Resilient Mechanism in Learning Modern Physics: A Grounded Theory

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Method Article

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Abstract

Higher Education Institutions shifted from the traditional face-to-face delivery of instruction to online classes to cope with the situation we are in right now, the global pandemic COVID-19. This shift in the educational landscape sustains the continuity of the teaching and learning process, and this change led the students to new experiences and perceptions towards learning Physics. This qualitative study used Active Interviewing and followed a Straussian grounded theory design to collect and code interview data to identify emergent themes and generate a theory. The research participants exposed four emergent themes and the main category regarding their experiences and perceptions in Learning Modern Physics in an Online Class. "Students' Resilient Mechanism in Learning Modern Physics" emerged as the core category, and the entailedfour4 essential themes were: (1) Positive Outlook towards Learning Modern Physics Online, (2) Challenge to Overcome, (3) Efforts to address challenges, and (4) Adaptation to the online learning of Modern Physics. The grounded theory of Positivity-Persistence-Adaptation: Students' Resilient Mechanism in learning modern physics in the new normal of delivering instruction reveals that in this trying time, students are trying to be optimistic towards learning (Positivity), manage to adapt to changes and challenges (Adaptation) and keep the determination in this trying time to sustain and continue learning during this time of pandemic (Persistence). In summary, the theory highlights students' positive attitudes as they continue the quest to learn modern physics in this new normal educational setup. Students' persistence towards learning in this time of pandemic is very important since this is a propelling mechanism that will enable learners to succeed in their learning and studies despite the challenges they are facing.

Introduction

The growth of online learning has increased drastically due to the COVID-19 pandemic caused by the virus SARS-COV-2. This has challenged the educational system across the world and forced higher education institutions (HEIs) to shift from traditional pedagogical methods to online teaching-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 safety of the students (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 (Arrieta et al., 2020). 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 perceptions towards education, especially in science education.

Science education, mainly physics education, is found to be more interesting, easier to understand, and enjoyable when done with technology integration such as simulations, video demonstration, and gamification (Alegre, 2012). In the Philippines, premier universities are trying to incorporate many laboratory activities into online applications and computer-based data gathering and interpretation (Mercado, 2020). Despite the exponential growth and interest in online learning, e-learning, and computer-aided instructions, 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 student who took online distance learning experienced connectivity loss, instructor inaccessibility, autonomy in learning, and lesser peer interaction. On the other hand, online learning affects students' academic performances 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, students' attitudes and perceptions towards online learning are very unpredictable and many possible undesirable habits may be manifested by students and so it must be explored especially in learning Physics.

Classes for 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 learning of Physics using the online platforms.

Related Literature

Science and science education is one of the most important subject areas in the secondary and tertiary level due to its significance and 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 allows students especially science majors to generate ideas, weigh decision intelligently and understand the concepts and theory behind a 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 particularly Physics education is about teaching learning that involves

students in 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 in to the outside or classroom premises. Through this exposures of students to the outside world and performing laboratory experimentations students can apply and better grasp the concepts of physics (Mercado, 2020). However in this time of pandemic these exposures to outside world and actual laboratory experimentation were not allowed as per advised by CHED and also this is also a safety measure of the institutions to protect their student and employees to be exposed and infected by the SARS-COV-2 virus. Hence, the conduct of the physics classes and Science classes in general were 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 lots of issues in the delivery of instruction such as geographical remoteness, limited offering by institutions, and complex lives of students (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) online learning environment can offer students lots of opportunities for flexibility, collaboration and interaction that is way different from face-to-face learning environment. Also, it uses educational technologies to design, deliver, manage learning and knowledge imparting at any time 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 access of students to this type of learning? These questions are very 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, sentiment and perceptions of students must be identified so that necessary improvements can be done (Rodriguez et al., 2008). Students' perceptions about online learning were not all positive, according to Janet et al. (2005) online

learning causes inadequate human interaction that is needed to establish peer support, deeper discussion on 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.

The uncertainties about the effects of online learning to students' perceptions towards modern physics motivated the researcher to develop a theory that would help educators and students to be guided on how physics teaching learning in general should be done, enhanced and become meaningful despite the situation we are currently.

Statement Of Objectives

This study aims to generate a theory on how students learn modern physics in an online class that transpired on (1) students' perception and experiences, (2) Challenges and coping mechanism in studying modern physics in the new normal educational setting.

Research Design: Grounded theory

Glalsserian Grounded theory approach is a type of qualitative method that will be used in this study to gain insights from the phenomenon and conceptualize the social patter and structure through the process of constant comparison (Scott, 2009) in order for the researcher to generate a theory on the experience and perceptions of students in learning modern physics online.

Figure 1 shows the inductive process of theory generation from the study of Abadiano (2014). It works the other way around from the observations to the generalized concept and theory. Inductive method is sometimes called as "bottom up" reasoning were we begin with specific observations, then detect the patterns and commonalities, after which tentative hypothesis were formulated then a generalized conclusion or theory will be generated.

Research Environment

The study will be conducted at Notre Dame of Marbel University which is located at Alunan Avenue, Zone III, Koronadal City South Cotabato. Notre Dame of Marbel University is one of the Premier schools in Mindanao. The University was founded by the Marist Brothers in the year 1945. NDMU is an institution with center of excellence in education, engineering and accountancy. The study will focused in

the College of Education because this is the department where the participants belong and will be benefiting from the research findings.

Research Participants/Informants

The participant of the research will be the third year BSED Science students who are taking EDSCI 128 course (Modern Physics) and they are chosen purposively. The selection criteria were as follows: (1) He/She should be enrolled in college of Education under BSED science program. (2) He/She must be a third year BSED Science students and taking Modern Physics. (3) He/she must be attending or opted to have an online distance learning for synchronous sessions.

Research Sampling

Six (6) participants will be interviewed for the study. It only utilizes 6 students because there are only six students who enrolled in Online Distance learning for Modern Physics course. However, data saturation will also be considered in determining the total number of informants in this study.

Research Instrument

Experts in educational management, curriculum and assessment will be asked to validate the semi structured in-depth interview guide. After the validation process the researcher will modify necessary changes if there's any from the validators. The validated interview guide will be tested through other BSED science students who were not enrolled in modern physics but taking physics courses through online distance learning.

Data Gathering

Data Collection: The researcher will be conducting a semi-structured interview with the six (6) BSED Science 3 students of College of Education, Notre Dame of Marbel University. Some participants were

contacted through online platforms and social media. All the participants were briefed about the purpose of the study and written informed consents will be solicited for their participation and asking permission to use an audio/video recorder to record the interview more accurately. Using their answers and feedback, the researcher will transcribe, the perform the triadic coding (Open, Axial and Selective) by Strauss and Corbin (1990).

Coding and Categorizing Data: In this part, the researcher will listen to all the transcription from the audiotapes several times before the transcription to be more immersed and be able to capture the meanings the participants wanted to convey. Then, line by line reading of transcripts will be done immediately after the initial interview with the participants. Codes will be constructed regarding the concepts related to Modern Physics learning through online platforms, then concepts will be classified whether they were similar or not. After which, themes will be formulated through the progress of line-by-line codings and integration of sub-categories by the use of constant comparison, modification and analysis of concepts.

Theoretical Sampling, Constant Comparison: During this part of research, the interview is guided based on developed concepts, and sub-categories from the preliminary findings of the gathered data of experience and perceptions of students in learning modern physics in an online modality. Participant sampling was directed by emerging constructs and categories. Throughout the data gathering and analysis period, emerging categories or themes were constantly compared with each other, similar concepts were integrated and contrasting categories will be further explored until the identification of solid concepts related to the study (Irene and Abadiano, 2017).

As cited by Abadiano (2014) from the study of (Duchscher and Morgan, 2004), Constant comparative analysis was the primary strategy in the integrated coding and analyzing stages of grounded theory. The goal was to clarify concepts and test hypotheses derived from the data while producing precise descriptions (Jeon, 2004). The making of constant comparisons during data analysis and collection, and theoretical sampling occurred simultaneously in order to ensure that the researcher could actually construct a theory that was grounded in the data (Jeon, 2004).

Memo Writing: In this phase, the researcher will start to write memo, reflections, analysis of the initial interview and will continue until the theory generation period. The researcher will take down his analysis on relationship, variation, links between basic concepts, codes and categories, as well as observations, the investigator's own logic. Also, critical analysis and reflection on categories, the process of integrating the concepts, emerging theoretical categories and core category in the memo. This is very important in

grounded theory because through this memo writing the investigator can express his observations, reflections, remarks, his own ideas, rationale, and evaluation on a certain phenomena in the entire duration of the study. Memo writing is critical in doing grounded theory studies and it should not be missed by the researcher before proceeding to theoretical writing, because if it was missed out doubts/questions on the validity would naturally surface.

In this research, the researcher will use memos as reference to the concepts that will emerge from coding and constant comparative analysis of data, selection of number of participants for theoretical sample, development of a focused interview questionnaire for the theoretical sampling, matching of sub-categories and contrast categories to develop theoretical categories and core category, and validate these categories of the study phenomena. According to Glaser (1978) without memo writing in doing grounded theory is not grounded theory approach.

Theoretical Sensitivity: It will be assumed in this preliminary theory generation process that the study of the phenomenon is presented by empirical evidence through interview and observations directly from study participants. Data will be analyzed, coded, categorized into emerging themes, by the use of field notes, and writing memos of experiences and perception of students in learning modern physics throughout the data collection process and through the review of related literature.

According to Glaser (1992) as cited by Abadiano (2014) in his study that, theoretical sensitivity refers to the researcher's knowledge, understanding, and skill, which foster his or her generation of categories and properties and increase his or her ability to relate them into hypotheses, and to further integrate the hypotheses, according to emergent theoretical codes. Glaser believed that theoretical sensitivity is attained through immersion in the data, line by line, comparison by comparison, memo by memo, and code by code (Walker & Myrick, 2006).

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.

Rigor of the Study: In this study the researcher secure the validity and rigor of the study by selecting the informants according to the criteria, let experts validate the research in-depth interview guide to assure that the questions are align to the purpose of the study and following the step-by-step procedures in analyzing the data.

Data Analysis

There are various and distinct analysis design to uphold the "groundedness" of the grounded theory approach. Davidson (20021) as cited by Alicamen (2020), explained that the collection and analysis are deliberately intertwined, and primary analysis of data is used to create a profile of the ongoing data collection. Combining the data collection and analysis are believed to magnify the insights and elaborate the emerging theory by asking questions that would lead to the real phenomenon relevant to the participants. Moreover, collected data were evaluated by incorporating various techniques of coding. In analyzing data for grounded theory, coding is defined as a method of conceptual abstraction by assigning broad ideas (codes) to a particular occurrence in the collected data (Kaiser and Presmeg (2019).

According to Charmaz (2006) coding and constant comparative technique are vital and critical in unearthing grounded theory. Glaser and Strauss (1967) define constant comparative techniques as the continuous and inductive way of determining whether the data is saturated or not by constant recoding. Kolb (2012) as cited by Alicamen (2020) there are 4 different activities involved in constant comparative technique namely, first, evaluating incidents similar to each category. Secondly, incorporating categories and their characteristic. Third is defining and delimiting emergent theory, and lastly, crafting the theory. These different activities are very important to unveil and extract authentic data in a form of statements, themes and eventually uncover the theory.

There are three types of coding process that are necessary to establish a grounded theory: open, axial and selective coding (Strauss and Corbin, 1990). Open coding was used to extract and reduced the information into a smaller fragment while comparing and noting the similarities and differences of the data and similar data were given the same code (Alicamen, 2020). Another purpose of the open coding is to determine the saturation point of the data (Strauss and Corbin, 1990). When the data is rich, axial coding was done. Kaiser and Presmeg (2019) stated that axial coding is the process of interrelating concepts and categories. This second phase of coding is essential to examine and explore the relatedness between and among the categories to formulate the connection between them. During the axial coding sub themes/ categories are identified in order to come up with the core category (Strauss, 1987). Lastly, selective coding was done. From the funneled and refine sub-categories, the core category was identified that reflect the overall phenomenon being studied. After this the researcher was able to distinguish the chief phenomenon of the study and can finally answer the research questions and grounded theory will emerge which emanated from the raw data that undergone rigorous analysis and interpretation (Straus, 1987; LaRossa, 2005; Alicamen, 2020; Vollstedt, 2015).

Results And Discussion

After the thorough analysis of the data, the core category that emerged was Students' Resilient Mechanism in the online learning of physics. There are four themes that transpired in this study, namely:

Theme 1: Positive outlook in Learning Modern Physics Online

Theme 2: Challenges to overcome in online learning

Theme 3: Efforts to address challenges of learning Modern Physics Online

Theme 4: Adaptation to the Online Learning of Modern Physics

Out of these themes, propositions were formulated. After the formulation of propositions, hypotheses were derived from it. Then, for each theme, thorough discussions were extensively written.

Theme 1: Positive outlook in Learning Modern Physics Online

In the study of Blackmon and Major (2012), students have more positive experience when they are involved and felt sense of responsibility for their learning outcomes. In this study, students shared that they have the autonomy in learning, and they have the wide access to different resources which make them realized that learning in an online physics class is part of their responsibility and not just on the instructors' duty. Gedera (2014) also found out that experiences of students in a virtual classroom are perceived to be more positive despite the challenges that technology brought in a virtual classroom. As a matter of fact, challenges were perceived positively by the students which propels them to learn more and see the brighter side of learning physics online. Furthermore, in the study of Lauran et al. (2014) the flexibility of learning in online class which means learning can take place anytime, anywhere and according on one's pace were the characteristics that the students like about learning physics online. Because of these, students developed this optimistic view about learning modern physics online.

In this section, statements of the participants regarding their positive outlook towards learning modern physics being enjoyable and fun are presented.

I always find it fun to do even though it comes difficult stage or easy stage. In learning modern physics online bad internet connection is the main factor that changes it all." P1

"I enjoy re-watching our recorded session and also watching YouTube videos where I can know more about the topic." P4

"Learning modern physics online was hard and fulfilling at the same time. Pero enjoyable naman sya dahil you get a chance to learn extensively physics not just depending on the content provided by the teacher but it will drive you to study hard even more. Ninais ko na tanawin ito positively and opportunity to learn." P5

Some participants commented that they see modern physics online learning to be flexible and a learning opportunity.

"I perceived learning modern physics online as same with the face to face…modern physics online made me be more flexible to any learning situations. It opened a lot of opportunities where I can learn in any spaces and use any tools online for understanding the subject." P2

"It does make you resilient over the course of time at the same time develop your positive outlook as you look at to learning each day. New environment makes new challenges, and these challenges are opportunities to improve." P1

Proposition: Students demonstrated optimism despite the inevitable situation of learning modality in this new normal to carry on science learning

Hypothesis: Positive outlook towards the inevitable situation of learning modern physics online is vital for learning continuity of students.

Themes 2 & 3: Challenges to overcome in online Learning & Efforts to address challenges of learning Modern Physics Online

Science learning in a virtual platform presents challenges that would either help student to be better or the other way around. Challenges such as network issues, time constraints, distractions at home and difficulty of topics were shared by the participants of this study. Amidst the challenges in learning modern physics online, the students took actions to ensure learning continuity and have a better conceptual understanding of physics knowing that it is not an easy subject. Some of the efforts that the students have done were watching YouTube, using simulations, familiarizing technology, and thinking positively. In the study of Scalise et al., (2011) the use of simulations in science learning helps students to grasp better the concepts and improve students' interest towards science. Watching YouTube video is part of students' effort to overcome challenges in learning modern physics, according to Koto (2020) YouTube videos are effective for science learning as long as selection of video is done carefully to ensure factual, procedural and conceptual change. Other prevailing challenges such as network issue and distractions at home we minimized by subscribing to network providers and preparing a room for online learning at home.

In the study of Rannastu-Avalos (2020) teachers encountered challenges such as technological manipulation and management of students in an online class, because of this it is important also for the students to do their part and take actions toward the challenges that surfaces along learning modern physics to foster collaboration and better learning management. Similarly, Blackmon and Major (2012) found out that students taking part in their learning as an aid to the lacking actions of the institutions helps develop positivity to the learners. Thus, students have demonstrated initiatives to overcome challenges in order to continue learning in this time of pandemic. The participants have shared the efforts in learning modern physics through an online class:

"It limits me learning applications like laboratory. YouTube and laboratory simulations aided me in our lab works." P3

"I treat the online learning *in modern physics as an opportunity to train myself in adapting to situations that are out of control…I familiarize myself and improve my digital media and technology literacy skills. Also, I perceived learning modern physics online as a challenge to overcome." P6*

"I complied to the requirements as needed such as internet connection. I made the requirement materials such as quizzes and problem sets as fast as I can in order to catch with the deadline…I did my best to focus on listening to the lesson." P1

Participants also shared the following challenges they have encountered of which efforts are made to overcome them to ensure learning continuity:

"Internally, procrastinations, and distractions are the first obstacle that I have difficulties to overtake. Externally, internet connection, in between class demands from my family and background noises." P2

"I experienced lack of time to understand the topics clearly during the synchronous classes. Also, there are some issues in the connectivity to the internet." P4

"One of the challenges I experienced in learning modern physics are difficult topics…" P5

"A major challenge I encountered is the unstable connection…another is time constraints as you a lot at least 5 minutes into the submission…" P1

Proposition: Students taking actions towards the prevailing challenges of online science learning are most likely to continue learning.

Hypothesis: The efforts of students to address challenges in learning modern physics will enable them to pursue and attend online classes.

Theme 4: Adaptation to the Online Learning of Modern Physics

Despite the presented challenges of the pandemic, the students who were taking modern physics in an online class saw a silver lining that help them adapt with the situation where they are in. Adaptation to institutions involves both cognitive and social adaptation (Akcinar, 2013). In this case students have manifested cognitive adaptation by enhancing their knowledge about the lessons of modern physics as well as improving their technological skills to be adept with the technology being used in online learning. Students who have adapted cognitively tends to learn better and use effectively resources present in the online platforms although there some negative effects (Plowman et al., 2009). Some studies suggest that institutions who opted to have online distance learning should focus on the "what, where and how" of the learning process (Zhao, 2020). It is important for the learners to adapt well to the new normal of education because it is one of the most effective approach next to face-to-face to facilitate and deliver instruction to children.

Student in this study have responded that they really have adapted to the new environment and these adaptation mechanisms have allowed them to formulate learning techniques, learning management, maximized online resources, and perceiving the online situation in a positive way. Thus, students have cope with the situation and acknowledge that they have to thrive to survive and carry-on learning. Some of the participants have shared on how they have adapted to the situation:

"These kind of experiences and challenges allowed me to aim to be better at my learning techniques. Adjusting to the new environment needed better time management and learning online accelerated the time for adjusting so I was barely able to catch up." P1

"I responded to the demands of learning physics in an online class the same as face-to-face." P2

"Online platforms taught me something that I cannot actually learn during face-to-face. I became knowledgeable in terms of maximizing technological resources. I had no choice actually but to always look at the positive side, this optimism and resiliency enable me to learn new things and be flexible." P3

"I treat the online learning *in modern physics as an opportunity to train myself in adapting to situations that are out pf control…I familiarize myself and improve my digital media and technology literacy skills. Also, I perceived learning modern physics online as a challenge to overcome. We bought a wifi router, a computer, and load every week as a respond to the demands of online class. I also prepared different sim cards in order to have a stable connection if one service provider is down…" P6*

"It helped me develop my intrinsic motivation…it helped me examine myself and to what extent am I knowledgeable of this." P5

"I studied ahead some of the topics that I may encounter throughout the class. It challenged me a lot knowing that this will be mostly learned independently…I also found ways and means to know about different resources which I can utilize to understand the topic clearly." P4

Proposition: Students manifested coping mechanisms to learn modern physics better and more efficient in this new normal of teaching.

Hypothesis: Students' adaptation to the online learning of modern physics enables them to maximize learning resources and unleash one's potentials.

Theory Generation:

In studying the learning experiences of students in an online modern physics class, Students' Resilient Mechanism emerged as a core category. From the interview responses of the participants the following transpired as they learn modern physics in a virtual flatform such as positive outlook in learning modern physics, challenges to over-come, efforts to address challenges of learning modern physics, and

adaptation to the online learning of modern physics. After the rigorous analysis of the data, the students' experiences in online modern physics class were described as follows:

When the pandemic hit the country and forced the higher education institutions to close and eventually led to this online distance learning, teachers, parents and students has been shocked due this unexpected paradigm shift. This sudden change in the educational set up have brought so much pressure to the stakeholders especially to students because they will be traversing an unknown path of this online learning. Since students doesn't know what waits for them in this unknown path, they did some preparations to be equipped to whatever circumstance will occur. Because of these preparations the students don't feel much burden in learning modern physics online. Since they feel less pressure, they enjoyed learning modern physics despite the challenges that they encountered. While learning modern physics they have realized the positive or the advantages of learning modern physics online such as watching YouTube to deepen the understanding, recorded sessions can be replay and changed their perspective towards physics learning and become optimistic **(Theme 1)**. Despite the preparations there are some challenges that would surface along the way. However, students perceived learning modern physics positively, and take it as a challenge to be over-come **(Theme 2)**. So, they take actions to address the different challenges in order to foster learning continuity in this trying times **(Theme 3).** Moreover, students' initiatives and positivism helped them to manifest adaptation amid the adversities of this new normal in education. Initiative such as advance studying, maximizing online resources, technological skills enhancement, setting goals and self-motivation lead students to be adaptive to the situation and fulfill their role as learners that seeks excellence in this time of pandemic **(Theme 4).**

Mercado's theory simply states that positivity, persistence and adaptation are considered to be the college science students' resilient mechanisms for them to successfully learn modern physics by the use of virtual classroom or learning environment. Being an online modern physics student, one should make look the better side of the learning process and enjoy every lesson or task (positivity), subsequently, when there are challenges, or hindrances that would surface along the process of learning one must take action, be determined and have eagerness to address the different issues (Persistence), and to cope with the situation despite the adversities (adaptation) are essential to continue and survive online physics classes. Thus, the theory highlights the resilience of the students in taking modern physics subject through online class in this new normal set up of education.

Hypotheses for Validation:

The main purpose of this study is to explore the experience of students in learning modern physics through online class. Below are the hypotheses that needs to be validated in the future research endeavors:

1. Positive outlook of students in online learning of physics subjects motivates students to continue learning.
2. Students who are learning physics subjects through virtual classrooms take actions to overcome challenges.
3. Students' adaptation is driven by optimism and perseverance in learning physics.

Declarations

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

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Figures

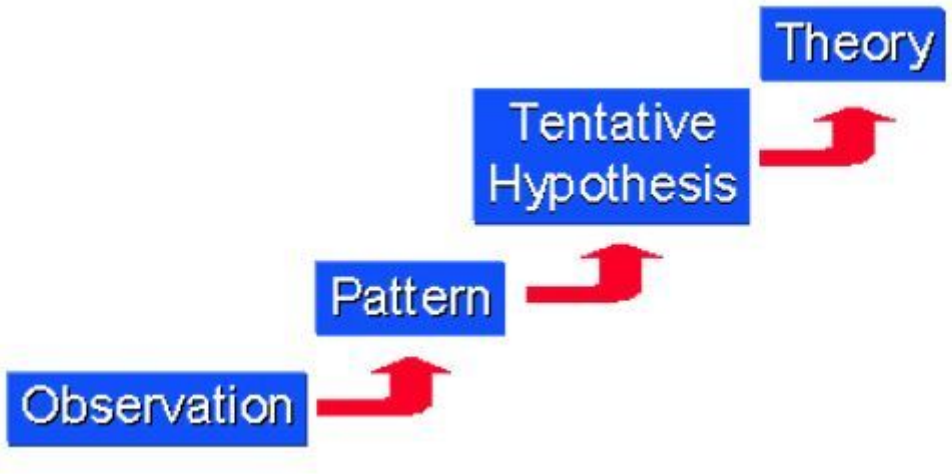

Figure 1

Inductive Process of Theory Generation