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DEVELOPMENT AND VALIDATION OF AUGMENTED REALITY LEARNING MATERIALS FOR SENIOR HIGH SCHOOL ALTERNATIVE LEARNING SYSTEM STUDENTS

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ABSTRACT

The primary goal of this research was to create an Augmented Reality Application as a tool or learning materials for Senior High School - Alternative Learning System (SHS-ALS). This will serve as an arcade of knowledge between virtual and real world that will create dynamic and interactive learning resources that resonate with the unique needs and interests of ALS learners, thereby enhancing their educational experience and outcomes. AR app will fill in the gap address the issues on learning materials and time constraint of SHS-ALS implementation. AR app undergone evaluation process using the ISO 25000 to evaluate the AR app based on the sample respondents of the application. Finally, the AR app was put through a series of test cases the focused on the features, functionality, performance, interactivity and compatibility of the App. During the development process of the AR application the hybrid agile model and rapid prototyping process was used to convert the designed into an application. Unity programming language and Vuforia were used to setup the AR app.

The sample included 167 SHS-ALS students and 90 SHS-ALS teachers from the division of Calamba city which used raosoft online calculator. To assess and verify the device

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consistency and the quality of use of the AR app, a self-constructed survey and evaluation questionnaires consistent with the ISO 25000 program quality model were used. Statistical methods used to analyze the collected data included percentage and weighted mean.

Result divulged that the AR app had been successfully developed using unity and Vuforia applications. The AR app was created based on its intended functions. The AR app was able to play embedded videos on the application once the target image scanned. The result of application evaluation using the ISO 25000 disclosed that the AR app was high in terms of functionality suitability, Performance Efficiency, interactive capability and compatibility.

In the light of the findings, the study proposed the following recommendations: school administrators should prioritize teacher training and ensure equitable access to devices for students to fully utilize the AR app. Regular feedback collection from both teachers and students will help monitor and improve the app's effectiveness; teachers should integrate AR into their lessons, promote student collaboration, and be adaptable in their teaching approaches; Students should engage actively with the app, provide feedback, and collaborate with peers during AR activities to enhance their learning experience; future researchers should focus on conducting long-term studies to assess the impact of the AR application on student engagement and learning outcomes. They should also examine the app's accessibility for diverse learners, including those with disabilities, and investigate how teachers adapt to using the technology in their classrooms.

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INTRODUCTION

Addressing the challenge of providing quality education to marginalized communities is a paramount goal for governments worldwide, and it remains particularly demanding in countries with a high level of socioeconomic disparity. The Philippines, like many other nations, faces the perennial issue of an increasing number of out-of-school youth at the end of each academic year. To combat this problem, the Department of Education has implemented various initiatives, with the Alternative Learning System (ALS) standing out as a key strategy.

The Department of Education, through its curriculum offerings, envisions the development of holistic and lifelong learners capable of making meaningful contributions to both the nation and the global community. The Alternative Learning System, in alignment with these objectives, specifically targets out-of-school youth and adults (OSYA) learners. The aim is to equip them with basic and functional literacy skills while providing equivalent pathways to complete their basic education, as outlined in the Policy Guidelines on the Implementation of Alternative Learning System for junior high school.

The impact of the Alternative Learning System on addressing the escalating number of out-of-school youth and adults is substantial. By offering flexible and accessible learning opportunities, ALS becomes a beacon of hope for those who could not afford to complete their

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basic education through conventional means. The program not only addresses the immediate challenge of illiteracy but also lays the foundation for broader societal benefits.

The success of the Alternative Learning System hinges on its ability to create an inclusive and adaptive learning environment. Tailoring educational approaches to the unique needs of out-of-school youth and adults, ALS recognizes the diverse circumstances that might hinder traditional educational participation. This flexibility contributes to the effectiveness of the program, allowing it to reach learners who might otherwise be left behind.

Moreover, the implementation of ALS is not solely about academic achievement; it also places emphasis on developing life skills that empower learners to navigate real-world challenges. By fostering a holistic learning experience, ALS aims to produce individuals who are not only academically proficient but also equipped with the resilience and adaptability needed for personal and professional success. Therefore, these young learners should be supported all throughout in their academic endeavors.

Since 2016, the Philippines was implemented the K12 program as the result the new policy and guidelines for educational system was changed. It leads to additional 2 years of school year for the learners. With this the guidelines of educational systems were change also to adopt with the trends of global needs. The learners will be considered as high school graduates once they finish the 6 years program of the high school, 4 years for junior high and 2 years for senior high school. Because of this the ALS program of the DepEd will have to intensify so that the learners can be able to finish the program and can continue to college

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level if they wanted to pursue the study. As part of this the department of education was implemented the enhance ALS program for SHS so that the learners from ALS junior high program, graduates of old curriculum, and adults' individuals can enroll in tertiary level.

Last school year (2023-2024), the division of Calamba City immediately implemented the offerings of ALS-SHS as a response to the mandates of the Department of Education on its different senior high schools. In the first year of implementation, there were almost 75 OSYA enrolled in the first implementation of the programs, taking different strands, they selected. This school year (2024-2025), there are 294 OSYA enrolled in different senior high schools in the Calamba City division. Since the ALS programs is new to SHS implementations there is a continues planning and persists a significant challenge in insuring the effectiveness of SHS ALS implementation. One of the aspects that need to address for this program is the learning materials for the SHS ALS students. Imagine a student who attended classes once in a blue moon only because of their scheduled setup due to many of them are working, lack of financial to support their study or any economic issues that they are facing. This can be a difficult part of the implementation of the programs. Providing modules in softcopy or hardcopy is not enough to impart the learnings to the students. A simple module cannot talk, possible it discusses the learning on writing way, but in the digital age most of the learners they are prepared more if the modules have image to support the lessons, a video that can explain what they would be needed to understand and an interactive and responsive approach that they can enjoy while answering the activities. Instructional materials must have to

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considered and ensure that this will be in accordance and relevance to the SHS curriculum as basis of the SHS ALS guidelines and must be cater the diverse learners.

In this digital age, technology has emerged as an effective tool for the learning process of SHS ALS that can transform education and addressing the needs of diverse learners. Augmented Reality (AR) has caught the attention of the researchers to be used in developing learning materials. Imagine a catalog of lessons, a series of modules with a touch of AR applications, that can turn the learning materials such as modules into interactive and responsive way of learnings.

AR has an ability to create immersive and interactive learning process by setting virtual environment through digital content onto the real environment. By integrating AR technology into education materials, educators can enhance engagement, provides further discussion about the topics while in a distance setup, cater diverse learning styles and preferences. It also makes the learning materials responsive and entertaining while learners are doing their lesson. Not only that, since the SHS ALS program was under monitoring and pilot implementations Augmented Reality is one of the key tools to the problem encountered on the learning materials, especially the diverse setup of the ALS learners.

The proposed research seeks to address to fill in the gap and address the issues on the learning materials and time constraint of the program. So, the researchers aim to develop Augmented Reality (AR) learning materials specifically designed for Senior High School ALS students that will serve as an arcade of knowledge between virtual and real world. By

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harnessing the potential of AR technology, it will create dynamic and interactive learning resources that resonate with the unique needs and interests of ALS learners, thereby enhancing their educational experience and outcomes. The created AR learning materials will undergo evaluation phases to explore the product quality of the developed AR learning materials in the SHS ALS context. By collecting feedback from the experts and conducting pilot testing with ALS students, it will validate the efficacy of AR as pedagogical tool for enhancing learning outcomes and engagement among SHS ALS students.

Research Objectives

This study primarily aimed to Develop and Validate Augmented Reality (AR) Learning Materials for Senior High School Alternative Learning System Students, Specifically, it aimed to:

1. develop augmented reality learning materials for Senior High School Alternative Learning System students;
2. evaluate using the ISO 25000 software product quality of the augmented reality learning materials for Senior High School Alternative Learning System Students in terms of:
    a. Functionality Suitability
    b. Performance Efficiency

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c. Interaction Capability

d. Compatibility

3. Is there a significant difference in the evaluation of the two groups of respondents on functionality suitability, performance efficiency, interaction capability and compatibility of the AR learning material application?

4. propose an enhancement of the developed augmented reality learning materials based on the evaluation.

Scope and Limitation

The study focused on the development and validation of augmented reality (AR) learning materials tailored for Senior High School students in the Alternative Learning System (ALS) program. These AR materials aimed to enhance the educational experience by delivering interactive and immersive content aligned with the ALS curriculum. Learning materials, including videos, images, and discussions integrated into the application, were sourced from subject matter experts and underwent validation by authorized authorities. The developed AR app was evaluated using the ISO 25000 software quality model to assess functionality suitability, performance efficiency, interaction capability, and compatibility.

The development process utilized a hybrid agile approach with rapid prototyping, employing iterative and incremental methods to create prototypes that allowed users to test

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interactions with the application. For evaluation, the system was reviewed by 167 SHS-ALS students and 98 teachers using the ISO 25000 model, black-box testing, and case tests. The AR learning materials functioned offline and were designed to be installed on Android-based mobile devices and tablets.

The AR application served solely as a supplementary teaching tool, without features for recording or grading student performance. It operated exclusively on Android systems, and its content focused on specific curriculum-relevant topics rather than comprehensive coverage of all subjects. The app's performance varied depending on the specifications of the devices used, highlighting potential limitations in accessibility and functionality.

Review of Literature

Augmented Reality (AR) is defined by its ability to merge the physical and digital worlds through computer-generated elements such as graphics, sound, and GPS overlays. Central to its functionality are technologies like Simultaneous Localization and Mapping (SLAM), which allow devices to recognize and track the physical environment, enabling accurate integration of digital objects. SLAM's real-time mapping capabilities ensure that AR applications can adjust to user movements and environmental changes seamlessly. Devices such as smartphones, tablets, and AR glasses act as conduits, making AR an accessible tool for enhancing real-world interactions (Youdale, 2024).

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AR is transforming various industries by enhancing engagement and interaction. In education, it offers immersive learning experiences, such as virtual explorations of historical sites or interactive lessons in science. For instance, students can observe the water cycle using AR applications like the Merge Cube, creating hands-on opportunities in virtual environments. Similarly, healthcare professionals leverage AR for diagnostics, surgical training, and patient education. In gaming, AR integrates the real world into gameplay, as seen in popular applications like Pokémon GO. Retailers use AR to improve customer experience by enabling users to visualize products, such as furniture or clothing, in their own spaces before making purchases. This adaptability demonstrates AR's versatility and its ability to foster creativity and problem-solving skills (Edutopia, 2024).

Despite its transformative potential, AR faces challenges, including the high costs of development and hardware, as well as the need for precise environmental mapping. Additionally, intuitive user interface design is essential to ensure accessibility. However, the growth of mobile technologies and 5G connectivity is expected to address these limitations, making AR more affordable and widely available. Future developments in AR are likely to enhance its applications in education, healthcare, retail, and beyond, driving innovation across sectors and making immersive experiences an integral part of daily life (Interaction Design Foundation, 2024).

The study by Hung, Chen, and Huang (2017) investigated the effectiveness of augmented reality (AR) in enhancing children's learning. Using an experimental design, 72 fifth-graders were divided into three groups, each assigned a different learning material: a

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picture book (2D graphics), physical objects (3D models), and an AR graphic book (3D virtual objects). The materials were used to teach the names and characteristics of six bacteria. Learning performance was assessed based on error rates, content retention, and user satisfaction at intervals of 1, 2, and 3 minutes. Results revealed that the AR graphic book provided the most engaging and effective hands-on learning experience, enabling children to better explore and understand the subject matter. Follow-up interviews highlighted AR as the preferred medium, with children expressing higher motivation and satisfaction compared to traditional materials. This research underscores AR's potential as a valuable educational tool, effectively combining learning and motivation while serving as a compelling alternative to conventional methods like textbooks and physical models. For practitioners, this suggests incorporating AR to boost engagement and accommodate diverse learning preferences, especially when traditional materials fail to capture students' interest.

The study by Piatykop et al. (2021) explored the application of augmented reality (AR) in early literacy, focusing on a newly developed AR app for teaching the Ukrainian alphabet, numbers, and animal sounds. This app created using Unity, C#, and Vuforia, leverages 3D visualization and auditory elements to make learning interactive and engaging. The study compared existing AR applications and highlighted how this specific app enhances the learning process by immersing children in a composite real-and-virtual environment. The findings showed that the AR app significantly improved children's interest, self-efficacy, and retention of new material, particularly in memorizing letters and numbers. Teachers and parents noted that AR helped sustain children's attention, reduced learning time, and made lessons more

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enjoyable. These results affirm AR's potential to enhance early literacy by combining interactive experiences with educational content, making it a promising tool for young learners.

RESEARCH METHODOLOGY

This part reviews the design and the flow of the AR learning material application. It contains varied design step of the system namely as Development Process, Construction Pattern, Tools and Equipment, Resources and Time Allotment used in the process. With the use of the appropriate techniques and methodologies, the proponents were able to develop a concrete pattern of construction and development of the system.

Project Concept:

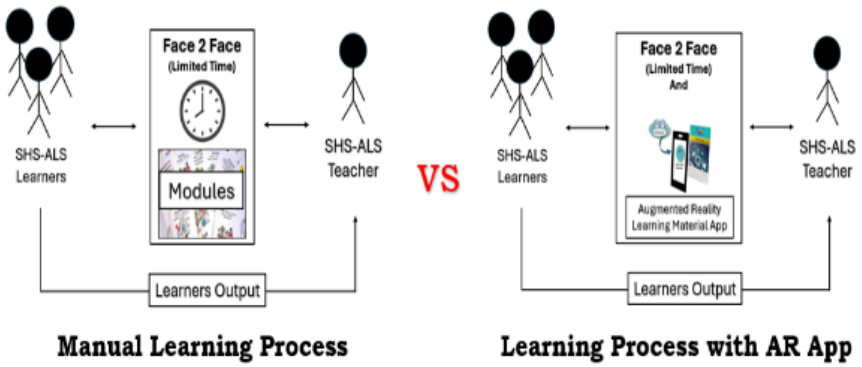

Figure 1. Manual vs AR App Learning Process

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Figure 1 shows the manual process of teaching practice of the teachers and learning process of SHS-ALS students. uses a manual and traditional process for creating, developing, and disseminating learning materials. Since SHS-ALS have limited time to attend school they were not able to learn some of the lesson on the subjects. While the teachers who handled them experience difficulties in terms of implementation of the process, difficulties to monitor the students learning and also difficulties in preparing learning materials.

With the develop AR learning materials app both teachers and SHS-ALS will benefit from it and become experienced an interactive and ease way of learning process. This AR app used unity and Vuforia application to develop the AR learning materials then it was render into an Application Programming Interface (API) which will be installed to the android smartphone or tablet. Using this AR app and smartphone/tablets the students will just scan the image on the learning materials then the videos and activity will be seen on the device.

Design and Development Process

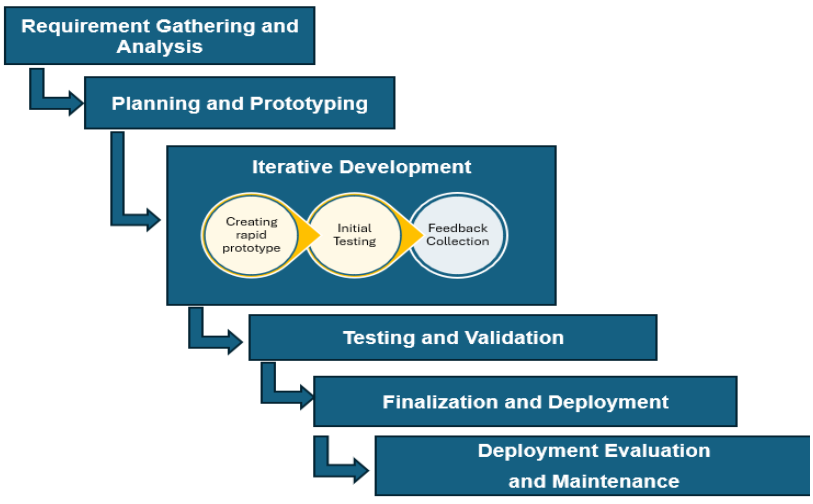

Figure 2. Hybrid Agile model with Rapid Prototyping

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The researchers used the Hybrid agile model with rapid prototyping specifically using iterative and incremental system development method for the development of the proposed project, because the researcher believe that it can provide the fastest and most convenient way of planning for the project. Additionally, the researcher also believes that it is the most appropriate and most applicable developmental tool to be used in the proposed project mentioned.

In this approach the first phase of the model was requirement gathering and analysis which were collaborated with educators, ALS curriculum experts in order to define the goals, key topics and core interactions for the AR learning materials.

The iterative and incremental development paradigm for software engineering focuses on the ability to design a project on a process of iteration to complete the required system. The proposed project chunk into small parts of functionality, requirements for every function and undergone a series of testing and evaluation before the new function is integrated on it.

The Hybrid Agile Model with Rapid Prototyping development shown in figure 2 as the system development approach in the project. The first part of the AR development is the Requirements Gathering and Analysis Phase in which all the requirements where analyze and identify the target projects. In this phase, the information will be gathered by the researcher through questionnaire, Interviews, document analysis such as related studies and other sources will analyze in order to create a plan for the development of the proposed AR application which fits with need of the school as it follows also a certain standard. This phase is very important as it signals the beginning of the project. Without this phase, the researcher

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will not be able to continue the development of the project. Planning and Prototyping was the second phase of the development process, in this stage creating a sample prototype of the project was developed.

The iterative and incremental portion of the model covers the analysis and design of the system to be develop, implementation process in which the finish small part of the projects in implement and it will proceed to testing and evaluation of the finish part of the system. In the part of Analysis and Design, researcher will focus on the actual design of the Augmented reality application. This includes the image target, videos, and functions that will complete the development of the AR application. This also includes the design of the user interface to make sure the user-friendliness of the proposed system to users. In the implementation phase the proposed AR application develops and implements the theoretical paradigm and background easily. In this phase the design presentation will translate into an artificial language that result in instruction could be executed by the computer and software application to be used on the project.

Testing and Evaluation phases, in these phases the computer hardware and software development will be used as a key checkpoint in the overall process of the proposed AR application to determine whether the objectives are being met. Testing is required to ensure the AR application quality and that it will not create errors during run time, especially when it will be used. The researcher will used Black box testing is a technique of testing in which the tester is oblivious to the AR application, functionalities and user interface. Black box testing will be done by the Teacher, IT and students. Once it was accepted in the process of testing

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and evaluation the iteration will continue, so the next functionality will be subjected to the analysis and design, implementation, testing and evaluation. This process will continue to iterate until all the required functions are meet. The last part is deployment phase, where the whole AR application is ready to use.

Testing and Evaluation Plan

One of the most important parts of developing an educational learning app is the testing and evaluation. Through this phase, the functionality and usability of applications met the users' standards. Before the AR learning material application finally duplicated, deployed, and used by the SHS-ALS students and teachers, the bugs and errors experience and found during the pilot testing were addressed to minimize the AR app failures using a series of the testing every time the AR app updated. The following testing technique in the entire development of the prototyping of the AR app First, was the Black box testing. This a technique of testing without having any knowledge of the interior workings of the application. The tester was oblivious to the system architecture and does not have access to the source code. Typically, while performing a black-box test, a tester interacted with the system's user interface by providing inputs and examining outputs without knowing how and where the inputs worked.

With regards to evaluation plan, this was done under the supervision of the principals in all High School Integrated School that offers SHS-ALS program. The researcher used

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random sampling to get the number of respondents which were also took part in the evaluation process.

The researchers used the survey questionnaire for the improvement of the develop augmented reality learning material app which guided them to setup the AR app if there were features to be changed or to be included. The questionnaire was distributed to the randomly selected SHS-ALS students, SHS-ALS teachers and School Head. With this questionnaire, the developer and researcher were able to identify if the AR app met the needs of the students and teachers as well as by the school. Also, it will help to develop and to reflect on the functionality, efficiency, interaction capability and compatibility of the AR learning material app.

Respondents of the Study

The Distribution of the Respondents of the Study shown in Table 2. This research dealt on the development and validation of Augmented Reality Learning Material application using unity and Vuforia app. The focus of this research was to provide an augmented reality learning material app which will be serve as the supplemental tool for the teaching and learning process of all senior high school alternative learning system students in the division of Calamba city. With this goal in mind, the researcher used a sample 167 out of 294 students who enrolled in SHS-ALS program and 90 SHS-ALS teachers sample out of 117 for the school year 2024-2025.

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Table 1

Distribution of the Respondents of the Study

Name of School	Total number of SHS-ALS Students	Total Number of Student Respondents	School Staff (Teaching ALS SHS Department	Total Number School Staff Respondents
Palo Alto Integrated School	37	20	3	2
Calamba Integrated School	28	16	20	15
Calamba Bayside Integrated School	52	30	15	12
Majada In Integrated School	21	12	14	11
Lecheria Integrated School	47	27	12	9
Integrated School of Lawa	12	7	10	8
Camp Vicente Lim Integrated School	59	33	30	23
Punta Integrated School	12	7	3	3
Makiling Integrated School	26	15	10	7
Grand Total	**294**	**167**	**117**	**90**

The sample number of respondents was computed through raosoft online sampling calculator. These 167 SHS-ALS students and 90 SHS-ALS teachers were coming from different secondary school that offers SHS-ALS program. The obtained number of students is presented in Table 1.

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Statistical Treatment of Data

The following statistical tools and test were used in the study to validate the functionality suitability, performance efficiency, interaction capability and compatibility.

Likert Scale. This was used to interpret and gauge the evaluation of the respondents in the AR Learning Application. The numerical scale, mean score ranges and its verbal interpretation is specified here.

Table 2

Likert scale, description and range distribution

Numerical Scale	Mean Range	Verbal Interpretation
4	3.25 – 4.00	Strongly Agree (SA)
3	2.50 – 3.24	Agree (A)
2	1.75 – 2.49	Disagree (DA)
1	1.00 – 1.74	Strongly Disagree (SD)

Mean Percentage Score.

This was used to determine the functionality suitability in use of AR Learning Application of both students and teacher - respondents.

Weighted Means and Composite Means. These were used to determine the result of the system evaluation using the ISO 25000 as per evaluated by the respondents.

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Data Gathering Procedure

Prior to data gathering, the researchers made necessary coordination to concerned school. Data gathering permits was obtained from the management before the conduct of the actual survey to the teachers and students who served as the respondents of the study. The study maximized the use of Google form for an online survey. Personal surveys are likewise done to the respondents to ensure complete and high percentage of retrieval. During the actual survey, the respondents are given enough time to answer all the items in the questionnaire. Then these questionnaires were retrieved, and data were tabulated and followed by the computation and interpretation through the help of professional statistician.

RESULTS AND DISCUSSION

1. Development and Validation of Augmented Reality Learning Materials Application.

Figure 3. SHS-ALS AR Learning App

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Figure 3 depicts the SHS-ALS Augmented Reality Learning Application. According to the diagram, the AR application was built using the unity and Vuforia application. The Vuforia was intended to create database of all target image and will embed on the unity application on where the programming and setting up the whole project. Videos and Learning contents were integrated along with the image target in unity which turned into an application which installed on Android phone. Using the target image the videos and contents embedded on the application were virtually play once the target image was scanned.

2. Evaluation of the Augmented Reality Learning Application evaluate using the ISO 25000 in terms of Functionality Suitability

The evaluation of the respondents on the Augmented Reality Learning Material application in terms of functionality suitability is shown in Table 3. It can be gleaned in Table 3 that both groups of respondents strongly agreed that the AR application can work offline or without internet connection which leads the user to use the application in a remote area or in any place even there is no internet. It gained a weighted mean of 3.70 from the students and 3.67 from SHS-ALS teachers.

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Table 3

Evaluation of the Respondents on the Augmented Reality Learning Material Application in terms of Functionality Suitability

The Augmented Reality Learning Material Application…	SHS-ALS Students		SHS-ALS School Teachers	
	Weighted Mean	**Verbal Interpretation**	**Weighted Mean**	**Verbal Interpretation**
1. provides a feature needed to achieve the learning goals.	3.66	Strongly Agree	3.61	Strongly Agree
2. content aligned and relevant with the lessons.	3.64	Strongly Agree	3.63	Strongly Agree
3. can work offline or without internet connection.	3.70	Strongly Agree	3.67	Strongly Agree
4. meet my need to understand effectively the lesson.	3.65	Strongly Agree	3.66	Strongly Agree
5. functions provide the support that I need to my study.	3.66	Strongly Agree	3.67	Strongly Agree
Composite Mean	**3.66**	**Highly Functional**	**3.65**	**Highly Functional**

Legend: 3.25-4.00=Strongly Agree; 2.50-3.24=Agree; 1.75 – 2.49=Disagree; 1.00-1.74=Strongly Disagree.

In addition, the two groups of respondents strongly agreed that the system is highly functional in providing the support that the respondents need to study using the AR application and this is evident on the weighted mean of 3.66 from the students and 3.67 from the SHS-ALS teachers. This may mean that bot the students, teachers, and students find that the function of the application can runs well.

The weighted mean of 3.65 and 3.66 from the students and SHS-ALS teachers respectively indicates that they strongly agreed that the AR application can play videos embedded on the target images that can use by the students to their classes. This finding is true since both teachers, students and teachers are able to use it well during their trials in the system.

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On the other hand, the weighted mean of from the student 3.66 from the students and 3.61 from SHS-ALS teachers showed that both respondents strongly agreed that the AR application can provides a feature needed to achieve needed learning goals of the respondents.

Lastly, the weighted mean of 3.64 from the students and 3.63 from the SHS-ALS teachers illustrated that the respondents strongly agreed that the AR application that the content of the protoptye aligned and relevant to the lessons. This only shows that the respondents find it easy to understand the lesson on the sample AR module.

Generally, the Augmented Reality Learning Material Application in terms functionality suitability is highly functional as proved by the composite mean of 3.66 from the students and 3.65 from the SHS-ALS teacher- respondents. This can be inferred that the system is ready for use as it is highly functional and suitable to use.

Table 4

Evaluation of the Respondents on the Augmented Reality Learning Material Application in terms of Performance Efficiency

The Augmented Reality Learning Material Application…	SHS-ALS Students		SHS-ALS Teacher	
	Weighted Mean	**Verbal Interpretation**	**Weighted Mean**	**Verbal Interpretation**
1. can load quickly on the device once it starts to open.	3.44	Agree	3.51	Strongly Agree
2. can work smoothly and responsive on devices.	3.67	Strongly Agree	3.59	Strongly Agree
3. can performs very well and did	3.55	Strongly Agree	3.54	Strongly

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not crashing during use.				Agree
4. can uses the device's resources efficiently (i.e. battery.	3.35	Strongly Agree	3.46	Strongly Agree
5. can load the videos and images quickly once the target image is scanned.	3.65	Strongly Agree	3.59	Strongly Agree
Composite Mean	**3.53**	**Highly Efficient**	**3.54**	**Highly Efficient**

Legend: 3.25-4.00=Strongly Agree; 2.50-3.24=Agree; 1.75 – 2.49=Disagree; 1.00-1.74=Strongly Disagree.

The evaluation of the respondents on Augmented Reality Learning Material Application in terms of performance efficiency is shown in Table 4. As showed in Table 4, the two groups of respondents strongly agreed that the AR application can work smoothly and responsive on devices with the highest weighted means of 3.67 from the student and 3.59 from the SHS-ALS teachers. This only shows that the system is efficient in playing videos while scanning the image target.

In addition, both groups' respondents strongly agreed that the AR application can be load the videos and images quickly once the target image is scanned at it has the highest weighted means of 3.65 from the student and 3.59 from the SHS-ALS teachers. This only shows that the system is efficient in playing videos while scanning the image target.

The weighted mean of 3.55 from the students and 3.54 from the SHS-ALS teachers both two agreed that while testing the protoptye the respondents did not experience any error or crashing.

On the other hand, the two groups of respondents, the students and the SHS-ALS teachers just agreed with the obtained weighted means of 3.44 and mark as agreed and 3.51 respectively that the AR application in term of providing quick response upon turning on the

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devices and AR application must need to enhance. This may mean that the AR application installed on the low version of android phones that leads the application slow during the booting part.

Moreover, the low weighted means of 3.35 from the students and 3.46 from the teachers indicated that they just agreed that the system is quickly shown on the screen when the buttons are pressed. Perhaps, it is because it takes a little longer time to pop up on screen when the function buttons are pressed. This also implies that there a need to enhance the efficiency of this particular feature.

To sum up, the system's quality in terms of performance is efficient as proved by the composite means of 3.53 from the students and 3.54 from the teacher- respondents. This can be inferred that though the performance of the system is efficient, some operation features are needed to be enhanced to increase its efficiency level.

Table 5

Evaluation of the Respondents on the Augmented Reality Learning Material Application in terms of Interaction Capability

The Augmented Reality Learning Material Application…	SHS-ALS Students		SHS-ALS Teacher	
	Weighted Mean	**Verbal Interpretation**	**Weighted Mean**	**Verbal Interpretation**
1. allow the user to easily interact with learning materials.	3.70	Strongly Agree	3.69	Strongly Agree
2. is easy to use and easy to navigate.	3.66	Strongly Agree	3.66	Strongly Agree
3. can respond well to inputs and image scanning.	3.62	Strongly Agree	3.66	Strongly Agree
4. can be easy to access and use the features of the application.	3.77	Strongly Agree	3.77	Strongly Agree

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5. can be engaging interactions and useful for learner learning experiences.	3.80	Strongly Agree	3.79	Strongly Agree
Composite Mean	**3.71**	**Highly Interactive**	**3.71**	**lighly Interactive**

Legend: 3.25-4.00=Strongly Agree; 2.50-3.24=Agree; 1.75 – 2.49=Disagree; 1.00-1.74=Strongly Disagree.

The evaluation of the respondents on Augmented Reality Learning Application in terms of Interactive Capability is presented in Table 5. The data disclosed that both groups of respondents strongly agreed that the AR application can be engaging interactions and useful for learner learning experiences with a weighted mean of 3.80 from the students and 3.79 from the SHS-ALS teachers. This result shows that during the testing of the protopye AR application provides an engaging interaction experiences and useful for the learning experience. The weighted means of 3.77 from both group of respondents the students and teachers revealed that the AR application can be easy to access and use the features of the application.

Meanwhile, both groups of respondents strongly agreed that the system maintains a fixed standard of output with weighted means of 3.79 from the students and 3.69 from the SHS-ALS teachers. This may mean that the AR application allow the learners to interact with the learning materials using the AR applications. This evident on the trial made by the respondents. Furthermore, the respondents strongly agreed that the AR application during their testing process it shows that the application is easy to use navigate with a weighted means of 3.66 for both SHS-ALS students and teachers.

Summing up, the AR application in terms of Interaction Capability is highly interactive as proved by the composite means of 3.71 both from the students and SHS-ALS teacher-

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respondents. It can be inferred that the AR application is highly Interactive while the learners studying their lessons.

Table 6

Evaluation of the Respondents on the Augmented Reality Learning Material Application in terms of Compatibility

The Augmented Reality Learning Material Application…	SHS-ALS Students		SHS-ALS Teachers	
	Weighted Mean	**Verbal Interpretation**	**Weighted Mean**	**Verbal Interpretation**
1. is compatible with smartphone or tablet with android Operating System.	3.67	Strongly Agree	3.69	Strongly Agree
2. can works well on smartphones, tablets and android OS.	3.67	Strongly Agree	3.69	Strongly Agree
3. did not experience any issues such as freezing, crashing while using the AR application.	3.67	Strongly Agree	3.67	Strongly Agree
4. can adjust well in different screen sizes and resolutions of the devices.	3.65	Strongly Agree	3.70	Strongly Agree
5. can work well in any sizes of image target across the learning materials.	3.65	Strongly Agree	3.69	Strongly Agree
Composite Mean	**3.66**	**Highly Compatible**	**3.69**	**Highly Compatible**

Legend: 3.25-4.00=Strongly Agree; 2.50-3.24=Agree; 1.75 – 2.49=Disagree; 1.00-1.74=Strongly Disagree.

The evaluation of the respondents on the Augmented Reality Learning Material Application in terms of compatibility is shown in Table 6. As depicted in Table 6, the two groups of respondents strongly agreed that the augmented reality application can run in most commonly use devices such as phone and tablet with the highest weighted means of 3.67 and 3.69. Also, both two groups agreed that the AR application can work well on the smartphones

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and tablet with 3.67 and 69. This only shows that the AR application is compatible to android smartphone /tablet devices as tried by the users.

Likewise, the respondents strongly agreed that the AR application while the respondents test the AR were did not experience any issues such as freezing, crashing while using the AR application which got the weighted means of 3.67 both the group. This also indicates that the AR application compatibility in on the android smart phones.

The weighted means of 3.65 from the students and 3.70 from the school SHS-ALS teachers disclosed that both groups of respondents strongly agreed that AR application can adjust in different screen sizes and resolutions of the devices. This finding is true since the AR application works when tested with different android smartphones.

Lastly, the quite low weighted means of 3.65 from the students and 3.69 from the SHS-ALS teacher – respondents indicated that they strongly agreed that the AR application can work well in any sizes of image target across the learning materials. Perhaps, low weighted mean may suggest that others have not tried running the application devices.

As a whole, the system's quality is highly compatible as proved by the composite means of 3.66 from the students and 3.69 from the SHS-ALS teacher- respondents. It can be deduced that the AR application is compatible to be used in android device such as smartphones or tablet.

3. Significant Difference in the Evaluation of the Two Group of Respondents on the Functionality Suitability, Performance Efficiency, Interaction Capability and Compatibility of the AR Learning Material Application.

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Table 7

Significant Difference of Responses in the Evaluation of the Two Group of Respondents on the Functionality Suitability, Performance Efficiency, Interaction Capability and compatibility

Variables	Z-statistic*	p-value**	Interpretation
Functionality Suitability	0.016	0.988	Not Significant
Performance Efficiency	-0.006	0.995	Not Significant
Interaction Capability	0.000	0.999	Not Significant
Compatibility	-0.155	0.877	Not Significant

Table 7 shows the Z-statistics and p-values across all variables suggest no statistically significant difference in the perceptions of teachers and students regarding the AR app's functionality suitability, performance efficiency, interaction capability, and compatibility. Since all p-values exceed the typical threshold of 0.05, both groups likely share similar evaluations on the app's attributes.

The findings suggest that the AR learning app provides a consistent and effective user experience for both teachers and students in ALS settings, as evidenced by the lack of significant differences in their evaluations of functionality suitability, performance efficiency, interaction capability, and compatibility. This uniformity indicates that the app's design effectively meets the needs of both groups, potentially reducing the need for additional

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customization and facilitating a smoother, more universal adoption process. By satisfying critical ALS educational requirements without favoring one user group over the other, the app fosters a supportive digital learning environment that could enhance overall engagement and confidence in digital tools within ALS programs. Additionally, this alignment provides a data-driven foundation for scalability, enabling developers to concentrate on core improvements and broader deployment rather than adjusting functionalities for different user preferences. This consistency in perception not only streamlines the integration of the app but also encourages further adoption of digital resources, paving the way for a modernized, inclusive approach to alternative learning.

4. **Proposed Enhancement of the Developed Augmented Reality Learning Materials based on the Evaluation.**

    1. The high functionality suitability ratings across all evaluated aspects suggest that the AR application meets essential user needs, particularly its offline capability, which is crucial for accessibility in remote areas. This feature allows both students and teachers to use the application effectively without requiring internet access, supporting equitable learning opportunities for ALS students in under-resourced locations. Given that the app successfully supports video playback, aligns content with lessons, and addresses learning goals, it provides a well-rounded educational experience. However, to further enhance its effectiveness, a recommended development focus could be on integrating interactive assessments or quizzes that offer immediate feedback. This

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enhancement could reinforce learning outcomes by allowing students to self-evaluate their understanding of the material in real-time, which would be especially beneficial in remote, self-paced learning environments. This feature would deepen engagement and support teachers in assessing student progress, making the app a more comprehensive educational tool.

2. This result indicates that the app effectively supports an interactive learning experience and provides a reliable tool for both students and teachers. Additionally, it was found that minimal issues with errors or crashes, suggesting that the app is stable and well-suited to support the learning environment without significant interruptions. However, start-up responsiveness and delayed response when pressing buttons highlight areas for improvement, particularly on lower-end devices. This limitation may impact accessibility, as slower response times could discourage use or disrupt learning flow, especially in low-resource settings where older devices are more common. To enhance the application's performance, particularly in start-up and button response, developers could implement optimizations to reduce load times and improve responsiveness on older Android versions. Potential strategies include simplifying code, minimizing background processes during start-up, or enabling adaptive loading based on device specifications. Additionally, optimizing UI elements for faster response when pressing buttons or links could improve user experience, ensuring a more seamless, uninterrupted interaction with the app. By focusing on these enhancements, the app

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can better serve ALS students and teachers by providing a more efficient, accessible, and universally responsive learning tool.

3. The findings suggest that both students and SHS-ALS teachers perceive the AR application as highly interactive and engaging, effectively creating an immersive learning environment. The app is also user-friendly, with both groups finding it easy to access and navigate. These results indicate that the app is well-designed to facilitate smooth interactions, making it an effective tool for learning. Additionally, the app maintains consistent output, ensuring reliable interactions that enhance the overall learning experience. This reflects the app's potential for broad use across diverse educational contexts. However, while the app has demonstrated high interactive capability, there remains room for improvement, particularly in ensuring that the interactivity is maintained across different devices and varying network conditions. One proposed enhancement could involve integrating more diverse interactive features, such as gamified elements or real-time feedback mechanisms, to increase engagement further. Additionally, optimizing the app for performance on a wider range of devices, including lower-specification smartphones, could ensure that all learners, regardless of access to high-end technology, can benefit from the interactive capabilities. This would also help address potential gaps in access and ensure that the app can be universally used in both urban and rural settings. By expanding the interactivity features and

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optimizing the app's functionality for diverse user contexts, the app can become an even more powerful tool in enhancing the learning experiences of ALS students.

4. The findings suggest that the AR application is highly compatible with commonly used devices like smartphones and tablets, providing a smooth user experience across various screen sizes and resolutions. Both students and SHS-ALS teachers reported no issues with freezing or crashing, indicating that the app performs well on Android devices. The app's adaptability to different device types further enhances its accessibility, making it suitable for diverse learning environments. However, the slightly lower ratings regarding image target compatibility across different device sizes suggest that there may be occasional limitations in how the app interacts with various target images or devices, particularly those with different screen resolutions. To improve the app's compatibility and address the minor concerns raised about image target compatibility, developers could focus on further optimizing the app's ability to adapt to a broader range of device specifications and screen resolutions. This could involve refining the image recognition algorithm to ensure seamless interaction with targets on devices with varying screen sizes or lower resolutions. Additionally, ensuring that the app maintains consistent performance across all types of Android devices—especially those with older or less powerful hardware—could enhance its universal usability.

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CONCLUSION

1. The prototype AR Learning Material Application has been fully developed intended for the use of the SHS-ALS teachers and their students.
2. Both the teacher and the student – respondents evaluated AR learning material application as highly functional, highly efficient, highly interactive capable, and highly compatible, therefore, ready for its implementation.
3. There is no significant difference in the perceptions of teachers and students regarding the AR learning material application's functionality suitability, performance efficiency, interaction capability, and compatibility.
4. The enhancements for the AR learning material application have been proposed based on its findings and implications.

RECOMMENDATIONS

1. School administrators should prioritize teacher training and ensure equitable access to devices for students to fully utilize the AR app. Regular feedback collection from both teachers and students will help monitor and improve the app's effectiveness.
2. Teachers should integrate AR into their lessons, promote student collaboration, and be adaptable in their teaching approaches.
3. Students should engage actively with the app, provide feedback, and collaborate with peers during AR activities to enhance their learning experience.

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4. Future researchers should focus on conducting long-term studies to assess the impact of the AR application on student engagement and learning outcomes. They should also examine the app's accessibility for diverse learners, including those with disabilities, and investigate how teachers adapt to using the technology in their classrooms.

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References:

Interaction Design Foundation. (2024). What is Augmented Reality (AR)?. Retrieved from IxDF. IEEE. (2024). AR Technology and Challenges. Retrieved from IEEE Xplore.

Hung, Y., Chen, C.-H., & Huang, S.-W. (2017). Applying augmented reality to enhance learning: A study of different teaching materials. Journal of Computer Assisted Learning. DOI:10.1111/jcal.12173.

Piatykop, O., Pronina, O., Tymofieieva, I., & Palii, I. (2021). Using augmented reality for early literacy. CoSinE@ICTERI.

Youdale, K. (2024). 7 Augmented Reality Tools for K-12 Classrooms. Edutopia. Retrieved from Edutopia.

António, Faria and Miranda Guilhermina Lobato. "Effects of using augmented reality on students' learning." Trends in Computer Science and Information Technology (2023).

Abdusselam, Mustafa Serkan and Selcan Kilis. "Development and Evaluation of an Augmented Reality Microscope for Science Learning: A Design-Based Research." International Journal of Technology in Education (2021).

Bahriah, Evi Sapinatul, Salamah Agung and Ade Irma Nur. "Development of Augmented Reality Technology-Based Interactive Learning Media in Chemical Bonding Materials." JCER (Journal of Chemistry Education Research) (2022).

Amirahma, Sabila and Novi Setyasto. "Development of Augmented Reality-Assisted Teaching Materials in Science Subjects: Solar System Topic." Jurnal Penelitian Pendidikan IPA (2024).

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ISSN: 2704-3010

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Available online at https://www.instabrightgazette.com

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Khoirunnisa, Tsania and Mohammad Ahsanuddin. "The Design of Quartet Card Game Integrated with Augmented Reality for Sharf (Morphology) Learning Media." Arabiyatuna: Jurnal Bahasa Arab (2024).

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