



Integration of Virtual Laboratories in eLearning: Enhancing Science Education amidst COVID-19 Pandemic



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Abstract

The effectiveness of virtual laboratories during the new normal education is a great challenge for both educators and students which indicates that education must continue amidst the health crisis. The study determined the experiences of eight Bachelor of Secondary Education major in Science students of the Bukidnon State University, College of Education, in virtual laboratory activities amid the COVID-19 pandemic during the academic year 2020-2021. This qualitative action research utilized a descriptive phenomenological research approach of Husserl since it deals with the experiences of the learners in science-related activities. The open-ended questions were adapted and modified from the study of Reece (2015). It collected data through interviews via an Online Platform. The researchers analyzed the response of the students to come up with generalizations regarding their learning experiences when engaging virtual laboratory using qualitative descriptions by utilizing themes and frames. The study identified six emerging themes from the data such as learner autonomy, preparation required for lab activities, evidence of student learning, presentation, collaboration, and motivation to learn science. More so, a virtual laboratory is safe, provides alternative space, allows to save time, and it saves money for both teachers and students. Immensely, it allows students to explore online simulations. Integration of virtual laboratory is a strategic way of promoting a conducive learning environment to fill the gaps in students' learning despite the pandemic. Hence, it offers a constructive and versatile learning environment which made them realized the importance of Science and Technology and its essential role in advancing a safer community.

Keywords: COVID-19 pandemic, eLearning, new normal education, science education, students' experiences, virtual laboratory

Introduction

COVID-19 pandemic brought a great crisis around the world; its potent impact negatively influences the economic aspect of every country around the globe. In the Philippines, the government had not declared a temporary academic freeze despite the COVID-19 pandemic. With a great challenge, the State continues to move forward and embrace the flexible learning system to give opportunities to the learners, particularly to the college students, to learn during the new normal. By utilizing the most accessible technology, such as the internet, educators find it efficient to create a virtual classroom environment. Students can safely communicate with each other, and teachers can easily provide learning materials and give specific instructions to the learners. Moreover, laboratory activities can also be conducted by the students virtually.

Virtual laboratory activities are very common to college students who took courses in line with scientific fields such as Biology, Chemistry, and Physics. Conducting virtual laboratory activities is rarely done in some of the schools in the Philippines. For this reason, students are still in the process of adopting the new type of learning system. According to Oclarit (2017), a major concern in many schools is that their science laboratories lack essential equipment, which hinders the teacher and students' ability to do any laboratory activity. Similarly, using simulation programs or virtual laboratories, the students perform and comprehend the experiment on the computer as it promotes security, time, and cost. Furthermore, no study proves the effectiveness of conducting virtual laboratory activities. As cited by Lampi (2013), the debate over the efficiency of integrating virtual laboratory activities about the students' development of practical skills remains unresolved. Therefore, experts consider further evaluation of the different educational simulations to prove their effectiveness to the learners. Science is everywhere, and it means a lot about how the world is changing right now with the emergence of modern technologies.

The main purpose of this study is to discover more about the students' learning experiences upon engaging in virtual laboratory activities to enhance science education during the new normal in Bukidnon State University, Malaybalay City, Bukidnon, Philippines. Since this platform is new to the participants, their reaction and their coping mechanism with the said new learning was determined. This also aims to know the adjustments and barriers of the participants when engaging and in entering the virtual laboratory activities, whether the effectiveness of virtual laboratory triggers their eagerness to learn despite the barriers and situation. This aims to engage students in a new type of learning and to let them explore with the help of technology, and to be able to still collaborate with other learners who are far away amid the current situation.

Methodology

This qualitative action research utilized a descriptive phenomenological research approach of Husserl since it deals with the experiences of the learners in doing virtual laboratory activities. The goal of Husserl's descriptive phenomenology was to determine the significance of a person's lived experiences or to extract meaning from their daily lives (Barrow, 2017). The study was conducted at Bukidnon State University, Fortich Street, Malaybalay City, during the second semester, the school year 2020-2021.

The participants of the study were the 8 Bachelor of Secondary Education (BSE) major in Science students of Bukidnon State University (BukSU), specifically the second year and third-year students who were purposively selected. The participants are the most suitable source of data because they have more experience and exposure towards physical lab and virtual laboratory.

The researchers obtained an approval letter from the Chairperson of the Bachelor of Secondary Education (BSEd) to conduct the research study successfully. Then, the researchers asked to consent to the research participants to be part of the research study. A semi-structured interview with the participants was done through video conference in the Google meeting. The video interview was conducted, recorded, and kept with the utmost confidentiality.

The study used the six steps of analyzing phenomenological data: transcriptions, organizing the data, coding, deducing categories, identifying common themes, and making interpretations, and maintaining a reflective journal (SAGE Research Methods Datasets, 2019).

RESULTS & DISCUSSION

Six Identified Themes:

Theme 1: Learner Autonomy

The theme of learner autonomy is all about the academic subjects, impact of science classes, and participation on extracurricular activities of the students. The participants have science subjects such as Physics, Biology, and Chemistry in general with virtual laboratory activities. The responses showed that the impact of science classes on the students differ from each other, wherein most of the participants shared that learning science subjects is dynamic in which they can use their learnings in the actual setting of life. Despite the pandemic we are facing right now, these participants were able to use their prior knowledge in dealing with virtual lab that helps in widening their understanding with science related subjects and have an active participation to varied community services.

Theme 2: Preparation required for lab activities

In taking virtual labs, the participants are affected by the current situation because they found it hard to complete every task since there are a lot of disturbances, most especially the unstable internet connection, and limited resources. More so, despite those challenges, students were able to overcome and understand that the process of taking virtual lab is a step-by-step process. It needs accurate and clear virtual lab instructions and other references such as from YouTube-inspired video demonstrations to make those tasks easier for them. Unlike the actual laboratory activity, doing virtual laboratory activities does not require many laboratories apparatus and instruments. The participants stated that they only need their laptop, notebook, ballpen, a comfortable place, and the most important thing is to have a stable internet connection. The activity does not require any laboratory equipment knowing that most of the processes are done virtually. The learners have limited materials to be used in their DIY models which makes them realize that learning science concepts is still possible and can be learned during the pandemic in order to continue in learning science.

Theme 3: Evidence of student learning

In terms of providing authentic learning experiences, the study suggested that a virtual laboratory is a student-centered learning environment because it allows the learners to learn independently as effectively as possible. Due to the direct instructions of the teachers online, giving only the students the most relevant guide and related references for their activities, students are being encouraged to be resourceful and creative. The learners can easily visualize the activities such as the kinds of tissues in the body in virtual laboratories because there are detailed images like the microscopic views, and since virtual lab has an attractive format which includes the graphics and set up, just like the features in the PHET Simulations and making of bamboo resonance speaker at home. Learners also acquired the value of being patient, particularly when they experience having trouble with their internet connection. Their accomplished practical performances proves that through the integration of virtual laboratories can be a way to enhance science education amid the pandemic.

Theme 4: Presentation

Another theme which is presentation, signifies on how students utilized the different digital learning platforms. The participants do their presentation after the virtual lab by utilizing online learning platforms such as graphic presentations, answering questions in Google forms, making video presentations, and writing a reflection which will assess every student for the things they have learned throughout the lessons. The study suggested that after conducting virtual laboratory activities, assessment and evaluation towards the students is important to know if the whole process in teaching and the strategy used by the teachers are appropriate to the needs of the students. Thus, the virtual laboratory can give ample chances for the students to understand every concept and improve their capacity as a student especially in learning science and become better after the assessment conducted by their teachers.

Theme 5: Collaboration

With this identified theme, it explains how students were able to manage in connecting with others, student's perceptions towards the integration of virtual lab for instruction and student's engagement in learning science. In the time of health crisis, participants could connect with other people virtually using different social media platforms and personally with their families. It indicates that connecting with others to ask for assistance and moral support can influence the learners' motivation to learn. There is a collaboration with their peers as it promotes camaraderie in the midst of the health downfall. Students were able to value the importance of teamwork in order to learn as a whole and not being forced to become selfish, as virtual laboratories could develop leadership among the students and improve science education.

Theme 6: Motivation to learn science

The last theme depicts the positive implications of virtual lab to the students, satisfaction and reaction of the students when dealing with virtual laboratories and its connection to their course. The statements of the participants showed that virtual lab offers a lot of positive vibes to the learners, even if it was hard for them to adjust in the urgent shift of learning. In general, the participants believe that virtual lab is fun, and they are enjoying it. Similarly, students are gaining additional insights while performing their task because they found it interesting. The positive impact of the student's experiences in the virtual lab can greatly influence their motivation to discover more about science. Thus, virtual laboratory activities also underpin different teaching strategies, student-centered activities, and virtual collaborative activities that will lead in enhancing science education despite the current situation.



CONCLUSION

This study revealed the learning experiences of the BSE-Science students in the virtual laboratory during the new normal and identified the six emerging themes such as learner autonomy, preparation required for lab activities, evidence of student learning, presentation, collaboration, and motivation to learn science. Science subjects impacted a big part in their learning experiences and students gained additional insights wherein it triggers their interest in dealing with science. Moreover, the participants do prefer collaborative work compared to work independently in each task where they can express their thoughts towards their groupmates effectively. In this time of the pandemic, the virtual lab is more essential; it was safer compared to face-to-face and recognized as an alternative learning platform for the students, particularly for them to explore a new type of learning, appreciate online tools and simulations.

This may imply that the learning experiences of the Science major students have been proven that it is hard for some learners. By that, the teachers may incorporate ample video resources into their Google classroom which are accessible for all, to ease the difficulty and doubts of the students in various virtual laboratories in the new normal. These findings suggest that orientation and integration of the virtual laboratories as an effective and safe strategy in delivering the different concepts of science may be encouraged by administrators and embraced by educators to continue the learning of the students and could enhance science education amid the current situation. Additional pre-recorded demonstrations of the teachers in every experiment must be also taken into consideration because there are students who don't have a stable internet connection and the resources in their homes are limited.

Further research could be conducted using other types of research it may be triangulation, correlational or quasi-experimental research design and enhance the number of the participants to explore the bigger scope of the learning experiences of the students in the virtual laboratory during the new normal.

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