

AUGMENTED REALITY: AN IMMERSIVE TECHNOLOGY TO ENHANCE SCIENCE TEACHING

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Abstract

Augmented Reality is the integration of physical world into virtual environment while Google Lens allows the quick-scan of information through a smartphone's camera. With the demand of 21st century and the advancements of technologies, education must evolve and should not be left behind. Google Lens is widely utilized to gather information and there were existing data on utilization of it in plants recognition. However, there were insufficient studies showing its effectiveness in enhancing student's academic performance in science education leading to the conduct of this study. This study aimed to thoroughly investigate the principles and applications of augmented reality in studying ecosystem, with a specific focus on its integration into the development of lesson exemplar in science. Quasi-experimental, mixed method design was used to gather data where a total of 36 learners as the participants of the study, 50% of students were assigned to experimental group and the same number of students in the control group. The findings showed that statistically, there is no significant difference between the post-test scores of the control and experimental groups after the intervention however, there is a minimal effect on student's academic performance. Students' experiences using augmented reality encompasses on utilizing Google Lens that helps them deepen their understanding of the ecosystem. On the other hand, it fosters collaborative learning between the teacher and the learners in the actual classroom setting. Google Lens has a minimal effect as intervention in learning ecosystem but can enhance student's performance with proper utilization and teacher's guidance.

Keywords: Augmented Reality, Ecosystem, Google Lens, Science education.

INTRODUCTION

Background of the Study

Augmented Reality (AR) is a technology that offers enhancement of the real-world through extends digital elements, sounds, and other information to the physical environment. These enhancements are ultimately achieved through different devices including smartphones, and other smart devices.

AR as a technology overlays virtual objects (augmented constituents) into the real world. AR as a technology that superimposes a computer-produced portrayal on a user's outlook of the real world and, therefore, shows a composite (Oxford Dictionary, 2023). AR is a computer-generated 3D environment that allows the user to communicate in virtual environment (Silva, R.; Oliveira, J.C.; Giraldi, G.A., 2003). In other words, the person utilizing the computer has the ability to "immerse" themselves in the artificial environment, which could be a simulation of a complicated phenomenon or a simulation of reality. With a lot of AR nowadays, one commonly and widely used is the Google Lens. It is a photo recognition technology in identifying objects and provide information using Google Search. Google Lens identify texts, artworks, and other features matches to the object being searched. It can be used through phone's camera to capture real-life objects (Emberton et. al., 2019).

The word “eco” means a part of the world while “system” refers to correlating units. Both living organisms and its surrounding function together as a single unit and this unit is called the “ecosystem”. Ecosystem is a natural coordination of life and the environment where life is referred to as biotic component which includes plants, animals, and all living organisms (Murray, 2018).

Furthermore, the integration of augmented reality specifically the Google Lens into the ecosystem offers additional information for students and teachers in the virtual and physical world of learning. It enhances the motivation and academic performance of students.

This research study focuses on the application integration of augmented reality in the teaching and learning process where teachers are able to create a lesson exemplar and students are expected to acquire information about the topic and improve their academic performance with the use of Google Lens, an augmented reality application.

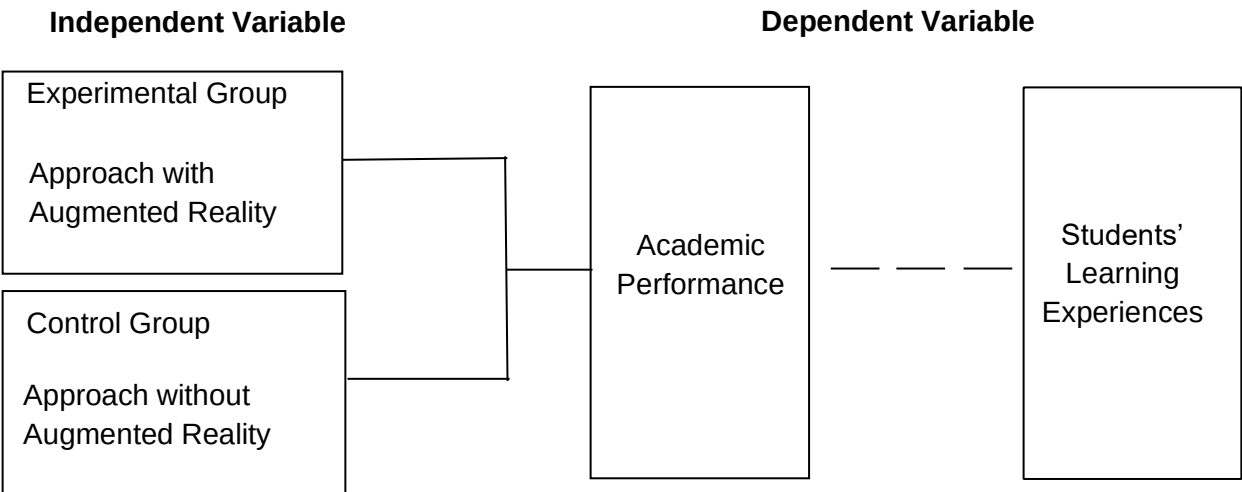
This research study focuses on interactive and meaningful teaching and learning, which are essential for ensuring optimal effectiveness. With these methods, students are actively engaged in the learning process, resulting in the understanding of the material. By prioritizing interactive and meaningful teaching, it can create a more dynamic and effective learning experience for students.

Significance of the Study

The result of this study is beneficial to the following persons:

This study may help high school learners understand ecosystems through augmented reality in science learning. For pre-service teachers, it can foster a dynamic and engaging classroom environment that encourages active student participation and collaboration. Science teachers may benefit by improving educational and learning materials using augmented reality in Science Education. School administrators can utilize the insights from this study to design programs and policies that promote the use of augmented reality in teaching, thereby fostering a more effective and innovative learning environment. Curriculum developers may also find this study valuable in enhancing the curriculum guide and supporting teachers in creating a more interactive and engaging learning experience for students. Lastly, future researchers may use this study as a credible and significant reference for their future studies.

Conceptual Framework
Theoretical Framework



This study is anchored to Connectivism Learning Theory of George Siemens and Stephen Downes in 2005. In *Connectivism: A Learning Theory for digital Age*, Siemens outlines what he sees as a pedagogy that truly aligns with the technology available to educators. To him, traditional pedagogies are components within connectivism, but he believes that only connectivism has enough distinct differences from other.

Connectivism starts when an individual relies to a digital technology to solve a problem. This may include, googling a question, sending a text message to a friend, or browsing social media contents. Connectivism Learning Theory highlights the use of digital technology in helping to solve a problem and deepens the understanding of a topic (Siemens, 2004 and Downes, 2005).

Furthermore, constructivism is an approach to learning that allows people actively construct their own knowledge which is influenced by learner's experiences (Elliott et al., 2000). The primary concept of experiential learning by John Dewey is "learning by doing" where learning is the construction of experiences that allow learners make their personal learning outcomes through experiences and reflections (Chan, 2022).

Constructivism or constructivist learning is an active construction of knowledge of learners that varies from independent learners, critical thinkers, and inquisitive investigators. Theoretically, learners are not just consumers and acceptors of knowledge but as active makers and critical users of knowledge (Fostnot, 1989 and Piaget, 1977).

The use of connectivism and constructivism theories with integration of experiential learning will enhance the students' understanding of ecosystem through the augmented reality specifically the use of Google Lens in learning science. It promotes deeper comprehension of the existing knowledge while encouraging students to explore new experiences and widen their perspectives. These approaches provide a framework for learning that can help students improve their academic performance.

Statement of the Problem

This study aimed to thoroughly investigate and elucidate the foundational principles and applications of augmented reality in studying the ecosystem, with a specific focus on its integration into the development of an exemplary lesson plan in science.

This study is beneficial to various stakeholders in education. High school learners may gain a better understanding of ecosystems through augmented reality in science learning. Pre-service teachers can foster a dynamic and engaging classroom environment that encourages active student participation and collaboration. Science teachers may enhance educational and learning materials using augmented reality in Science Education. School administrators can utilize the insights from this study to design programs and policies that promote the integration of augmented reality in teaching, fostering a more effective and innovative learning environment. Curriculum developers can improve the curriculum guide, helping teachers create more interactive and engaging lessons. Lastly, future researchers may find this study a credible and significant reference for further studies in this field.

In the view of the following problems, this hypothesis is presented: There is no significant difference in the result of the post-test scores of the control and experimental groups after the utilization of augmented reality.

LITERATURE REVIEW

The 2030 agenda for sustainable development aims to foster inclusive societies. Thus, countries under the United Nations Educational Scientific and Cultural Organization (UNESCO) implemented policies for inclusivity in education. The progress of Information and Communication Technology have evolved over time and widen its educational coverage through different media such as e-learning, Augmented Reality (AR) which is the combination of digital world and physical environment using software and programming. The utilization of AR has further increased in the context of education where everyone has the capacity to access using smartphones and its optimal used in educational inclusion. This study thoroughly investigates students' learning experiences in the utilization of AR in science education. AR helps students to aid learning and understand deeper concepts, identify questions, utilize technology and understand scientific concepts that fosters collaboration. This technology-based learning allows students to be independent learners that promotes learner-centered approach. Activities powered by augmented reality create learning spaces that incorporates virtual and actual world allowing students to gather information that is beyond their prior knowledge and observation. Moreover, AR has been utilized in the program of Science, Technology, Engineering, Arts, and Mathematics (STEAM) education to boost the interest and engagements of students in science, foster effective teaching and learning and helps improved activities.

With the demand of information, education, goods and services across the globe, the emergence and advancements of technologies were widely distributed to keep up especially in education. The 21st century is not just research-driven but also a technology-driven era where, the use of technologies are prevalent. Augmented Reality is one of the beneficial ways in uplifting the quality of education and to not fall behind from an increasing pace in all aspects of society. On the other hand, many AR applications were introduced and one of it is the Goggle Lens that is commonly built in smart phones and with the access to this application, it allows the user to identify objects and have a deeper comprehension beyond what is seen. Google Lens enables the user to capture and search using the phone's camera. It is acquiring information of the objects in real world through capturing and searching the relevant ideas about the object.

Effective Science teaching does not only require a wide understanding on concepts and knowledge but it also catch the learner's attention, keep the motivation and can bring the best out of each individual that will allow the students to be in their full potential. The integration of AR in education allows the teachers to have the ability to stimulate students' interest in learning science. Science is a complex subject that needs greater recognition in an emerging world. AR promotes an interactive and learner-centered approach where the teachers are able to use AR as immersive technology in enhancing science teaching. AR open doors of opportunities for experiential learning and not merely and fully dependent on theories and concepts.

RESEARCH METHOD

Research Design

The purpose of this research study was to determine the effectiveness of utilizing augmented reality as a tool in teaching science using an explanatory sequential mixed method. In the quantitative data collection phase of the study, the researchers used the quasi-experimental design specifically the pre-test and post-test control group design. According to Andales (2001), research

design, the researchers purposefully modifies and control specific stimuli, interventions, and conditions then observes how the condition affect or changes the subject's behavior.

In this in the study, both groups A and B took the pre-test. Group A received the intervention using augmented reality while group B did not undergo intervention. In gathering the data, it has three (3) stages, the pre-experimental stage, experimental stage, and the post-experimental stage.

In the quantitative phase of the study, the same set of exams from the pre-test was given to the students in groups A and B after the intervention. A 30-item researcher-made questions was given to both groups before and after the intervention and then were observed and evaluated through statistical analysis which is subjected into descriptive and inferential statistics.

In the qualitative phase of this study, the researchers chose three (3) representatives from experimental group using purposeful sampling on Group A based on their post-test score ranking (highest, middle, and lowest). The researcher then conducted an interview that was composed of five (5) researcher-made questions during the in-depth discussion. To ensure the validity of the qualitative instrument, it was evaluated and reviewed by the experts. The collected data were recorded through audio recording and the verbatim was transcribed for the thematic analysis.

Participants of the Study

Quantitative Data Participants

The participants of this study were composed of thirty-six (36) Grade 7 SPSTE (Special Program in Science, Technology and Engineering) learners of Guimbal National High School and were selected purposively for the experiment based on the match-pairing result using their pre-test scores in Science. Moreover, the homogeneity test was utilized to conclude that the two groups were homogenous.

Table 1. Distribution of the Participants per Group

Group	N	%
Experimental Group	18	50
Control Group	18	50
Total	36	100

Qualitative Data Participants and Settings

The researcher used the purposeful sampling (highest, middle, lowest) method to identify three (3) students of the experimental group for the qualitative phase of the study that will be asked through an in-depth interview. The researcher prepared a five (5) researcher-made questions then asked the respondents using a semi-structured interview.

This sample does not represent the entire population, but considered sufficient for the subject participants of the study and the researchers aimed to qualitatively describe the learning experiences of the respondents and do not intend to generalized the results of the study.

RESULTS AND DISCUSSION

This chapter presents the results and findings of the study. A table is presented to describe the study's findings, followed by a discussion of the results. The main objective of this study was to determine the effectiveness of utilizing Google Lens as immersive technology to enhance science teaching.

Descriptive Statistics

Table 2. Pre-test results of control and experimental group before using augmented reality

Group	<i>M (SD)</i>	Description
Control	21.39 (4.20)	High
Experimental	21.33 (4.73)	High

Table 2 shows the results of the pre-test score of Grade 7 learners, the control group (not exposed to the augmented reality specifically the use of Google Lens), and the experimental group (exposed to the use of Google Lens). The result showed that the pre-test scores of the learners exposed to the use of Google Lens or the experimental group were considered “high”

($M = 21.33$, $SD = 4.73$), so the same result was noted to the learners who were not exposed to the use of Google Lens or the control group as shown by the mean ($M = 21.39$, $SD = 4.20$) which implied that the participant’s level of prior knowledge about the selected topic was greater than the experimental group.

The pre-test result in this study was supported on the study of Berry, T. (2008), pre-test is assessment tool used to determine the baseline knowledge, of the certain topic or subject and it is administered to serve as roadmap for the students’ performance and enhance their learning in the subject matter.

Table 3. Post-test results of control and experimental group after using augmented reality

Group	<i>M (SD)</i>	Description
Control	24.67 (2.87)	Very High
Experimental	25.56 (2.75)	Very High

Table 3 shows the results between the post-test scores of Grade 7 learners, the control group (not exposed to the use of Google Lens), and the experimental group (exposed to the use of Google Lens). The result shows, that those learners who were exposed to the use of augmented reality or the experimental group had a “very high” score ($M = 25.56$, $SD = 2.75$), which implied that the learners exposed to the augmented reality improved their pre-test scores, whereas, there was also an improvement in the students who are not exposed to augmented reality or the control group and showed to have “very high” ($M = 24.67$; $SD = 2.87$). This result shows that learners who were exposed to augmented reality had a minimal improvement than those who are not exposed to the use of augmented reality specifically the use of Google Lens.

The result represented in the study of Shapovalov, V. et.al., (2019), 92.6% of cases on characterizing plant species were correctly identified by the Google Lens, allowing the recommendation of this program for teaching. Thus, this leads to a very high result for the experimental group in the result given above.

Augmented Reality develops the visual and digital knowledge of the learners as well as enhances the student’s learning that resulted to a higher rating for the post-test of the experimental group. Augmented Reality specifically the utilization of Google Lens allowed the learners to take picture, scan, and browse through the internet showing the related images of the scanned picture. This method has significant implications on teaching as well as it helped teachers integrate

technology to improve and lift the student's learning. As demand, for the use of technologies in the 21st century, teachers were able to impart learning through Google Lens applications. Augmented Reality empowers the knowledge sharing, research ability, and critical thinking of both teachers and learners.

Inferential Statistics

Moreover, in the result of the Mann-Whitney U test, it was established that the post-test of the experimental group is higher than the control group. However, the difference between these variables were minimal thus resulted to not significant outcome. Table 3 shows the result of comparison between the experimental and the control group.

Table 4. Mann Whitney U test result in the post-test scores of the participants

Group	Mean Rank	$\sum$ Ranks	MWU Value	p
Control	16.61	299.00	128	.p
Experimental	20.39	367.00		

Table 4 shows the difference between the post-test results of the control group (without intervention) and the experimental group (with augmented reality as an intervention) after the utilization of Google Lens. The result of the data presents, that although the experimental group is higher than the control group, it still shows no significant difference (*Mann Whitney U Value*=128; $p=.277$) in both the control and experimental groups since $p>0.05$, hypothesis presented was accepted that there is no significant difference in the post-test scores of control and experimental groups. In post-test, both groups display very high result with minimal difference. This result implies that augmented reality or Google Lens has minimal effect in enhancing student's learning. However, there are factors contributing to the ineffectiveness of the technology. It also reveals that the result of the control group improved and significantly higher than their pre-test scores leading to a conclusion of effective teaching strategy but without the intervention.

This result is supported in the study of Virata and Castro (2019), in Augmented Reality in Science Classroom: Perceived Effects in Education, Visualization and Information Processing shows that teachers are having a hard time choosing for free resources of apps that will meet their needs. In another study, conducted by Yilmaz (2021), showed in the result that the effectiveness of augmented reality depends on the good integration and utilization into the learning environment. It also showed that AR is best tool for teaching abstract subjects that do not necessarily need for a direct instruction through observations. This study also showed that improvement for AR software interfaces must be developed to be best suitable and appropriate for teaching method. Another factor contributing to the less effectivity of the utilization of Google Lens according to the study of Shapovalov et.al., (2019), is the efficiency of identifying species depends more on the resolution of the image than the physical characteristics of the camera in which they are captured.

Student's Learning Experiences while Using Augmented Reality

Students in experimental group were able to express their experiences in utilizing Google Lens as an intervention in the activity allowing them to determine its effectiveness in learning ecosystem. Capturing different and wide array of experiences that leads to a meaningful learning. As this study

is founded in a theory of constructivism and connectivism with the integration of experiential learning, it allowed students to utilize augmented reality on their own.

According to Acampado (2019), in his study Understanding Experience: Dewey's philosophy, he stated that experience is the central theme of Dewey's philosophy that requires deeper understanding and analysis. It is defined as the interactions between organisms and its environment.

Experience in Dewey's philosophy was considered to be dynamic, expressive that communicates and socially oriented.

To sum it all, the different responses of experiences from the experimental group while using augmented reality were recorded and transcribed.

"My experiences on using Augmented Reality are all easy going for its ability to provide instant information of objects and landmarks through camera lens which make everyday life more convenient." (Glys, 10-13)

"Pag-gamit ko kang Google Lens, gindara na ako sa google dayun gin pakita sa akon ang species ka mga tanom kag animals nga hindi ko ma man-an unless na i-google ko gid [When I used Google Lens, it carried me to Google platform and allowed me to see different species of plants and animals that I don't know unless I will search for it]." (Ray, 12-14)

"Google Lens allow us to search something using a device's camera". (Layj, 14-15)

Google Lens have benefited many especially in enhancing information services that creates and foster awareness among professionals and users over the traditional procedures, as explained in the study of Alimohammadi, D. et al. (2023) and supported the claims of the respondents.

Exploring Students' Challenges and Disadvantages of Augmented Reality

Taking photographs of organisms and capturing different levels in ecosystem poses a huge challenge for the learners. Students were able to encounter different difficulties that tested the utilization of augmented reality and its effectiveness. Exploring beyond the opportunities of Google Lens leads to its consequences that affected the utilization and learning experiences.

In the review of Alzahrani (2020), there are challenges associated with the use of augmented reality and it includes lack of experience in utilizing the technology and some technical issues such as the internet connectivity.

The following responses from the participants sum up the challenges and disadvantages of Google Lens.

"The disadvantage is the reliance of the internet go further increase." (Glys, 32-33)

"And disadvantage na kis-a wara ikaw signal, wara wifi [And the disadvantage is sometimes, you have no internet connection and no wifi]." (Ray, 51)

"Sometimes medyo slow and internet connections... then di ka, di ko kamaan if...how....paano gamiton [Sometimes, the internet connection is slow and I don't know how to use it]." (Layj, 19)

"Nabudlyan ako magkomparar kang species nga ginapicturan ko kaysa sa, sa picture nga ginapakita sa Google [I have difficulties in comparing species (of the plants) I have captured and the pictures that I can see in Google]." (Ray, 31-33)

"Sometimes ang...hindi accurate ang gina give na nga answer [Sometimes the, Google Lens doesn't give accurate answers]." (Layj, 26)

In the study of Shapavalov et al. (2020), it has been observed that, the efficiency of Google Lens to recognize the capture picture depends on the resolution of the photo than its physical appearance and also cited in the review of Shapavalov et al. (2021), that Google Lens has its

limitations both pedagogical and technical aspects. For the pedagogical way, is the lack of teachers' idea or knowledge how to utilize, and its lack of guidance and technicalities affects as well in terms of mistakes in its functions and the underworking errors.

Augmented Reality: Advantages through Google Lens

Despite the threat of the disadvantages and challenges brought by the augmented reality in learning and teaching, the students were still able to find out that Google Lens has still its advantages and opportunities that may enhance learning.

As explained by Al-Ansi et al., (2023), Augmented Reality (AR) technologies as well as the Virtual Reality (VR) have uplift and transform different learning approaches into a more immersive, interactive experiences that promote active engagement and learning.

With the disadvantages lies on the other hand the opportunities given by the Google Lens and the following responses sum it up.

"It offers real time information overlay on the physical world, providing instant access to details, about plants, animals, landmarks and more." (Glys, 8-9)

"The advantage that I have known, is the ability to provide quick information about the world around us." (Glys, 31-32)

"Kung magamit ikaw Google Lens, ma man-an mo kun something safe na, ma touch or ma eat dayun, ma- an mo kung anu ra specific ang ana nga species [When using Google Lens, you will know if something is safe to be touch, or eat and you will know what will be its specific species]." (Ray, 46-48)

As shown in the study of Shapavalov, V. et al., (2021), Google Lens is an effective tool in learning Biology and it has a unique software that allowed and helped students recognize and determine different species of organisms as well as the genus of the plant that students are searching.

The Grade 7 learners under Special Program in Science, Technology, and Engineering of Guimbal National High School who belong to the control group of this study were given the same activity but without the intervention of Google Lens and they were not able to experience the utilization of augmented reality in learning.

Special Program in Science and Technology Learners as Active Makers of Knowledge

The participants are the Grade 7 SPSTE learners of Guimbal National High School considered as the best suited for the study. SPSTE learners are considered to be advanced in learning thus, they are active makers of knowledge. This study augmented reality incorporates SPSTE program in High School as it focuses in science and technology.

In the process of teaching and learning, participation is one of the effective strategies. Students learn in various ways leading to the knowledge of teachers that students are active when they pay attention to teacher's learning objectives according to Triyanto (2019).

Exploring the Wonders of Ecosystem Leading to Development of Lesson Exemplar

In progress of this research on the effectiveness of Google Lens as immersive technology to enhance Science Teaching, the detailed lesson plan was utilized. The development of lesson plan has undergone several stages. First, the researchers have consulted the course facilitator of Grade 7 SPSTE at Guimbal National High School, regarding the least learning competency of the learners in the Second Quarter at which the researchers will worked and provided table of specifications (TOS) for the exam. Out of the least learning competency specifically in the topic ecosystem, a fifty

(50) item researcher made exam was pilot tested to thirty-one (31) learners of Don Felix Serra National High School and thirty (30) item remaining questions were kept for the basis of pre-test and post-test of the participants. The most essential learning competencies under the topic ecosystem are 1) Differentiate biotic from abiotic components of an ecosystem (S7LT-IIh-9); 2) Describe the different ecological relationship found in an ecosystem (S7LT-IIh-10) and, 3) Predict the effect of changes in abiotic factors on the ecosystem (SLT-IIj-12).

As stated in the study of Kamarainen, A.M., et.al, (2015) examples from studies suggest that the tools and context in an immersive artificial world helped in promoting students' active engagement in the field of ecosystem in science.

Augmented Reality: Portal to Inquiry-Based Approach in Teaching Science

After identifying the objectives and the respondents, the researchers designed the activities and content highlighting the topic interactions in an ecosystem as the least learning competency of the students. To implement the intervention of Google Lens in experimental group, a lesson plan developed where the topic interactions as the least learning competency in the 2nd Quarter was incorporated and being used. The lesson plan was formulated for both Experimental and Control group following the detailed lesson plan with 7Es ((Elicit, Engage, Explore, Explain, Elaborate, Evaluate, and Extend). The Experimental Group was given an activity on elaborate stage of the lesson plan where the utilization of augmented reality was added. There are three topics included in the development of lesson exemplar in science with the integration of augmented reality, namely: 1) Components of an Ecosystem 2) Ecological Relationships: under ecological relationship is the symbiotic relationship and non-symbiotic relationship among organism in the ecosystem and 3) Transfer of energy through trophic levels. Student-centered approach does not focus mainly on teachers however, it gives the avenue for the students to learn on their own and teachers serves as facilitators and guide on the learning of the students. In this approach the theories of inquiry-based learning, constructivism, connectivism and experiential learning takes place. Inquiry-based learning encourages students to formulate questions, conduct research, and create new ideas based on their findings. Constructivism enables students to understand and create concepts based on their prior knowledge and take ownership of their learning while connectivism is turning into digital world on solving problems such as browsing the internet and searching different media platforms and the experiential learning allows students to learn while doing it. Providing meaningful experiences that contributes to enhancement of their academic performances.

According to Sommerauer et.al., (2018), augmented reality has evolved rapidly and researchers elucidate that AR has the capacity to deliver persuasive learning experiences in the four-walled classroom as well as in informal settings such as museums. According to Noriah, Ismail et.al (2006), inquiry-based learning guide students to develop and analyze meaningful questions allowing them to create their own solution to the problems as they acquire knowledge based on their understanding and observations. Connectivism is an approach to learning that emphasizes the importance of connections and networks in learning process. It is necessary in education as new teaching pedagogy to enhance teaching, support the collaborative learning spaces and foster learner-centered in promoting learning. On the other hand, experiential learning approach in teaching provides learners the chance to gain knowledge and insights based on their experiences, enables them to reflect upon those first-hand experiences and integrate it in daily life. The classroom is a place to foster experiential learning through hands-on activities such as laboratories, according to Wurdinger and Carlson, (2010).

Capturing Learning Beyond the Four-Walled Classroom

As one of the objectives presented in the lesson plan, students will take and collect pictures depicting different ecological relationships present in school premises, a trip to ecosystem was conducted to capture photos of various organisms outside the classroom. With the integration of augmented reality, students were able to learn beyond the confined room. Allowing students to construct, and experience learning on their own and do not dwell as merely consumers of knowledge but as active makers of it. This activity with the integration of Google Lens aimed to aid the learning of the students in ecosystem by identifying distinctive and unique characteristics of organisms beyond their prior knowledge and observations. Through scanning the captured photos using Google Lens, it provides various related pictures and information that could further deepen their understanding.

In the claims of the study of Vuta (2021), upon the result of COVID-19, many education sectors have been affected around the world, and needed to rely on innovations and digital sources. Augmented Reality leads to access of educators and learners on different materials beyond time and space.

CONCLUSION

Summary of the findings

To provide answers to the statement of the problem, this study seeks to find the effectiveness of augmented reality specifically the use of Google Lens, the researchers conducted an explanatory sequential mixed method to prove the effectiveness of augmented reality in an actual classroom setting.

The pre-test score of the Grade 7 SPSTE learners in control and experimental groups was "High." However, the control group had a higher mean score than the experimental group. In the post-test, there is a slight difference in the performance level of the two groups where the scores of the Grade 7 SPSTE learners in control and experimental group was considered as "Very High" and the experimental group had a higher mean score than the control group. Statistically, there is no significant difference between the post-test scores of the controlled and experimental groups after the intervention. This means that augmented reality or the Google Lens has minimal effect in enhancing the student's learning. However, there are factors contributing to the ineffectiveness of the technology. It also revealed that the result of the control group improved and significantly higher than their pre-test scores. This leads to a conclusion of effective teaching strategy but without the intervention. Students' experiences using augmented reality encompasses learning experiences in utilizing Google Lens to deepen their understanding of the ecosystem and its components. This also includes on living organisms' distinctive and unique characteristics, while embracing the challenges they faced as they explore Google Lens to acquire new knowledge and how they have overcome each obstacle. On the other hand, students' experiences of the traditional method of learning Science requires qualitative observation to describe an object or an organism at hand based on what they only see. While students' perception towards utilizing augmented reality in education opens a greater new learning opportunities, not just in the topic ecosystem but also in other branches of Science like biology especially in determining the type of species. Above all, students expect more on utilizing augmented reality in Science Education in the future, as it allows students to immerse in the virtual world.

Conclusions

Augmented Reality specifically the use of Google Lens method has minimal effect to enhance Science Teaching. It fosters collaborative learning between the teacher and the learners in the actual classroom setting. It can somehow enhance students' academic performance by providing informational learning opportunities. However, the approach recognizes that students are more likely to grasp and retain knowledge through the traditional method of teaching and by actively listening to instructional content delivered by teachers.

The pre-test and post-test results of the students who were exposed to augmented reality shows that there is a significant but modest difference between the experimental and control group and significantly improved their academic performance. Students learn effectively by fueling their knowledge through immersion of augmented reality in learning Science specifically in organism recognition with the guidance of the teacher. Students who were not exposed to augmented reality experiences difficulty to describe a certain organism based on their prior knowledge and what they have observed physically.

The improvement in the post-test scores of the learners exposed to augmented reality learned differently when exposed to hands-on learning such as the intervention with augmented reality where they were given a chance to capture images with regards to the topic ecosystem and scan it through the Google Lens than students who were not exposed to this process.

Using the augmented reality method in teaching science, learners improved in their academic performance. It also enhances student participation and engagement in the teaching-learning process through in-depth interviews. Through augmented reality, specifically the use of Google Lens as an intervention in teaching Science, learners develop their critical thinking skills to analyze several information given by Google Lens, acquire new knowledge beyond what have been taught to them. Since Google Lens provide diverse information related on the topic matters, this leads to difficulty of identifying and comparing information of what they need and in contrast to what is provided by the Google Lens resulting to confusion and ambiguities of information. Proper utilization and application of augmented reality can enhance students' learning outcomes through teachers' guidance motivations and strengthening the use of the said approach.

Recommendations

Having analyzed the students' view on their experiences in utilizing augmented reality in learning science, researchers found certain areas in the strategy that need enhancement and revision to achieve a better result in using augmented reality specifically Google lens.

Students should actively participate in class discussions and pay attention when utilizing the augmented reality to further enhance the usefulness and its effectiveness. The only conflict, is the proper way of utilizing AR and the time allotment. Therefore, students should be given enough time to finish answering the given activity on time.

Second, pre-service teachers should integrate augmented reality as part of their teaching process. This serves as supplementary educational tool to foster an active and engaging class discussion for a better understanding of the topic. AR is a useful supplementary tool in delivering complex topics especially Science subject. It offers diverse simulations and engagement in virtual laboratory activities that could help students to have a better grasp of the topic and experiential learning.

Third, Science teachers should learn how to utilize augmented reality specifically the use of Google Lens in Science teaching. This could also be used in other subjects as an alternative

approach to help improve students' academic performance. Science teachers must adapt to the technological world since technology offers a wide range of instructional materials that could supplement to the subject matter.

Fourth, School Administrators should support and provide teacher learning development programs, such as utilization of augmented reality and instructional materials. By training the teachers, to become a 21st century skilled teachers and enhance instructional materials with the utilization of augmented reality educational tools, applications, and/or websites as the technological world continue to change in time, education must evolve in time.

Lastly, the researcher highly recommends further studies on the remaining effective use of augmented reality specifically Google Lens in improving students' academic performance in different fields of study. The findings of the study require further investigation in consideration of study limitations which is a time element.

ACKNOWLEDGEMENT

The researchers would like to express their heartfelt gratitude and deepest appreciation to the following individuals who have contributed in the fulfillment of this study and for making this study possible: First and foremost, to the Almighty God, who has bestowed abundant blessings and graces, and who has guided the researchers from the beginning to the completion of the study. Special thanks to: Dr. Ramon N. Emmanuel Jr., Campus Administrator, for his unwavering support. Dr. Mae Angeline T. Tajolosa, Head of the Research Services Department, for the approval and valuable suggestions. Dr. Edsel O. Coronado, Research Adviser, for his patience, guidance, encouragement, and valuable advice in improving this paper. Dr. Mae Angeline T. Tajolosa, Prof. Sharon G. Perucho, and Prof. Fritz M. Balisang, the panel members for dedicating their time and providing insightful comments that have greatly enhanced this study. Their approachability and professionalism are truly appreciated. DFSNHS and GNHS faculty for allowing the researchers to conduct the study with their students, and who were approachable and supportive in assisting the researchers in completing this research study. DFSNHS and GNHS students who are the participants of the study for their cooperation, valuable insights, and time dedicated to participate in the study and answering the interview questions. Lastly, the researchers express their heartfelt appreciation to their families and friends for their unending love and support, both financially and emotionally, and for encouraging them to continue their journey, especially during challenging times of field operations. Our boundless gratitude!

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