

“Anilab: An Augmented Reality Mobile Application Used to Assist Teacher in Educating Elementary Students”

Submitted by:
Ella Jane B. Caraecle
Feljan P. Sularte

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Chapter 1. Introduction

1.1. Background of the Study

Many people's lives were affected by the pandemic caused by Covid – 19. The education sector is one of those hit by the Covid-19 pandemic. As a result, all classrooms have been transitioned to online classes, but teachers and students, especially those in elementary school, are finding it difficult to teach/learn because they are accustomed to face-to-face instruction or classroom setting. Students' required learning resources are readily available at their classrooms. Students were quickly bored even though it was online and seemed to be easy. Elementary students find it hard to understand to keep up with their classes. Hence, students' concentration and emphasis are lacking because they are still young.

The online learning for both students and teachers has advantages and disadvantages, just like any other teaching method.

The transition to online learning for all students is very effective this teaching method provides another way to minimize the connection between students or between students and teachers.

An efficient way to visualize abstract concepts and support students' interaction and engagement is the Augmented Reality (AR). Elementary pupils like to study and learn by using images or videos than learning through short messages services (SMS) of their teachers. Augment Reality is one of the solutions of visualizing the learning process of the students. Through these technology, elementary students

will have fun while learning. Thus, using AR technology will be beneficial and helpful for the elementary teachers on teaching their lessons to their students.

The application of AR in education has been investigated at all educational levels, including early childhood education. In primary and secondary education (Koutromanos, G.; Sofos, A.; Avraamidou, 2015), as well as from elementary school to university levels, (Scrivner, O.; Madewell, J.; Buckley, C.; Perez, N. December 2016).

Kindergarten pupils, K-12 students, university students, and adult learners are all examples of different sorts of learners. Elderly individuals, students in technical and vocational higher education (Radosavljevic, 2018, Akçayır, M., 2017) and students with special needs focused on a variety of study areas (for example, city history), (Rodríguez, F.E., 2013, M.; Dede, C. 2014.) Both in formal and informal settings in the framework of contextual learning theory (Rodríguez, F.E.; 2013) and constructivist learning, learning settings theory.

Augmented reality (AR) has been described as "system that have the following three features: (1) combine real and virtual, (2) interactive in real time, and (3) registered in 3-D." (Azuma, R.T. 1997,p. 2), while it is more broadly described as a state between actual and virtual surroundings (Milgram, P.; Takemura, H.; Utsumi, A.; Kishino, F, 2351, 282–292) .AR technology enables simultaneous interaction between the real and virtual worlds. Digital information (text, audio, images, video, 3D objects) is superimposed on the real world in such a way that it appears to be a part of it. It does not isolate the user from the physical environment, which "is likely one of the key

reasons for AR's growing popularity". (Kounavis, C.D.; Kasimati, A.E.; Zamani, E.D. 2012, 4, 1–6p. 2).

Augmented reality apps are classified into two types: image-based applications and location-based applications. Image-based applications are further classified into two types: (a) marker-based tracking, which requires specific labels (e.g., Quick Response Code), and (b) marker-less tracking, in which an image serves as the trigger for multimedia content playback. When a user arrives at a specific location, location-based applications are activated.

1.2 Statement of the Problem

During the past year, due to a viral outbreak of a disease named "COVID-19", most countries has opted to promote social distancing and strict quarantine procedures to combat the spread of said epidemic. This has also resulted in many students to take online classes as a replacement to campus lectures or classrooms following the quarantine guidelines. However, many students, including younger ones have often find this format of classes boring and thus hindering them from learning subjects needed for their future.

The researchers would like to propose the use of augmented reality (AR) to better enhance the interest of students in learning, help them visualize things and to have an interaction for better learning experiences.

1.3 Objectives:

The main goal of this research is to see the effectiveness and efficiency of Augmented Reality Application that would benefit both teachers and students where teachers could teach their students easily and students to easily understand their lessons.

- To develop a marker-based application using unity game engine.
- To conduct a survey for students ages 10 to 12 years old on usability of the application.
- To conduct a survey for the teachers to determine the system functionality and educational content of the app.
- To validate the design and performance efficiency of the system.

1.4. Significance of the Study

- The Augmented Reality (AR) game application that was used were beneficial for both elementary students and teachers.
- It was less hassle and stress-free for the elementary teachers on how their students will learn their lesson.
- Elementary students did not only learn but have fun while learning their lessons

1.5. Scope and Limitations

The researchers' will develop an Augmented Reality application that will assist the teachers to teach the lessons to elementary students and help the elementary students to understand and focus on their studies.

1. The application was marker-based application due to the limited resources of the researchers.

2. The application focuses only on elementary science subject specifically, the human body skeletal system.

3. The application was limited to devices that are compatible with the google play service for AR.

4. The hardware and software that was used in developing the application was also limited due to lack of resources of the researchers.

5. The research is limited to students across Zamboanga City Division's Baliwasan District's Grade 5 and Grade 6 classes.

6. The following schools involved are Baliwasan Central School, San Jose Gusu Elementary School, Good Shepherd Missions School, Southern Support Command Elementary School, Ebenezer Bible Schools and John Spring Elementary School are the elementary schools that make up this school district.

1.6. Operational Definition

In this section, terms will be defined in relation to the researcher's study. The following are the terms used in this study:

- † **Augmented Reality** – The application of sound, visual objects, or other sensory effects to a real-world environment.
- † **Unity Engine game** – is a gaming engine used for the developing the mobile Augmented Reality.
- † **Image recognition machine vision** - is that the power of software to identify objects, places, people, writing and actions in images.
- † **Image Tracking** – detects two-dimensional planar pictures from a custom-defined target collection and then continually monitors the pictures' positions and orientations as you or they move in the setting
- † **Marker base-** is a mobile device application that allows you to scan physical photos, known as "markers," and then produce a 3D model, another picture, video, Or scene, as well as interact with it using your smartphone
- † **Vuforia Engine-** is an Augmented Reality software development kit (SDK).
- † **Learners** - are elementary school students who will use the program.
- † **E learning-** is defined as a learning system that includes both structured and informal learning through the use of technology resources.
- † **Elementary Science Teacher-** a person who teaches science subject.

1.7 CONCEPTUAL FRAMEWORK

In this section, the main dependent variable is the learning in augmented Reality. The student user which is the independent variable that consist of Male and Female that are mediator variables which will be the users of the application . The Subject topic which is also the independent variable that helps the students user to better understand topic that is dependent variable so that students able to learn and enhanced their learnings and knowledge on their lessons and easier to be able to understand the lessons. While the consistency is the use of augmented reality for the next output variables.

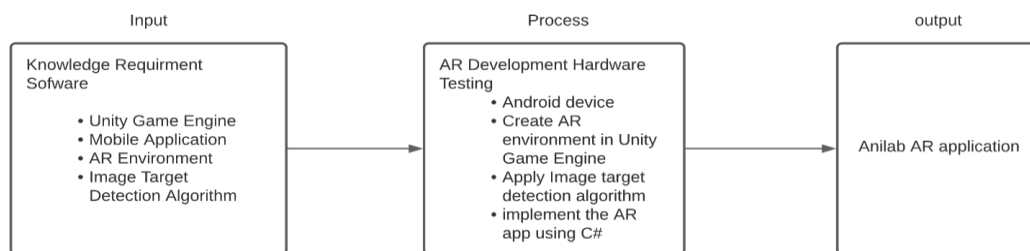


Figure 1. Conceptual Framework of proposed mobile application using Augmented Reality

Chapter 2. Review of Related Literature

2.1. RELATED LITERATURE

2.1.1. ONLINE LEARNING

Rodriguez et al. (2008) agreed, contending that sustaining enrollment in advanced education would be dependent on understudies' learning experiences and observations in an online format, an estimation also discussed by Dobbs, Waid, and Del Carmen (2009) and Motargy and Boghikian-Whitby (2010). Various experts have recommended increased testing in this area (Allen and Sailor, 2008; Glass and Sue, 2008; Powell, 2007).

Advances in development of computer technology since the 1990s have achieved an extended usage of online devices in distance tutoring. Today, various establishments of higher learning offer online direction with fused electronic instructive gadgets (Rodriguez, Ooms, and Montanez, 2008). E-learning is another effective method of improving government assistance, especially in the organization chosen for this evaluation (Collins, Kim, and Amodeo, 2010; Donavant, 2009; P. Griffith, May 23, 2013 singular correspondence). Because of the recent growth in distance learning in the field of government assistance, there is a lack of knowledge of how government benefits professionals perceive by using this kind of learning system.

Online classes have been shown to be beneficial for students who choose self-directed instruction (You and Kang, 2014). An understudy responded to

online coursework in a Kirtman-led review says, "It is more private, so I can spend more resources on the ideas that I need assistance with and less in ideas that I can get quickly" (Kirtman, 2009, p. 110). Self-regulated students are more likely to use a variety of "intellectual and metacognitive procedures to accomplish their learning goal" (You and Kang, 2014, p. 126). Students who can enhance their self-directed academic skills often used time management, audited content 6 Web-based LEARNING on a regular basis, sought assistance from instructors or peers, faced time limits, and used metacognition to consider their own learning (You and Kang, 2014).

In a survey comparing teachers' and students' views on online education, (GayTan, 2015) discovered that students viewed improved online learning as the absolute most significant factor in maintaining on-site learning, with instructor experiences as the second most significant factor. Karma and Rossi (2015) discovered that when teachers and students do not communicate, online students perceive distance to be more dominant, and that without contact, students experience feelings of hopelessness. Students perceive themselves to be more completely disconnected in on-line classes than the face-to-face classes and disconnected but also less motivated to social community (Otter et al., 2013).

Disconnection affects students' academic understanding throughout the online learning, which can result in class frustration or withdrawal rates. Lowenthal, Bauer, and Chen (2015) used experiments to gather feedback from online students and discovered when positive feedback from online instructors or advice was rated lower than positive feedback from face-to-face instruction. The latest research by the Bill &

Melinda Gates Foundation found that learning criticism enhanced students' performance, indicating there's a need to analyze students' perceptions of online classes.

The interpretation of appropriate psychological and social education systems between students will encourage additional outstanding patience and encouragement to continue pursuing more online classes.

The interpretation of appropriate psychological and social education systems between students will encourage additional outstanding patience and encouragement to continue pursuing more online classes. For example, some research examined into the competence of behaviors and ways of thinking about improvement management of K to 12 curriculum government supported educators in urban and rural setting. The purpose was to investigate the connection between repeat use as well as opinion mostly on validity of internet learning devices depending on the type of school environment. Schools seemed to have the maximum level of development reliability, accompanied by their country peers. This data can be beneficial to online students and teacher in understanding the most productive developments, as well as work base to enhanced use of progress, especially in the country assessment. To improve students' trial learning in the investigative corridor, renowned researcher developed an e - learning structure using a combination of structure methods and appropriate learning methods.

Coordinating requests are expected to be suggestive of creative relationship to energize their inventive thinking. Through peer evaluation,

understudies could acquire from others' thinking methodologies while appreciating and denouncing their creation. After the structure was made, an evaluation attempt was performed. Differentiated and the benchmark bunch, individuals who used the system to help forming showed tremendous redesigns after various occasions trainings. At that point, other assessment communicated that the standard "flipped homeroom" passes on address material in video setup to understudies outside of class to represent dynamic learning in class.

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Reflexive multimedia illustrations combine with actual proof teaching methods to address known chaos environments for accessing learners. Each incorporates a live action scenario of understudies investigating a whiz concern with a sensible analysis wherein clients participate. Clients are asked to make figures, answer questions, gather additional details, and draw conclusions over the duration of each ten-minute film. Spreading and imprinting previous responses allows each client to have a remodeled interpretation.

Assessment of how students will learn from these devices is being used to cultivate whole modules that will meld the IVV as a planning creation to be done as homework, accompanied by suggested activities to be done in class to make the implemented concepts more significant and more specific. The results of this study show that using an electronic investigation lobby was a major contributor to students' learning development.

2.1.2 ONLINE LEARNING SUCCESS

Online courses can be agreeable, testing, and give intellectual incitement at the point when understudies are locked in. Capra (2014) noticed that online students time the executives' abilities and association with online educators upheld online understudy achievement. Hamzah, Fortunate, and Joarder, (2014) and Pehlivan (2013) discovered a connection between students' academic achievement, time management skills, and that academically effective learners even manage their time properly. According to Hamzah et al. (2014), academic excellence should be enhanced by understudies further developing time

management skill. 64 Besides that, Jaggars and Xu (2016) mentioned that in the online learning environment, teacher and students' involvement, students' connection, and cordial innovation have the largest impact on students' academic achievement.

An online direction advertised during enlistment or upon enlistment in the school would additionally help understudies in knowing their job, what teachers expect of online students, and the contrasts between understudies learning eye to eye versus web based learning conditions (Bork and Ahidiana, 2013). An online approach advertised during registration either upon enrollment in the school will furthermore aid students in recognizing their role as an online student, what teachers expect of online students, and the differences between understudies learning face to face versus web-based educational systems (Bork and Ahidiana, 2013). Providing different students online learning direction before course section has proven to be successful in converting them to this new way of learning (Haynie, 2014). Furthermore, the structure for internet learning increases learners' interest in learning, coordinates student autonomy, and enhances discernment for scholarly achievement in students who take part in online courses (Krugers and Waters; Wang, Shannon, and Ross, 2013). The online education system anticipates that students can be successfully engaged with activities that promote the six principles of Knowles' online learning concept (Allen and Zhang, 2016; Schultz, 2012). These principles highlight the student's ability to (a) promote a motivation or soreness for obtaining information, (b) enhance learning guide or structure, (c) self-conceptualize, (d) place oneself in an academic condition of accessibility to accomplish goals, (e) nurture concern based skills, and (f) become such a self-inspiration.

2.1.3 ONLINE LEARNING CHALLENGES

Educational technology continues to represent mainstream culture and therefore restricts people outside the mainstream culture (Oswal and Meloncon, 2014). No technology is an area that can easily be taken for granted in daily life. This is not very common because there is no funding available for online training. Ultimately, this leads to students gaining access to the global knowledge available on the Internet. "Technical exposure can bridge the gap between rich and poor, rich experience and extraordinary" (Chaney, 2001, p. 28). No technology is something that must be taken for granted in daily life. This is unusual because no funding is available for online study. Ultimately, students will have access to the global knowledge available on the Internet. "Technical exposure can cross the gap between poor and rich, extensive expertise and extraordinary" (Chaney, 2001, p. 28).

Despite the benefits and promises of distance learning, there are few issues that should be addressed, including the learning outcomes, costs involved, use of technology, and perceptions of teachers and students. The average product quality in online learning. Most of these concerns is connected to others in various ways. Another challenge for online students is staying motivated in their classes. Students who lacked independence and self-motivation performed less than their classmates (Savenye, 2005).

Students with a lack of self-regulation usually did not have enough time to complete the course. Orders therefore lead to inferior work or late orders altogether (You & Kang, 2014). In general, "successful students tend to be more confident that they will be successful, have greater self-responsibility, greater self-organization skills, and better skills and access to technology" (Savenye, 2005, p.2)

Baron and Wright (2008) hold the following view: “It is not easy for teachers to introduce new literacy skills into the classroom, especially when two-thirds of teachers are unwilling to use technology” (page 292). Turbill (2001) pointed out three factors that prevent teachers from using technology in the classroom: lack of time and experience to understand and learn software, lack of security, and lack of learning and support. Hansen (2008) and Businessman (2009)

Brush (2007) defines these obstacles as one or more of the following: the need for technical support, time constraints, and lack of technology, including insufficient technical tools (such as hardware, software, computers, and other resources). Appropriate technical support must be obtained. Lack of knowledge and skills can also cause teachers to be reluctant to use technology in the classroom. Class management knowledge leads to a lack of technology in the classroom. Class management skills include rules and procedures for computers, printers, monitors, laptops and smart boards. Hugh and Brush (2007) also found that there are some institutional barriers that can prevent teachers from using technology in the classroom.

Although the use of e-learning has all the advantages, its implementation will cause many problems in the education system. Therefore, the continuous separation of eLearning from the actual environment will undoubtedly lead to identification problems. And the personality of the student. Interaction in such a room is one of the main limitations. In this type of education, comprehensive and inclusive assistance is lost, and the principle of independence is challenged to a certain extent .On the other hand, believes that learning is not suitable for any type of education.

2.1.4. AUGMENTED REALITY

Augmented Reality (AR) and Virtual Reality (VR) technologies are becoming increasingly popular as hardware and software evolve, making them accessible for a variety of applications. This have been applied to different areas because of their potential to improve the user experience while learning. Training, simulation, games or other tasks. This are the two most popular subsections of the broader concept of Augmented Reality (AR) as an umbrella term that encompasses both AR and VR. This is evident from the extensive review by S.Chuah.

Unlike virtual reality, augmented reality attempts to enhance rather than replace one's personal environment. By utilizing a technological lens that enables the user to see and interact with the information that surrounds us augmented reality on mobile allows users to interact with data on a more personal level. New technologies and applications in the fields of information search, entertainment, gaming, and location-based services such as tourism and directional mapping are rapidly emerging.

2.1.5 Augmented reality vs. Virtual reality

Augmented reality is frequently looked upon as a "center ground" between virtual reality and the physical climate (Milgram, 1994). In contrast to augmented reality and the physical world, the realm of virtual reality lies entirely within the synthetic. Virtual reality can be defined as, "a computer generated, interactive, three---dimensional environment in which a person is immersed" (Aukstakalnis& Blatner, 1992). Virtual realities, such as those found in computer games like World of Warcraft and Second Life. Virtual reality can be experienced by the player through control of an avatar in a

PC --generated environment and presented on a computer screen. Users may also experience virtual environments by wearing head---mounted displays such as those are commonly used by the military for training purposes.

The fundamental difference between virtual and augmented reality lies in the user perspective and immersion methods employed by each system. Virtual reality systems strive to be a completely immersive experience, similar to the level of immersion users experience with everyday living. In contrast, augmented reality distinguishes itself as a "mixed reality" between two worlds by blending virtual elements within a genuine --world environment (Milgram, 1994). Characterizing augmented reality: Although many researchers have broadened the definition and scope of augmented reality, the most regularly accepted defining criteria were brought about by Ronald Azuma in 1997 (Zhou, 2008). Azuma states that augmented reality systems share the following three attributes:

1. Combines genuine and virtual items in this present reality.
2. Possesses intelligence and is presented in genuine --time.
3. Registers and adjusts virtual and actual items with each other in 3D.

The reasoning for these standards is to try not to restrict augmented reality to explicit innovations. Preceding Azuma, researchers had primarily characterized increased reality using head---mounted shows, an approach incapable to distinguish some AR and VR applications. These new criteria grow the applications of augmented reality to handheld cell phones such as smartphones and screen --based frameworks that read specialized coded tags that can present augmented reality information on a stationary computer screen (Azuma, 1997).

Augmented Reality introduces a new mode of interacting with the physical and virtual environments, while also improving the real-world user experience (Kesim and Ozarslan, 2012). According to Wu et al. (2013), augmented reality (AR) enables students to develop valuable activities and became one of the most important new technologies in education. Students will feel a realistic degree of reality when engaged in such a learning environment, due to the fact that AR will provide opportunities for teaching and learning.

The use of augmented reality (AR) in education is a hot research subject AR allows users to connect virtual objects to the real world to facilitate real-time interaction .The application research of augmented reality in education still in its early phases, and no research on the role and consequences of augmented reality in education is published. AR becomes much more usable because it eliminates the need for special equipment and can be used on mobile devices. Most people now own mobile devices, and their use has expanded to have better access to AR no longer requires special equipment and can be easily used on computers or mobile devices. AR supplements the real world with relatively little virtual information, while VR mainly contains frequently used virtual information. The degree of virtual reality in the real world determines the type of technology needed to support AR, because different display and tracking technologies will lead to different degrees of immersion.

Example of Software application of AR is the Pokémon GO mobile application that can be used on smartphones another example of the augmented reality technology is the Star Wars Jedi Challenges (Star Wars Jedi Challenges) mobile application, here users are required to wear a headset. Today, many people have mobile devices and therefore

can use AR The advancement of mobile technology and the widespread use of smart phones, learning using AR has become possible.

Smartphones and tablets are ideal choices for realizing augmented reality experiences through fast processors, graphics hardware, and various integrated sensors.

Mobile AR applications can be used in various education sectors and education related AR applications are now more common on mobile devices Using AR can increase the motivation of students to study and improve academic performance. Research on the effects of using mobile AR in education is insufficient, and there are many ways to explore the potential of AR to enhance students' learning motivation and improve academic performance.

Most technologies used for AR and VR are based on a specific single device. Microsoft HoloLens It is a device that inserts virtual objects and information into the user's field of vision, providing an augmented reality experience. Oculus Rift is a virtual reality viewer that covers what users see the entire field of view and only interact with the virtual objects displayed in the viewer.

Other devices include simple smartphone casings, where the smartphone transmits images to the user through a stereo lens system. These devices provide an immersive experience in an immersive environment that can easily make users feel as if they are living in a virtual world or expanding and separating in the real world. On the other hand, they also have some shortcomings in terms of ergonomics, such as: B. Due to incorrect focus distance, the user's field of view is limited and eye adjustment problems occur. The fact that users feel completely disconnected from the real world can also bring some dangers, especially when used for a long period of time.

2.1.6. MOBILE AUGMENTED REALITY

Augmented Reality on Mobile is a new Augmented Reality technology that can be used on mobile devices such as smartphones, iPads, iPods, gaming consoles, and military Head-Up Displays (HUD). It extends and improves the mobile device's user experience



Figure 2. Reality-virtuality continuum Taken from Yuan thesis

The following characteristics define mobile augmented reality:

- 1) It combines real and virtual imagery;
- 2) It is interactive in real time;
- 3) It registers the virtual imagery with the real world; and4) it is accessible via mobile devices (Goh, Sunar, and Ismail 2019; Keating et al. 2011).

The improvement of AR innovation started during the 1960s. In 1994, Milgram and Kishino proposed "reality-virtuality continuum" which separated the innovation between the nonstop scale among the real world and virtuality. Since then, AR has been perceived as a free field of study. Contrasted with blended reality (MR) and computer generated reality (VR), the expanded reality gives more practical encounters with the blend of the virtual and genuine climate.

Nonetheless, the improvement of AR was as yet restricted and stayed at the period of preliminary applications until the mid-2000s. With the presentation of superior cell

phones, camera, designs preparing abilities, and inertial sensors, AR is getting more consideration and won (Ko, Chang, and Ji 2013).

There are three main technologies on which the AR system is built:

1. Tracking. The system must know the user's view to retrieve and display related virtual content. In particular, it must know the position and orientation of the display system in a physical coordinate system with a known mapping to a virtual system. The setting of orientation and position parameters is called tracking.
2. Register. Tracking is only a means to gain registration of the ultimate alignment of real and virtual information displayed to the user. Recording must be performed to an accuracy of pixels at an interactive frame rate to maintain the illusion of real and virtual coexistence in the same domain.
3. Display. An AR system must be able to create a combination of the real and the virtual. Therefore, the screen must be allowing the user to see the real world covered by 3D graphics. It must also be tracked to at an interactive frame rate.

2.2. RELATED STUDIES

2.2.1. FOREIGN STUDIES

Self-Coordinated Learning

Several foundations have recently embraced it as an important factor of their long-term preparation and achievement. Despite consistent growth patterns in online attendance and the benefits of online learning, dropout rates for online classes continue to be higher than the conventional (on-campus) courses.

The self-coordinated learning (SDL) hypothesis of Knowles have been emphatically connected with online scholastic execution and recognized as indicators of online learning and life achievement.

Impacts identifying with knowledge and skills may be separated into three categories: engagement factors, which make students more receptive to learning; psychological elements, which make learning content more open and aid comprehension; and execution factors, which produce improved results and create skill. Impacts of creating development as self-governing students centralized: the growth of trust, especially for student who have had little achievement in the past; inspiration to learn; and self-sufficiency, taking greater responsibility for their own learning and finding out how to learn.

The advantages of web-based learning incorporate adaptability, openness, and greater access to learning assets, specifically for communities who may never have the opportunity to acquire an education. Online enrollment growth patterns are predictable and the advantages of web-based instruction, online course wear down rates remain higher than traditional face-to face instruction. (Bawa, 2016; Choi and Park, 2018; Doe et al., 2017; Kauffman, 2015; Peck, Stefaniak, and Shah, 2018). India is utilizing amazing ICT instruments like open source, satellites innovation, neighborhood language interfaces, human-PC interface, advanced libraries, and an arrangement to come to the remotest of towns. College Awards Commission (UGC) - INFONET gives electronic access to insightful writing accessible over the web in every aspect of figuring out how to the college area in India. UGC also leads IT/ICT direction programs for college and school. For improving the ICT abilities of instructors, associations like

the Public Board of Instructive Exploration and Preparing (NCERT) and Public Board for Educator Schooling (NCTE) have been dispatching conspires occasionally. .

Advantages of Educational Technology development: Consistent access to learning assets: With portable learning, you can take in and focus anywhere - from the classroom to your office, or from your computer to your pocket. A true modular learning platform enables customers to take a course on any computer.

Adaptable, compact accommodation

The most important advantage of m-Learning is the ability to change learning schedules. Students are not restricted to a given actual climate, a certain transportation channel, or a predetermined number of periods for undergoing preparation and training. Understudies will update their insight base with a no time to waste premise by using the most current breakthrough to prep for meetings or introductions.

Opportunity, force, and choice: m-Learning students can choose where, when, and how they will think. The new variety of possibilities involves internet, interactive self-guided, downloaded online learning, and computer-based learning. Learning offers new levels of opportunity, and also the ability to take control over learning designs. Students will access authoritative capacities, download classes, and survey their learning experience through a learning the executives framework with only a PDA, mobile gadget, PDA, or then again crossover tool. M-Learning offers a proficient path for students to get to key data and boost their time.

Shared Learning

Shared Learning: Both the capacities of cell phones and their wide setting of utilization add to their penchant to cultivate cooperation. Cell phones can undoubtedly speak with different gadgets of the equivalent or comparative sort, empowering students to share

information, records and messages. They can likewise be associated with a common information organization, further improving opportunities for correspondence. These gadgets are too commonly utilized in a social environment, thus connections and coordinated effort will in general happen through the gadgets as well as at and around them too. Investigation into community learning with cell phones is incredibly educated by past research on PC Upheld .

2.2.2. LOCAL STUDIES

At the University of the Philippines – Open College (UPOU, depicted in segment 1.4), asset based course improvement has been supported since 2003. It into the fundamental course improvement model in 2007 when the college moved to Moodle, an open source VLE which takes into account the production of courses including computerized assets and online exercises straightforwardly on the Moodle framework. New courses are being created under an asset based course improvement agreement, and personnel appointed to educate (called personnel in control or FICs) effectively created courses are urged to enhance the print modules (or supplant them inside and out, whenever justified) with open instructive assets (OER). FICs are likewise urged to coordinate on the web conversation gatherings, and they are allowed to utilize open source Web devices, for example, media sharing locales and Electronic conferencing applications, to upgrade course conveyance. The effect of setting on instructing approaches is particularly evident where educating and learning are non-adjointing. Among others, the present circumstance makes student investigation "before any educating and learning happens" (Naidu, 2007, p. 248) fundamental.

As per Naidu, while in study hall based educating "[a] extraordinary arrangement about student attributes, their learning styles, and ways to deal with study is regularly assumed" (p. 248), in DE it is basic that student ascribes, abilities, and requirements be taken into account in media determination, plan for association, and evaluation and criticism.(Naidu, 2007; Shearer, 2007). Nonetheless, calculating in student attributes is moreover especially testing in DE where there is an extraordinary variety of students and learning settings (Benson and Samarawickrema, 2009; Naidu, 2007; White, 2005).

DE PROGRAM (Small single-mode distance education)

Three student related variables are particularly significant in DE program and course configuration: access, student self-governance, and association (Shearer, 2007). The worry for access is key to DE, a method of schooling that looks for definitely to make learning openings available to "all people, paying little mind to their age, sex, area, what's more, individual situation" (White, 2005, p. 166). Utilization of Web innovations both empowers and obliges this mission by expanding the scope of DE projects while additionally restricting their range just to those students with admittance to the Web. The expanding accessibility of PCs and the Web even in non-industrial nations might be narrowing this specific computerized partition. Nonetheless, it is imperative to likewise consider the impact on student access of the calculated necessities of specific e learning plans, like data transfer capacity for getting to a VLE, participating in coordinated exercises, and getting to and utilizing specific substance configurations, for example, video documents Clara and Fitri, 2007).

Chapter 3. Methodology

The researcher will use Agile Methodology for software development in developing the Augmented Reality Mobile Application. Agile software development refers to a set of iterative software development approaches in which requirements and solutions change via cooperation amongst self-organizing cross-functional team development. Furthermore, the researchers recommended three stages: Pre-Production Phase or Planning.

In here, the researcher will be planning and identifying the components needed for the development of the augmented reality application:

1. Production Phase or Development

In here, the researcher are going to be planning and identifying the components needed for the event of the mobile application.

- Identifying what the researcher are going to be developing
- Checklist of goals to be done or needed within the development

2. *Production Phase or Development*

In here, development or the execution of the pre-production phase will commence.

- Do the task supported the checklist from the pre-production phase
- Implementation are going to be done by using the Unity Engine.
- Testing of the augmented reality mobile application during this phase so that to be able to know if there will be an improvement or need to be fixed.
- The respondents of the application will be taking a survey during this phase.
- In the algorithmic side, image tracking will be used for the augmented application.

3. *Post-Production Phase or Closure*

In here, development and testing are done and is predicted to be deployed to the respondents. The researchers' proposed agile methodology's three phases will be applied in this research of developing the augmented application.

3.1 Research Design

The research design that will be utilized in this research is qualitative research design that the researchers will going to use. Research method that will be applied in making of this study to find out if the use and effectiveness of AR (Augmented Reality) is useful and helpful for elementary teachers and students through questionnaires and surveys.

3.2. System Application Design

System Application design for Mobile Marker Based Augmented Reality

Applications.

Mobile Marker-Based AR System: Despite the fact that mobile AR is still in its early stages of development, there has been a lot of worry and discussion about marker-based AR because it is one of the most trustworthy types of AR systems.

Video stream from the

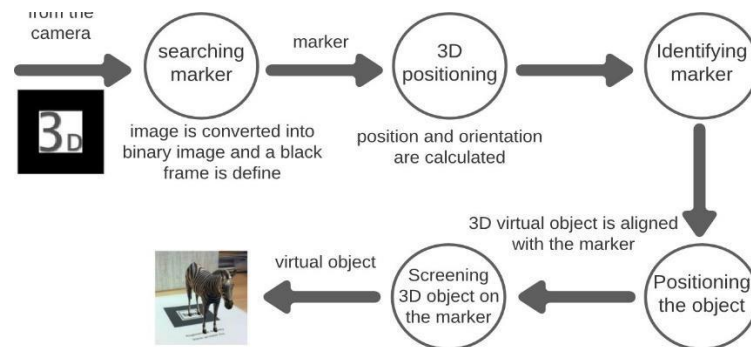


Figure 3. Mobile Marker- Based Augmented Reality Application Design

Excellent marker is easily and consistently identifiable under all conditions. Variations in luminance (brightness) are easier to perceive than differences in color. Machine vision techniques are used to determine chrominance (color). This is owing to the cameras' poor automated white balance: colors register wrongly, and an object's color in the image may shift depending on what else is in the frame, for example. Furthermore, the lighting alters the apparent colors of the objects, making color recognition difficult. Naturally, the greater the contrast in the higher the luminance, the easier it is to notice objects. Black and white markers are ideal in this regard.

Using the identified marker, the system should also be able to determine the camera's pose. Four known locations are enough to calculate a camera's posture uniquely, and the simplest shape to get them is a square. Furthermore, Corner point placements are generally resilient since they can be calculated as intersections of edge lines.

3.3 Marker Based Procedure

The first purpose of a marker detection procedure is to identify probable marker outlines. Markers, and then to deduce the locations of the corners of the markers in the image. Furthermore, the detecting system must determine that it is a marker and decode its meaning identity. Finally, the system computes the pose based on the data from the sensors found the marker's location.

The following are the steps in the basic marker detection procedure:

1. Obtaining Images the capture of an intensity image
2. Preprocessing image processing on a low level distortion line detecting/fitting detection of the marker's corners
3. Detection of possible markers and elimination of evident non-markers are quickly rejected if they are obvious. For possible markers, a rapid acceptance test is used.
4. Marker identification and decoding matching templates (template markers) encoding (data markers).
5. The marker pose is calculated. Pose estimation of markers for a correct pose, iterative pose calculation is used.

3.4 Vuforia

Vuforia is an appropriate tool for AR development; it supports iOS, Android, and Windows UWP and Android. When combined with Unity, it represents one of the best cross-platform solutions. The Vuforia, according to their official website, A multitude of sorts of recognition are possible with the platform. Developers can use Vuforia to bring synthetic things to life by using recognition and animation tracking of a larger number of items Vuforia Target Manager also works a picture enhancement that, in turn, leads to the optimization of the performance of the application It also detects and

tracks photos that have been predefined by the user that allow interaction within the AR world

USER

3.5. User Case diagram

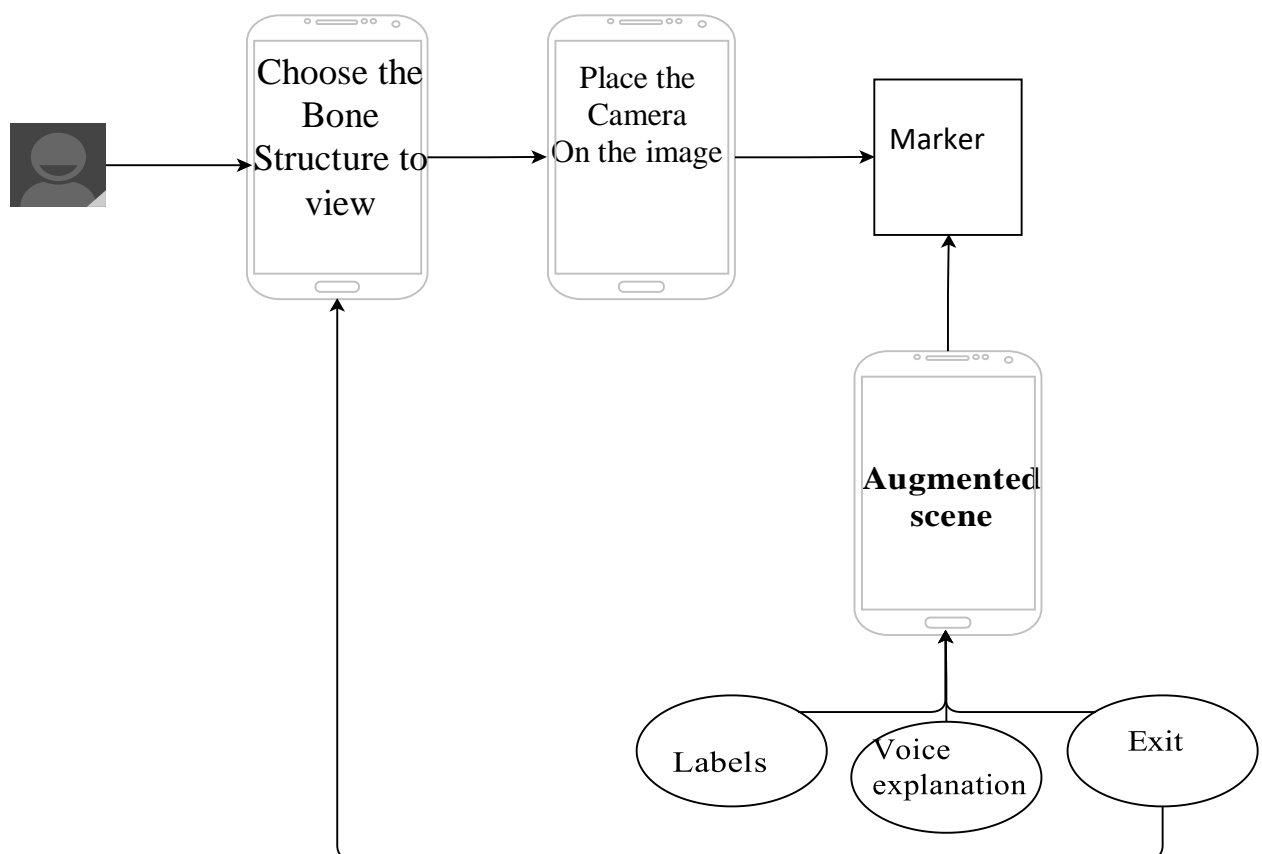


Figure 4. User case diagram

When you first click the first button, then click again to disappear, then the next button, then exit, then the x button, then the audio will return and the speaker will play when you click it for second time.

3.6. Research Materials

3.6.1 Software

In this section, the software/s below will be used for the implementation of the augmented reality application:

- **Unity Game Engine** – is a gaming engine used for the developing the mobile Augmented Reality.
- **VS Code** – is an editor used for the mobile application Augmented Reality script.
- **Blender-** is a 3D creative suite free and open source that covers almost all aspects of 3D design.

3.6.2 Hardware

In this section, the hardware below will be used for the implementation of the augmented reality application:

- **Laptop**
- Processor: intel core i3 4.0ghz

- Operating System: Windows 10 Pro
- Ram: 4gb ram,
- **Android**
- API level: 26
- Operating system: Android 8.0 Ram: 2gb

3.7. Research locale

The research study will be conducted only in selected elementary school here at Zamboanga City, specifically at Baliwasan District. Baliwasan District has six (6) elementary schools. The Central school is adjacent to the City Schools Division office. The nearest school from City Hall is three (3) kilometers while the farthest is twelve (12) kilometers, this are, the Baliwasn Central School and Southern Support Command School respectively.

3.8 Population and Sampling

The participants of this research are the elementary students and teachers who will be using the Augmented Reality (AR) Mobile Application develop by the researchers. The sampling method that will be used is Purposive sampling because it will be difficult to use other sampling techniques because of the existing Pandemic and Quarantine status of the City which varies every now and then. Students who have stable internet connection will be the target respondents of this study. It is because elementary students are strictly not allowed to go out of their respective houses thus purposive sampling is

the proper sampling method to be used in this study. This is to ensure that respondents will answer the questionnaire and will use the Augmented Reality Application.

Teachers teaching Grade 5 and Grade 6 will be able to help evaluate and distribute the AR develop by the researchers because they are the one who knows who among their students have stable internet connection.

3. 9 RESEARCH INSTRUMENT

The research instrument has two parts. Part 1 is about the basic information of the respondents. Part 2 which comprises of sixteen (17) questions, the first eight (8) questions is answerable by yes or no, while the next five (5) questions would answer the effectiveness of the AR. This will also answer if the participants finds it useful and effective in their learning.

The survey will be conducted through online using google form where the elementary teachers and students will be given the link.

The survey questionnaire will be uploaded to the internet using google forms to acquire details from the respondents; the elementary teachers and elementary students.

3.10. VALIDITY OF INSTRUMENT

To ensure the validity of the instruments that will be used in this research, the researchers will seek the help of our professors from ICT Department before it will be distributed to the respondents. They will be consulted for the appropriateness of questionnaire. Their comments will be integrated to the questionnaire.

3.11. DATA GATHERING PROCEDURE

The researchers will request class advisers of Grade 5 and Grade 6 of the Baliwasan District to identify their students who have the stable internet connections. Once identified that this students have stable internet connections, the parents will be informed that their child is one of the respondent of the study. If the parents will agree, then the AR apps will be forwarded to them for the use of their child. If the parents will disagree, then their child will not be included in the study.

When the AR Apps will be uploaded to the student t and he/she starts to use it, the survey questionnaire will be uploaded to web and they will be given the link of the survey questionnaire for then to answer, this is to ensure that all identified respondents will answer the questionnaires.

3.12. Statistical tool

The researchers will use an appropriate statistical tool for this study, namely chi-square for the questions with answers of yes or no. For questions 6 – 17, which has the Likert scale the mean will be used. It will also use t-test about means from within

school. ANOVA will be used to determine the significant effect from among six (6) different elementary schools of Baliwasan District.

Chapter 4 Results and Discussions

This chapter discusses the result of the study.

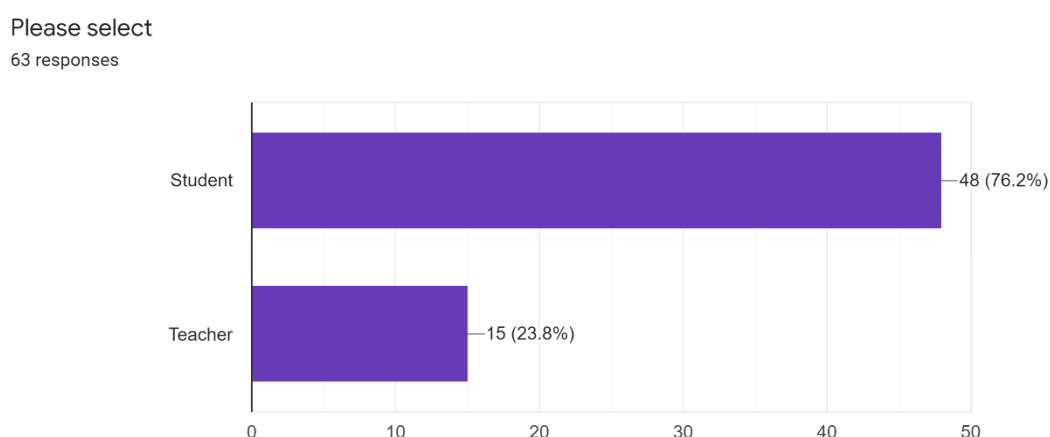
4.1 Samples and Population

The questionnaire was uploaded using google form. There were sixty-three (63) respondents who answered the questionnaire that has seventeen (17) questions. Of the sixty-three (63) respondents, 23.8% or fifteen (15) were teachers and 76.2% or forty-eight (48) were students. The table below shows the distribution of the respondents. Of the sixty-three (63) respondents, only sixty (60) give their schools as follows seventeen (17) from BCS, eleven (11) from San Jose Gusu, sixteen (16) from EBCS, six (6) from GSMS, thirteen (13) from SSC, and three (3) from JSES. It was observed that all respondents were from Baliwasan District, Zamboanga City Schools Division. 61.9% or 69 of the respondents were males and 38.1% or 24 respondents were females.

The age of the students ranges from ten (10) years old to twelve (12) year old while the age of the teachers ranges from twenty-eight (28) years old to thirty-nine (39) years old.

37.1% or 23 respondents ages 10 years old, 22.6% or 14 have the age of eleven (11) years old, and 16.1% or ten (10) of the respondents have the age of twelve (12) years old. On Teacher-respondents, three (3) or 4.8% have the age of twenty-eight (28), four (4) or 6.5% percent have the age of twenty-nine (29), while ages thirty (30), thirty-five (35), thirty-seven (37) and thirty-nine (39) have one (1) respondent each and two (2) respondents each for ages thirty-two (32) and thirty-three (33)

Table 4.1 Distribution of Respondents according to category



4.2 On-line Learning

All respondents have gadgets such as android cellphone and computers at their home, and they know how to use the gadgets. 95.2% or sixty (60) of them have internet access at home while the remaining 4.8% or three of them do not have internet at their home. All teacher-respondent have internet access at their home.

When ask if they enjoy on-line learning 90.5% or fifty-seven (57) of the respondent do not enjoy on-line learning while only 9.5% or only six (6) of them enjoy the on-line learning. Students' data showed when categorized in terms of sex, the Chi-squared (χ^2) test gives the computed value at 0.091 which is less than 3.48 with alpha (α) at 0.05 level of confidence. This implies that there is no significant difference on the answers between male and female students. This show that students do not enjoy on-line learning.

The table below shows the result of the survey for question number 4 when categorized as student in terms of sex.

Table 4.2 Responses of students

	Male	Female
Yes	2	1
No	26	19

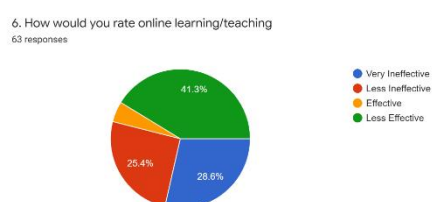
When data was subjected to chi-squared (χ^2) test the result showed no significant difference. However, the result for teachers is significant with computed chi-squared (χ^2) of 6.233. This show that teachers enjoy teaching on-line. But, when data was grouped together, the result is no significant. Their responses when asked if they play video games, 90.5% say yes and 9.5% answered no.

Table 4.3. Responses of Teachers

	Male	Female
Yes	3	4
No	8	0

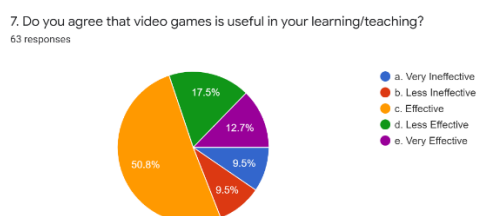
28.6% of respondents rate online learning very ineffective, 25.4% less ineffective, and 41.3% less effective, and only 4.8% or only three (3) of the respondents say online learning as effective.

Table 4.4 Pie chart on rating online learning



50.8 percent of the respondents says that video game in learning or teaching is effective, 17.5 percent says that it is less effective, 12.7 percent of respondents say it is very effective, while both 9.5 percent of respondents says it is less ineffective and very ineffective

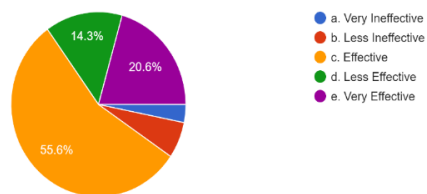
Table.4.4 Pie Chart on how useful the video games in learning or teaching



55.6 percent of the respondents says they believe that if they will be given a related application in learning or teaching is effective, 20.6 percent says that it is very effective, 14.3 percent of respondents say it is less effective, while 6.3 percent of respondents says it is less ineffective while 3.2 percent says it is very ineffective.

Table.4.5 Pie Chart that believes on the given related app

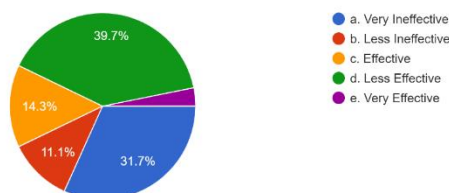
8. If you are given an apps that is related to teaching/learning do you believe it will be?
63 responses



39.7 percent of the respondents says they are focused on their learning or teaching it is less effective 31.7 percent says that it is very ineffective, 14.3 percent of respondents say it is effective, while 11.1 percent of respondents says it is less ineffective while 3.2 percent says it is very effective.

Table.4.6 Pie Chart on how the respondents are focus on this pandemic on their learning/teaching.

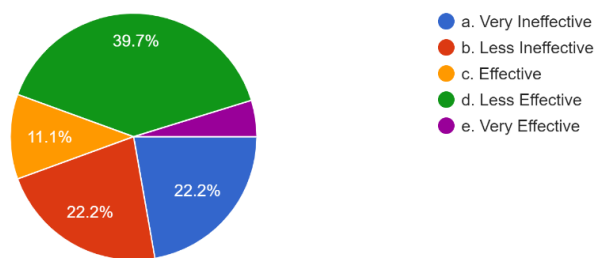
9. How focused are you on your learning/teaching during this pandemic?
63 responses



39.7 percent of the respondents says they are focused on their learning or teaching it is less effective 31.7 percent says that it is very ineffective, 22.2 percent of respondents say it is less ineffective, while 11.1 percent of respondents says it is effective while 4.8 percent says it is very effective.

Table.4.7 Pie Chart on how the respondents are doing well on this pandemic on their learning/teaching.

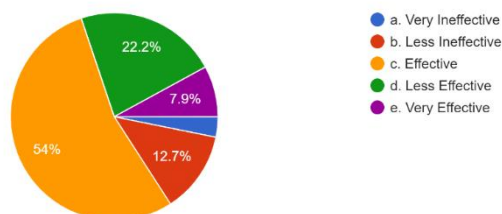
10. How sure you are that you do well in your learning/teaching during this pandemic?
63 responses



54 percent of the respondents says that ANILAB is effective, 22.2 percent says that it is very effective, 12.7 percent of respondents say it is less ineffective, while 7.9 percent of respondents says it is very effective while 3.2 percent says it is very ineffective in terms of entertainment.

Table.4.8 Pie Chart on rating the ANILAB in terms of entertainment

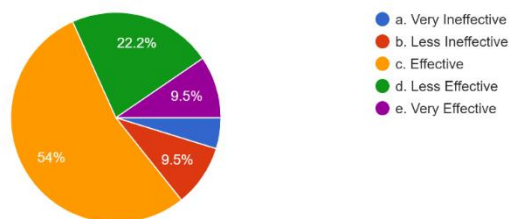
11. Rate the video/Anilab in terms of entertainment.
63 responses



54 percent of the respondents says that ANILAB useful as additional material in their study/teaching is effective, 22.2 percent says that it is less effective, both 9.5 percent of respondents says it is very effective and less effective while 4.8 percent says it is very ineffective

Table.4.9 Pie Chart on how useful the ANILAB as an additional material in teaching/study is

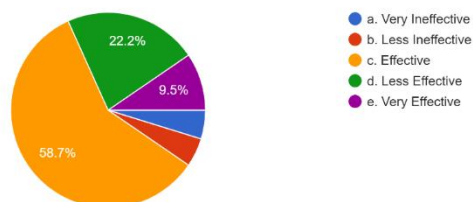
12. Is the video/Anilab useful as an additional material in your study/teaching?
63 responses



58.7 percent of the respondents says that ANILAB enhance their knowledge in science is effective, 22.2 percent says that it is less effective, both 9.5 percent of respondents says it is very effective and less effective while 4.8 percent says it is very ineffective

Table.4.10 Pie Chart on how ANILAB enhance their knowledge in science.

13. Did the video/Anilab enhance your knowledge in science?
63 responses

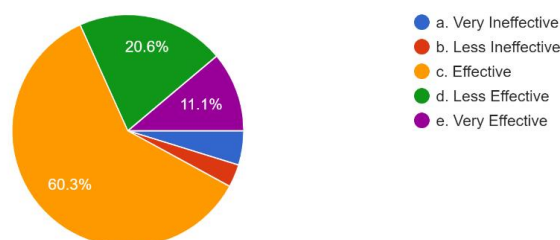


60.3 percent of the respondents says that ANILAB that is useful as an additional material in their study/ teaching in science is effective, 20.6 percent says that it is less

effective, while 11.1 percent says it is very effective while 4.8 says it is very ineffective and 3.2 percent says it is less ineffective

Table 4.11. Pie Chart on how ANILAB useful as an additional material in their study/teaching in science

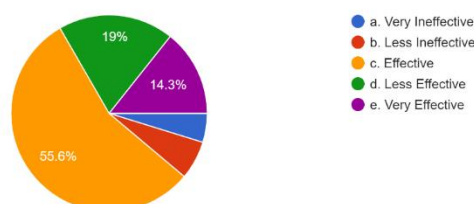
14. Is the video/Anilab useful as an additional material in your study/teaching in science?
63 responses



55.6 percent of the respondents rated the ANILAB in terms of educational content is effective, 19 percent says that it is less effective, while 14.3 percent says it is very effective while 6.3 says it is less ineffective and 4.8 percent says it is very ineffective.

Table 4.12. Pie Chart rating on how ANILAB in terms of educational content.

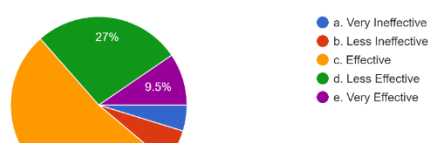
15. Rate the video/Anilab in terms of educational content.
63 responses



52.4 percent of the respondents rated the ANILAB in terms of systems functionality is effective, 27 percent says that it is less effective, while 9.5 percent says it is very effective while 6.3 says it is less ineffective and 4.8 percent says it is very ineffective.

Table 4.13. Pie Chart rating on how ANILAB in terms of systems functionality.

16. Rate the video/Anilab in terms of systems functionality.
63 responses



Chapter 5

Conclusion and Recommendation

5.1. Conclusion

- The Anilab AR (Augmented Reality) Mobile Marker based Application help both teachers and students, thus students were be able to understand their science lesson particularly on human skeletal system with less supervisions of teachers.
- For the teachers, the Anilab help them in teaching their students on the human skeletal system with less contact or face to face teaching.

5.2 RECOMMENDATION

- The researchers recommended that future researchers will add more topics about science. Specifically, the entire elementary science to be covered by the Anilab.
- It is also recommended that the future researchers, to enhance the features of the Anilab Application.

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APPENDICES

Hello Respondent,

The researchers of this survey are students from Western Mindanao State University in Institute of Computer Studies taking BS Computer Science and is currently working on a thesis entitled “Anilab: an Augmented Reality mobile app used to assist teacher in educating elementary students”

The study aims to propose a mobile gaming application that will be helpful for elementary students and teachers. This proposal also aims to determine

if the playing mobile game application is effective in teaching and learning lessons.

Rest assured that your answers in this survey will be treated with the utmost confidentiality and will only be used for analysis and interpretation for academic purposes.

Your participation will be highly appreciated for it will contribute to the realization of this proposal. Thank you very much for your time and support. Please click on the "Next" button to proceed to the questionnaires.

Survey Questionnaire

Part 1. Basic Information

Name (Optional)_____

Name of School: _____Age: _____
_____ yrs old Please check: Student ☐ Teacher:
☐ Gender: Male ☐ Female ☐

INSTRUCTION: Please read carefully and choose the most appropriate answer to the question.

1. Do you have gadgets at home such as android cellphone, computer and tablets,

a. YES b.NO

2. Do you know how to use this gadgets?

a. YES

b. NO

3. Do you have internet access at home?

a. YES

b. NO

4. Do you enjoy online learning (for students)/teaching (for teachers)? a.
Yes b. No

5. Do you play video games?

a. YES

b. NO

6. How would you rate online learning/teaching?

a. Very Ineffective

b. Less Ineffective

c. Effective

d. Less Effective

e. Very Effective

7. Do you agree that video games is useful in your learning/teaching?

a. Very Ineffective

b. Less Ineffective

c. Effective

d. Less Effective

e. Very Effective

8. If you are given an apps that is related to teaching/learning do you believe it
will be

a. Very Ineffective

b. Less Ineffective

- c. Effective
- d. Less Effective
- e. Very Effective

9. How focused are you on your learning/teaching during this pandemic?

- a. Very Ineffective
- b. Less Ineffective
- c. Effective
- d. Less Effective
- e. Very Effective

10. How sure you are that you do well in your learning/teaching during this pandemic?

- a. Very Ineffective
- b. Less Ineffective
- c. Effective
- d. Less Effective
- e. Very Effective

11. Rate the video/Anilab in terms of entertainment.

- a. Very Ineffective
- b. Less Ineffective
- c. Effective
- d. Less Effective
- e. Very Effective

12. Is the video/Anilab useful as an additional material in your study/teaching?

- a. Very Ineffective
- b. Less Ineffective
- c. Effective
- d. Less Effective

e. Very Effective

13. Did the video/Anilab enhance your knowledge in science?

- a. Very Ineffective
- b. Less Ineffective
- c. Effective
- d. Less Effective
- e. Very Effective

14. Is the video/Anilab useful as an additional material in your study/teaching in science?

- a. Very Ineffective
- b. Less Ineffective
- c. Effective
- d. Less Effective
- e. Very Effective

15. Rate the video/Anilab in terms of educational content.

- a. Very Ineffective
- b. Less Ineffective
- c. Effective
- d. Less Effective
- e. Very Effective

16. Rate the video/Anilab in terms of systems functionality.

- a. Very Ineffective
- b. Less Ineffective
- c. Effective
- d. Less Effective

- e. Very Effective

17. Rate the video/Anilab in terms of usability/usefulness as an additional learning materials.

- a. Very Ineffective
- b. Less Ineffective
- c. Effective
- d. Less Effective
- e. Very Effective

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