wheeler, 1993). According to Gedera (2014), many opportunities for flexibility, collaboration, and interaction are way different from a face-to-face learning environment. Also, it uses educational technologies to design, deliver, manage learning and knowledge imparting at anytime and anywhere.

The use of gadgets such as computers, cellphones, and tablets together with video conferencing platforms online enables students to have new practices, experiences, and opportunities in terms of learning science this time of pandemic. However, this new mode of instructional delivery posed a lot of questions to the academic leaders, such as; what do students think about online learning? Secondly, what do students do to be successful in online learning, and what can be done to improve student's access to this type of learning? These questions are essential to sustain the enrollment numbers in schools and determine the future implications to the education sector (Nwankwo, 2015). It is also integral that in the conduct of online classes, the experiences, sentiments, and perceptions of students must be identified so that necessary improvements can be made (Rodriguez et al., 2008). Students' perceptions about online learning were not all positive. According to Goodall et al. (2005), online learning causes inadequate human interaction needed to establish peer support, more profound discussion on the subject matter, and connectivity problems that add up to the difficulty of the subject matter. On the other hand, students expressed that online learning made them more responsible and held greater accountability for their learning.

In spite of the significant growth and interest in online learning or e-learning, positive outcomes are not ensured in all contexts (Gedera, 2014). With this, some of the research findings have shown the uncertainties about teaching and learning online. In the study of Blackmon & Major (2012), the students who took online distance learning experienced connectivity loss, instructor inaccessibility, autonomy in learning, and lesser peer interaction. On the other hand, online learning affects the academic performances of students and changes in attitude and habits. In the study of Fjelstul (2006) and Salamat et al., (2018), online mode of instruction helped students' academic performance to improve and become motivated to attend class; however, Zhu et al. (2013) stated that despite the positive effects of e-learning on academic performance, student's attitudes and perceptions towards online learning are very unpredictable, and students may manifest many possible undesirable habits. So, it must be explored, especially in learning Physics.

Classes for the school year 2020-2021 in the private Higher Education Institution in Koronadal City opened last August 24, 2020, and until this second semester, it opted to have online distance learning. Since the school has never done a completely face-to-face conduct of classes particularly in Physics, it is interesting to find out the experiences of the Physics students in terms of their preparation, learning engagement, and perceived challenges in online learning. This study would like to explore and gain insight from college students' experiences in learning Physics in this time of pandemic. The experiences and perceptions of students that can be drawn out from this study can be a basis to improve the teaching and learning of Physics using the online platforms.

Purpose of the Study

The main purpose of this study is explore, describe and gain insights from the experiences of BSED science students in learning Physics through Online Platforms.

Method

Research Design

To explore the experiences of the students in learning Physics in this new normal the study utilized a Descriptive Phenomenological Research Design. Phenomenological design is a type of qualitative research that deals with the similarities of a lived experience in a particular group. The aim of this design is to arrive at a description of a certain phenomenon (Creswell, 2013).

Sampling Design

The informants of this study were ten (16) BSED Science students which enables the researcher to have a rich data to be analyzed. They were chosen purposively because the study is specific to a certain phenomenon only (Violeta and Whitehead, 2013), and the selection criteria are: (1) The students should be enrolled under BSED Science program, School year 2020-2021, (2) have taken physics courses this school year 2020-2021 through online distance learning.

Data Collection and Instrumentation

Experts in educational management, curriculum and assessment will be asked to validate the in-depth interview guide. After the validation process the researcher will modify necessary changes if there's any from the validators. Then the researcher will write a letter to the academic vice president of the institution to ask permission to conduct the study and secure certification from the research ethic committee. Another letter will be sent also to the informants through email or other platform to inform them that they are being invited to participate in the study. After receiving the confirmation of the informants, they will then sign a letter of consent prior to the interview to assure that their participation in the study is voluntary and they agreed to state their experiences during the interview process and will be used in this research and their participation and responses will not affect their academic status in any of their subjects. After the signing of the letter of consent, informants will then be brief about the mechanism and purpose of the interview. Audio recorder will be used to record the interview and will be used in transcribing the whole interview process which will be used in the data analysis.

Data Analysis

The data will be analyzed using Colaizzi's (1978) Strategy. Colaizzi seven procedural steps from Duquesne school which follows Husserlian tradition is a robust method in order for the researcher to find, understand and describe the lived experience of the informants. The following steps that will be done are: (1) reading and rereading of transcripts, (2) Extracting significant statements, (3) formulating meanings, (4) categorizing into cluster of themes and validating with original text, (5) describing, (6) returning to participants, and (7) incorporating any changes based on the informants' feedback.

Research Rigor

In this study the researcher ensured the trustworthiness of the data and the results to establish the validity and rigor of the study. Hence, the researcher satisfied the following criteria namely, credibility, transferability, dependability, and confirmability (Guba and Lincoln, 1989). Credibility establishes the capability of the study to measure what is intended and is a true or correct reflection of the social reality of the participants. There are many strategies to address credibility such as prolonged engagement, bracketing and member checks which were in this study. Transferability on the other hand relates to the ability of the findings to be transferred or relate to other contexts or settings. In doing qualitative research one should remember that is specific to a particular context, so it is important to have "thick description" of the particular phenomenon and allowing the reader to assess whether the findings are transferable to their situation or not. Another criterion is dependability, it ensures that the process or method is described in sufficient detail to facilitate another researcher to repeat the work. Lastly, confirmability is comparable to objectivity in quantitative studies. The aim of this is to minimize the investigator's bias by acknowledging researcher predispositions and doing bracketing. By adhering to the following criteria, the researcher believes that this study is done rigorously (Holloway, 2008; Korsteins and Moser 2017 and Shenton, 2004).

Ethical Considerations

Considering the use of resources and time to be spent by the informants, the study considered the following dimensions of research ethics in the whole duration of the study: (1) Informed consent, (2) vulnerability of research informants, (3) privacy and confidentiality of information, and (4) transparency.

Results And Discussion

The shift in the delivery of instruction made all stakeholders imagine on what will happen in Philippine education, especially on science education in tertiary level after the school year 2020-2021. Due to the unpredicted circumstance and to many unexpected things that would come it is better for the graduates of

senior high school to be prepared by reflecting on the experiences of the college science major students after finishing a physics course in this time of pandemic. The experience of this students will enable them to understand the different scenarios, concerns and learning opportunities to succeed in learning science in an online platform.

In terms of preparations, science students just like other students had to prepare for the unknown and worst-case scenario. The instance of knowing that the school year will open the science students did personal preparations before the class will start. The preparations of the students for online physics learning were focused on technological resources and personal preparations. In the study on students' preparations there are 2 core themes that have emerge namely gathering of resources and establishing schema and learning environment. Preparations are essential for science students to respond to the demands of learning, as well as assure success in taking the course. This helps the students to equip themselves to stay connected in classes and connect the prior learning to the concepts of physics subject to be taken, and anticipate the rigors of the course (Shafiei Sarvestani, et al., 2019).

Theme 1. Technological Preparations

Since the school where the students were enrolled will hold synchronous and asynchronous classes, they ensure that their internet connection will be stable by subscribing to internet providers, buying prepaid WIFI modems, identifying places where signal for data connection is strong and some look for places where pisowifi are available. The students have also purchased different gadgets such as headphones, cellphones, and upgraded their personal computers and laptop to support software needed for synchronous classes. The participants shared:

"I told my parents, Ma, we need to buy the globe wifi plan, I also encourage my father to buy headphones because there are many distractions during online class because my sister is having her lesson about grade 7..." (P1)

Participant 5 also shared about her struggles in looking for strong signal within her area as a preparation for online classes

"I am struggling fetching signal sir so what I did is that I look for some areas to find a better signal, so I walk couple of hundred meters away from home just to have my classes" (P5)

In addition, Participant 7 shared also that he bought better gadget and subscribed to internet provider as part of his preparations

"I had prepared my gadgets, so I purchased a better phone, and subscribed from an internet service provider..." (P7)

Theme 2. Self-Preparation

After a long lockdown, students have to prepare their selves for the opening of online classes especially for physics classes because they have considered it as one of the most difficult subjects they have and will be taking. Part of the self-preparations of students were reviewing their past lesson which is related to the physics subject they will be taking in the upcoming semester, watch video about the upcoming physics subject and prepared their learning environments to avoid distractions so that they can focus learning. A participant shared:

"Self-preparation, I purchase my laptop, studied my notes and watch different videos that would be needed and is vital for the semester." (P6)

Another participant said:

"...finding place para di madisturbo sir kay dapat conducive and learning space...naga-lantaw sang mga video tutorials even before pagkita ko sang amo ni nga subject sa registration namon..." (P3)

And participant 12 also said that:

"I made something small room in our house that will be conducive for learning."

The participants shared in this study that the preparations are essential in the learning of physics using the online platform. In the study of Arrieta et al., (2020) preparations play a very important role to counter anticipated challenges in an online learning, some of the preparations includes technological resources enhancement, personal and profession development. These preparations are not just for students, but it is also evident in the ends of teachers and parents (Jan, 2020) which is also transpired in this study as the participants mentioned that they have told their parents to provide technological support as they take online classes.

In terms of self-preparations, the participants commonly shared that they have studied their lecture notes, watched video tutorial before classes starts and prepared a conducive learning environment. In an online class, students have this tendency to do advance preparations for their subjects especially the difficult one because they get challenged and cannot just relax knowing that things will not be easy (Gedera, 2014) especially in science courses such as physics. Jan, (2020) also highlighted in his study that learning environment preparations helps students to be motivated and have more focus in studying that's why conducive environment transpired as one of students' preparations.

Theme 3. Challenges in Online Learning

Even before the start of the school year 2020-2021 students have already anticipated the real challenges in this new normal in teaching and learning process some of these challenges are internet connection, and participation. However, it is different when one personally experienced and encountered them. After taking physics subjects in an online class, expected and unexpected challenges arise. The college science students have encountered challenges that can be

addressed on the next semesters as well as returning to a face-to-face instruction. They shared that network issues, topics for real laboratory work, time constraints, lack of motivation, distractions in home environment, and lack of interactions. A participant clearly pointed out:

"In the case of online class sir there are many distractions and also makes it hard to listen too really well when the connection is not that strong, the sound of teacher is choppy that makes you lose interest or motivation because you cannot understand what the teacher is talking...and there are time constraints in answering assessments or asking questions in your mind go away sometimes."

Another participant also shared about the challenge he had encountered regarding time constraints and limited interaction:

"The biggest challenges that I have encountered are the key concepts are very hard to tackle in a very short amount of time and the interaction is limited due to the technological constraints." (P7)

On the conduct of physics laboratory instructions, a participant shared:

"Sa online class kasi, Sir, limited yung interaction, and then yung laboratory hindi ma-handle yung mga equipment, hindi namin ma-grasp ang concepts ng mga lessons efficiently so we have to study again, review again, and research some other resources, Sir." (P5)

In terms of distractions at home while learning, she lamented:

"I study during nighttime when everybody is asleep and then during the day I focus on things like my lessons" (P1').

This pandemic has brought lots of challenges to students and teachers in learning and teaching. It transpired that laboratory activities in a physical classroom can never be replaced by the virtual simulations in an online classroom. In the study conducted by Jan (2020), it was emphasized that the unavailability of actual learning resources and materials affects the learning of the students, it may result to less learning or no learnings at all (Wang, 2020). Distractions at home remains a challenge too because the concentration or focus of the students is affected. According to Shafiei Sarvestani et al., (2019) that in an E-learning environment the surroundings or external factor should be conducive to foster learning. The role of time in learning is very important, according to the study of Blackmont and Major (2020) the more time being allotted to synchronous sessions the better the appreciation and learning of students, it is also imperative that the limited time or time constraints in learning especially in science subjects hinders the continuity of learning. Together with this limited time, the interaction between student-teachers, and student-students become limited. Another challenge that has been encountered is about networks issues, this leads to lack incomplete sessions, misconceptions, dysconnectivity, lack of motivation and even failure (Jan, 2020, Gedera, 2014, Shafiei Sarvestani et al., 2019, and Arrieta et al., 2020).

The challenges that surfaced in this study about the online learning of physics in this time of pandemic just simply explained that this trying time has taught us that every circumstance is unpredictable and we need to be ready to face challenges. Despite the students, teachers and other stakeholders did not have much time to prepare due to sudden outbreak, they still manage somehow and learned that preparation is the key. There is no perfect preparation but we know that every plan is flexible depending on the need and situation, and as teachers this is our primary task in order to cater the needs of our learners in this pandemic. In the part of students, this is an eye opener that they should learn and possess different skills such as critical, problem solving and adaptability to survive to any crisis. Dhawan (2020) highlighted that educational institutions should build resilience systems to ensure that students have those skills to cope with different challenges.

Theme 4. Learning Management and Learning Opportunities

Despite the challenges the students have experienced in these trying times, there is a silver lining in this crisis especially in education. The students have managed and found many opportunities in online learning of physics subject. The college science students perceived online physics learning as flexible and convenient, exploration of more learning resources and ways of learning physics, realizing more opportunities for improvement and maximizing the utilization of technology for learning. A participant shared about availability of resources in the web:

"I can explore the problem through the use of internet...formulas can easily be access through the net and improve my understanding." (P1)

Another participant also said:

"For me sir is that through online class po nama-maximize namin yung different references, we learned po to manage our time and lessons..." (P4)

In terms of perceived opportunities and self-improvement, a student said:

"I discover something about my attitude, I study at night, and I learn to study more, practice more problems and since nasa bahay lang I can google more problems to practice and watch videos in youtube to understand the concepts." (P3')

Another participant also said that online class enables her to become a better version of her and move out from her shell:

"Learning online physics is has a great impact for me Sir, because I have new knowledge where I can move out of my shell, I can learn new things and how I study my lesson." (P5)

Science students considered this online learning of physics as an opportunity to become better version of their selves in terms of technological capabilities, time management and adaptation to the challenges of the times. Face-to-face delivery of instruction for learning is the comfort zone of students as well as of teachers, however, the situation forced them to take road less traveled. Online learning as a road to travel opens lots of opportunities to teachers and students

(Arrieta et al., 2020) to make online teaching and learning better. It may prepare them when the world returns to a better normal that we used to have. Many studies found out that online learning can offer lots of opportunities, which can be observed today as most of the institutions switched to this modality. The stakeholders of education here in the country have been contented and never tried new modes of learning. This pandemic will be a new phase for online learning and will allow the stakeholders to appreciate the good side of e-learning. Educational technology has been taught to education students, and this situation is timely and relevant to let them experience firsthand what EdTech can contribute really and how it is utilized in an online platform to deliver instruction and try to think ways on how to improve the gray areas of the model (Dhawan, 2020)

In the study of Blackmon and Major (2012) students expressed that they perceive online learning as an opportunity to have autonomy in learning, learn to balance their family and personal responsibilities, opportunity to connect and collaborate with other peers which also transpired in this study. Even before the pandemic, there were already actions taken on teaching and learning through online modality, and it is called blended learning. According to Arrieta (2020), it was anticipated that this may be the future of education, and eventually as pandemic came, it forces everyone to do online education. With this, blended learning is foreseen as a new normal in the post CoVid-19 pandemic education because of its flexibility, and it allows us to maximize positive functions of education (Dziuban et al, 2018).

Conclusion

The study revealed that Science students prepared well for physics online classes despite the unknown path they will be traversing. The students prepared personally by improving their technological resources and capabilities, learning area at home and equipped their selves by studying in advance and watching related topics to the subject that they will be taking. Their internet connection must be strengthened by looking for a good signal and service provider, and there are some gadgets that they have purchased, and some upgraded their laptops to meet the requirements of the platform that will be used in virtual learning. In terms of learning environment, they have prepared an area where they cannot be disturbed and distracted when having their classes and focus on learning physics course. The advance studying was also done by the students to be ready and build their schema about the topics of the physics subject that they will be taking. Regarding the challenges in online learning, they said that network issues, limited time for synchronous sessions in a week, lack of motivation, unconducive learning environment at home, and not performing actual laboratory experiments are the main issues they have encountered. To address the challenges, the students said that they change their perspectives into positive, re-reading and accessing different resources from the internet such as simulations, videos that explains the lessons and additional reading materials, and study at night when everybody is as sleep. In spite all struggles of learning physics in an online class the students have seen an opportunity to manage well their learnings and improve oneself by exploring the internet with more ways and resources to learn physics better, an opportunity to improve time management, and be adept to the different technological applications for learning.

Based on the findings, it is implied that science students' preparations really helped them to manage learning the physics course in this new normal set-up. However, despite the preparations there are still challenges that have surfaced like unstable connection, distractions at home and time constraints. The challenges were overcome by the students through adaptation to the learning needs, maximizing available resources online and being optimistic which they perceived as the silver lining of this online class in physics. Thus, the college science students' experiences in this new normal classroom set up will transform them into a better science students and teachers in a real classroom and adapt to the new normal in education after CoVid-19 pandemic is over.

RECOMMENDATIONS

In the future studies, it is recommended to explore the experiences of other students who are not majoring in science and students who are in another school to have a better description of the phenomena being studied.

IMPLICATIONS

This study can be used as a basis by government agencies to continue the online distance learning or flexible learning even in post-pandemic time. Also, this would serve as a guide to the higher education institutions to revisit and improve the current pedagogies and instructional support to address gaps, and maximize learning.

Declarations

I, Justine Mercado, the author declare that I have no competing interest as regards to this preprint posting.

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