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Application of Augmented Reality for Independent Learning with Mobile Learning

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ABSTRACT

This study provides a thorough examination of the application of Augmented Reality (AR) in smart education, specifically focusing on markers, object recognition, and mobile content creation. It addresses the challenges faced in traditional educational methods, such as sustaining student engagement and facilitating effective knowledge acquisition. By superimposing virtual elements onto the physical world, AR offers an innovative solution to these challenges, allowing for visualization and comprehension of complex concepts in a tangible and accessible manner. The study highlights the variability in validation results reported for AR-based smart education, emphasizing the importance of cloud computing in integrating AR. Seamless content creation, upload, display, and accessibility within mobile graphics environments are identified as crucial factors. The overarching goal of this research is to address challenges and gaps in the application of AR for smart education, enhancing learning outcomes and facilitating real-time monitoring of production processes. It also aims to contribute to the advancement of infrastructure, learning processes, and overall progress in science and technology within the education sector. Employing an analytical approach, the study predicts system performance characteristics, evaluates technology application capacity, and assesses the efficacy of learning technology. This comprehensive methodology ensures a holistic exploration of the proposed AR-based education system. The principal outcomes of the study demonstrate significant innovation in smart education, with both the control and experimental groups showing substantial performance improvements. The control class exhibited a notable 52.6% increase in performance, while the experimental group showed an exceptional improvement of 69.8%. These results underscore the potential of AR in enhancing learning processes and promoting science and technology development. In conclusion, this study highlights the transformative potential of AR in smart education. By addressing validation challenges and harnessing the power of cloud computing, it provides

Keywords:

Information technology; Augmented reality; Administration students; Independent; Learning; Mobile learning

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valuable insights into the effective integration of AR and its profound impact on learning technologies. The findings strongly support the promise of AR-based learning, showcasing its ability to revolutionize education through interactive and engaging experiences.

1. Introduction

1.1 Research Background

The development of smartphone technology supported by hardware components such as cameras, Wi-Fi, and GPS, as well as mobile platform operating systems such as Android, iOS, and Symbian, is driving wide applications of various technological advances in the mobile environment. Augmented Reality (A.R.) technology integrates digital elements into the real world in real-time and follows the environment on mobile devices. Augmented Reality (A.R.) is an innovation that enhances reality with computer-generated images of some aspect (CGI), object, or even information, and allows users to interact [1]. Schema is the use of technological devices to visualize various sources of information from physical objects in the real world with virtual components [2], the reality of the virtual environment, forming a mixed reality. Most students used electronic devices such as smartphones, tablets, or computers during the technological era. A.R. has system-based features: visualization, interactivity, communication, three-dimensional graphical representation, and object recognition [3].

In addition, it plays a role in developing various activities with integrated tools to support learning at different levels of study and areas of development [4]. Implementation is not easy because there are many challenges at the academic level to control student interests and understand and adjust the use of devices in educational content. Because the content is dynamic, students are always more interested in using interactive agents in the learning process [5], an important indicator of the importance of using A.R. tools specifically for elementary students [6]. When applying technology, mechanical perspectives and the utilization of academic strategies can reduce the impact of student distraction and commit to use. Another important aspect is the level of student satisfaction with the help of A.R., in terms of advantages and disadvantages on which to base the construction of practical learning tools [7] successfully design videos using A.R., able to recognize markers and load via URL. The goal is to improve the characteristics of A.R. use tools as well as ways of generating new ideas with different applications. As a learning tool, A.R. application development is evaluated from the same subject, how to run it and show it to those who do not know. Augmented Reality applications that can be accessed via mobile can be either (online) or (offline). The advantage of the application (online) is that the presented data is constantly updated. Data is stored on servers and is called data; This type of technology is often called Cloud Computing. Cloud computing combines computer technology (calculation) and internet-based development (cloud). Computer network graphics describe the internet as a cloud. The cloud is an abstraction of the complex infrastructure it hides, just like the cloud on a computer network diagram. Cloud computing uses computational methods to present the capabilities of information technology as a service so that users can access it over the internet without knowing what is on it or having control over the technological infrastructure that supports tracking markers on servers [8,9]. After processing, the smartphone connects to a database to display images, sound, and video. A.R. is part of a virtual environment known as virtual reality (V.R.). Giving users an idea of combining the real world/object with the virtual world in the same place, for example, makes school strategies clean and healthy and is a technology that serves as a bridge between the natural world and the virtual environment by providing simultaneous interaction. A.R. can be distinguished from other technologies by collecting virtual and natural objects, providing interaction in real-time, and engaging 3D objects. Applications developed with A.R. use 3D objects, text, images, video, and animation, and these technologies provide simultaneous use. Therefore, Users can interact with objects and information. In education, A.R. interacts with virtual and tangible objects to provide natural experiences, enhance skills, and motivate active, effective, and innovative teaching, problem-solving, creativity, and student giving. Developing and implementing content for AR applications is difficult, but AR makes a significant contribution. Malicious applications are affected by light, output, and images. Students using A.R. must use multiple devices. This requires a discussion of spatial abilities, collaborative skills, problem-solving, and technology use. The paragraph highlights the increasing use of Augmented Reality (A.R.) technology in the mobile environment, particularly in the context of education. However, it mentions that the implementation of A.R. in education faces challenges at the academic level, such as controlling student interests and adjusting the use of devices in educational content. It also mentions the importance of student satisfaction and the need to design practical learning tools using A.R. The paragraph suggests that there is a need for further research to address these challenges and develop effective strategies for integrating A.R. tools in elementary education. Contribution of the Study: The study aims to contribute to the development of A.R. applications in education, specifically for elementary students. The study intends to evaluate the development and implementation of A.R. applications, focusing on how to run and present them to those who are not familiar with the technology. The study also aims to improve the characteristics of A.R. tools and generate new ideas for different applications. By addressing the challenges mentioned in the paragraph and providing insights into effective A.R. integration in education, the study intends to make a practical contribution to the field of educational technology.

In summary, the research gap in this study lies in the challenges of implementing A.R. technology in education, particularly at the elementary level. The study aims to contribute by evaluating the development and implementation of A.R. applications, improving the characteristics of A.R. tools, and generating new ideas for their applications in education.

1.2 Literature Review

1.2.1 Previous research results

The waking-up system recognizes markers in the form of input tools in the form of webcams and displays videos loaded through URLs during ideal conditions based on test results [10]. Uses AR to make 3-layered (3D) movements look more ongoing and appealing. Blender is used for building, and Qualcomm Augmented Reality (QCAR) is used on a phone running Android 2.1. This app shows the nose, larynx, bronchi, trachea, and lungs, as well as breathing systems. Students and teachers tested these results. Mobile Cloud Computing (MCC), which combines flexible registering and distributed computing in Information Technology. Versatile Cloud Computing [9] is classified as still in the beginning phases; having a further and exhaustive comprehension to decide the course of future technology is vital.

The purpose of the study is to present the background and principles of Mobile Cloud Computing, its characteristics, and current and future trends. Given characteristics, analysis of features and infrastructure of Mobile Cloud Computing shows opportunities for future research [11] discussed the combination of mobile compatibility capabilities, imaging capabilities, sensors, and network access to make pedestrian navigation aids. The study's results utilized existing powers and facilities to build an application to help users recognize the surrounding area. [12,13] discusses Markerless Augmented Reality technology in Android devices, as would be considered normal to make the execution of increased reality more productive, reasonable, and alluring, and can be utilized anyplace, whenever, by anybody without the need to print markers.

This research was carried out by designing marker-less augmented reality by utilizing the image angle feature, tracking the quality, defining image coordinates, and then displaying virtual objects on a target image (target image), on a textured six-sided box target (multi-target), and applying a virtual button in the target image.

1.2.2 Augmented reality

Augmented Reality has a few spaces of purpose, recognizing two massive kinds of parts or designs of AR. AR is an innovation that consolidates two-layered and three-layered virtual items into a typical habitat and tasks these virtual articles progressively [14,15]. Virtual article's capability to show data that can't be gotten straight by people. It makes the added practical reality a tool to aid the user's perception and interaction with the real world. The information is depicted as virtual objects helping users perform activities in the real world. The evolution of the use of markers for the benefit of natural things in the introduction of AR is shown in Figure 1.

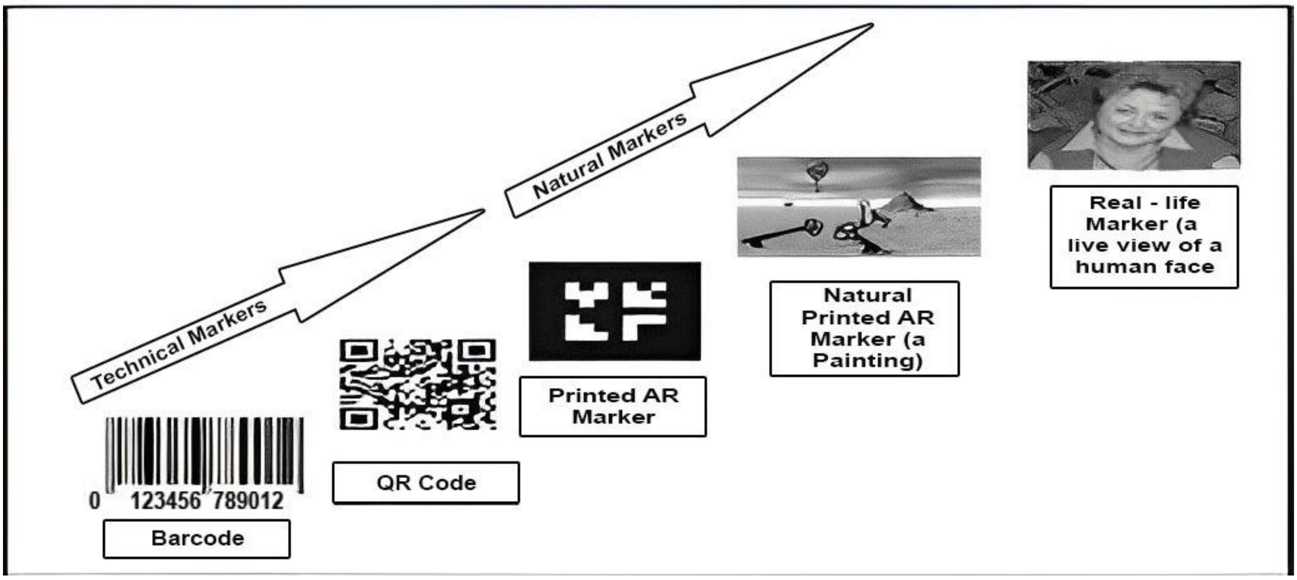

Fig. 1. Evolution Marker

How to use AR applications, starting with images of people being bullied. Then the picture is received in front of the HP (Mobile) camera, after which the camera will be taken with a pre-approved marker. If the quality matches the identification stored on the smartphone, it will be moved in 3-dimensional form. AR is an endeavour to consolidate this present reality with the virtual made through a PC, so the limit between the two is fragile [16,17]. AR is a variation of Virtual Environments (VE) or what is known as Virtual Reality (VR).

In contrast, virtual reality has a meaning where the user as a whole is inside a virtual environment. At a point when in a virtual climate, clients can't see the regular world around them. Unlike AR, which can still see the natural world, virtual objects are only displayed in the natural environment. Therefore, AR is only an addition to reality and not a substitute for [18]. There are many definitions of AR, but the general assumption is that AR permits points of view to be improved by showing virtual items by welcoming a crowd of people. Virtual objects are essential for a typical habitat. AR is, in this manner, a hybrid between the real and virtual universes [19,20] as shown in Figure 2.

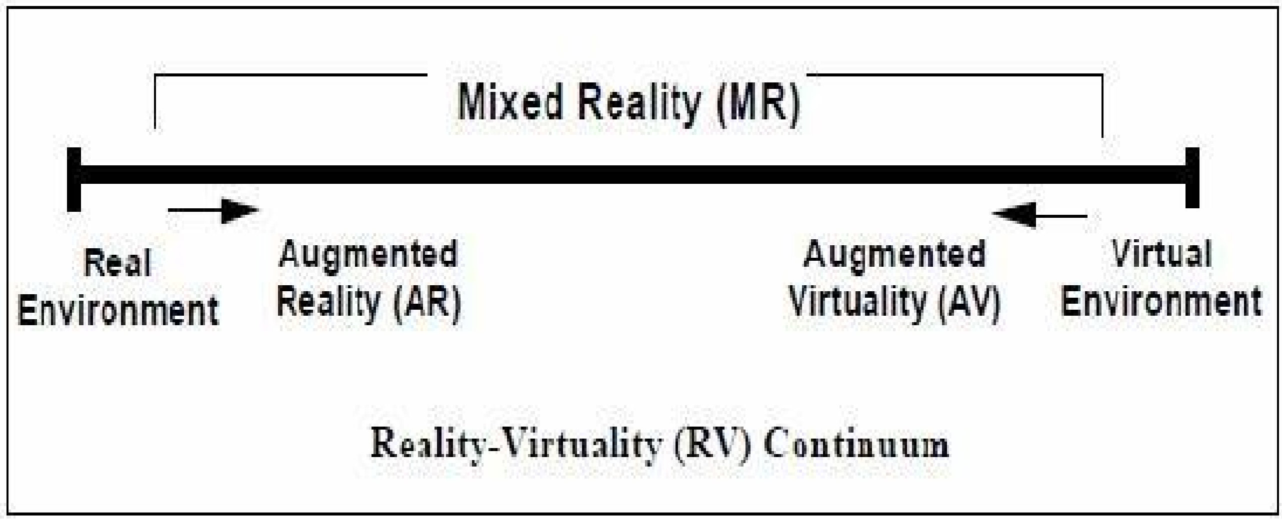

Fig. 2. Diagram Illustration Augmented Reality Source: [21]

Figure 2 shows that AR had three components: a device with a camera, software, and a trigger or activator. The camera had all kinds of devices ranging from PCs and mobile to wearables. Fitr software was a program for making the necessary additional information transformations of objects captured by the camera. Activator was an acknowledgment design treated as a determinant for the acknowledgment of an item and is utilized to interface the printed happy with the computerized one. AR can be recognized by two kinds, which use markers or pictures and by position, and find and coat layers of data of focal points, called POI (focal point) of our current circumstance, utilizing GPS (Global Positioning Systems), accelerometers, and compasses.

How to address visual data for programmed perusing rapidly and without mistakes for different parts, which used markers or pictures that work with codes. Being the direct contrast between the different organizations that exist, how it handles data, and how much information they can store. As most used up to the present day, we have QR codes (Quick Response), which implies speedy reaction codes, which are the development of scanner tags. QR is a two-layered scanner tag or 2D network created by Denso Wave Corporation in 1994 [22], which, being two-layered, reads the code in the two bearings and can contain up to 7.089 numbers, equipped for embedding pictures in their code, organized by three squares in the corners that permit the perused to distinguish the place of the QR code and a progression of boxes that encode arrangement and synchronization (as shown in Figure 3). There are different sorts of markers that, for example, QR is a two-layered plan of dabs, can be made as a particular identifier of an item. For this situation, assuming the client centres around utilizing the gadget, the outcome is data from 3D items superimposed from various points, introducing subtleties or additional items, including sight and sound applications.

Source: QR codes in AR. Anonymous Proceedings of the 8th International Conference on Virtual Reality Continuum and Industry ACM

Fig. 3. Structure of a code QR 7

1.2.3 Augmented reality on smartphones

With the hardware advancement of smartphones, AR technology is available and easily accessible. Some innovative companies offer AR "browsers" and create tools, publishing, developing, and hosting virtual content, even starting MAR. The advantage is that mobile devices have extra elements like GPS (Global Positioning System), high-detail cameras, Bluetooth/Wi-Fi associations, sound/video players, anemometers, and other tangible gadgets. Smartphone has implemented an augmented reality (MAR) mobile application. Android is a portable software that includes an operating system, middleware, an open platform, and, firstly, separating hardware from software. Create different devices running the same application and build an ecosystem for developers and consumers [23]. Android Screen is a natural application installed on iOS, Android, and Ova and can view information presented in a neat AR format as desired. Screen application, can see the weather, play games, view satellite positions, search for nearby restaurants, search for the nearest cineplex location, and search for Dixon information, as shown in Figure 4.

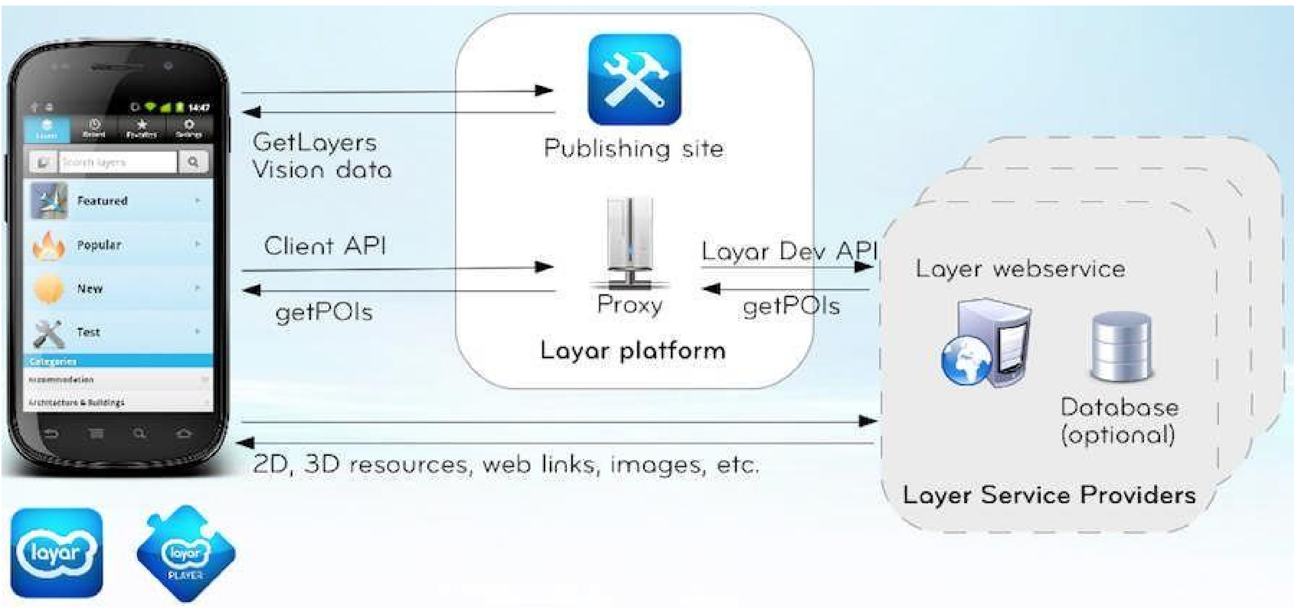

Fig. 4. Source:http://www.layar.com/documentation/browser/layar-platform-overview/

AR applications supported the acknowledgment or investigation of different cycles, for example, aircraft maintenance using mixed reality [24]. Virtual prototype development at work to simulate the configuration of management equipment that results in danger. A tool is a technician's guide during industrial equipment maintenance and training. Character confirmation is to reproduce the substance of one individual (http://oeo.wa.gov/wp-content/uploads/Toolkit-Safety-Plan.pdf). Besides, it allows users to recognize data and different aspects of the city and travel as a tourist. It will enable tourists to explore new sites of interest according to the places visited and visualize exciting details in the environment (https://live-oeo-wa.pantheonsite.io/wp-content/uploads/Discrimination-Toolkit-06.pdf).

1.2.4 Use of RA in education

AR is used in various fields of study for a dynamic and interactive learning process, in which the student can visually develop his skills and build knowledge using supporting tools implemented with reality, also produce positive outcomes for scholarly execution, make it more inspired, increment the degree of information and improve the skills of remembering or memorization in a period the shorter [25] in various fields of study, e.g., computer science, medicine, architecture, and history [26].

1.2.5 Cloud computing

Cloud Computing is a worldview of data forever put away on servers (on the Internet) and briefly on client PCs, work areas, tablet PCs, notepads, and sensors [27]. The Cloud Internet is a computing model that provides IT capabilities as a service to users via the Internet. Cloud Computing was a model that could support the "Everything as a service" (XaaS) service. So it can incorporate virtualized actual sources and virtualized foundations [28]. Devices applied to augmented reality further develop the plan interaction on structural framework parts' underlying and gathering properties [29]. A few applications used AR with the utilization of idea maps, like around science [30], the field of search, and applications that serve for tourism and learning, where visitors acquire extensive and detailed knowledge [31]. Based on kinaesthetic learning, there are applications to study the graph of concepts and their determinations to achieve speed and speed increased contingent upon any position given by the developments of clients [32].

3. Research Objectives

This This study aimed to implement the results of technological and scientific advancement as applied by third parties and their demands, as well as to provide an overview of online collaborative learning, evaluation, and learning platforms.

3.1 Research Urgency

M strives for Appropriate Technology in developing networks and links of various academic activities:

i. building collaborative research fields
ii. joint lecturer programs employee exchanges [33].

Training managers, facilitators, and instructional designers learn how to implement and evaluate online courses and how learning platforms can improve student communication and course delivery.

3.2 Augmented Reality as a Learning Methodology

The degree of learning relies upon the various strategies and capabilities that the coach created to direct the understudy accurately or the kind of hardware that adds to advancing freely; one of the procedures utilized today is gamification since it has become perhaps of the most intuitive strategy where understudies learn through games that give brilliant outcomes in learning. A.R. centres around unique collaboration to complete different kinds of functional exercises, working with the most common way of knowledge and information obtaining [34]. Understanding is achieved outwardly by communicating with pictures or sight and good substance that aids and retain, for the time being, the utilization of calculated guides of the subject substance, assisting with incorporating and interfacing parts [35]. Then again, understudies foster constructivist learning, elaborate, and experience their education. Constructivism is the premise of using R.A., alluding to learning techniques. It creates different kinds, for example, endogenous constructivism that underscores the investigation of apprenticeships during learning, exogenous constructivism with a solid accentuation on the productive understudy effectively addressing the portrayal of his insight with materials, for example, guidance sheets and rules, and persuasive constructivism in which understudies communicate with understudies and fully backed up by an educator in the material: banter meetings, the utilization of interpersonal organizations [36].

The experience of utilizing A.R. to imagine components that are not accessible in 3D configuration works with admittance to information on different means, works on customary strategies, yet cannot forsake conventional detached procedures; however, rather supplements them with innovation using reading material, planning dynamic ideas, models, explicit areas. The R.A. part gets to integral concepts to grow the data connected with the subject's substance, where every understudy extends what is demonstrated or seen as intriguing. Generally, guides track down various advantages in the utilization of expanded reality as per the reason for its display, as well as in the improvement of exercises or tasks, a kind of innovation that can be adjusted to the requests and needs of clients as shown in Figure 5.

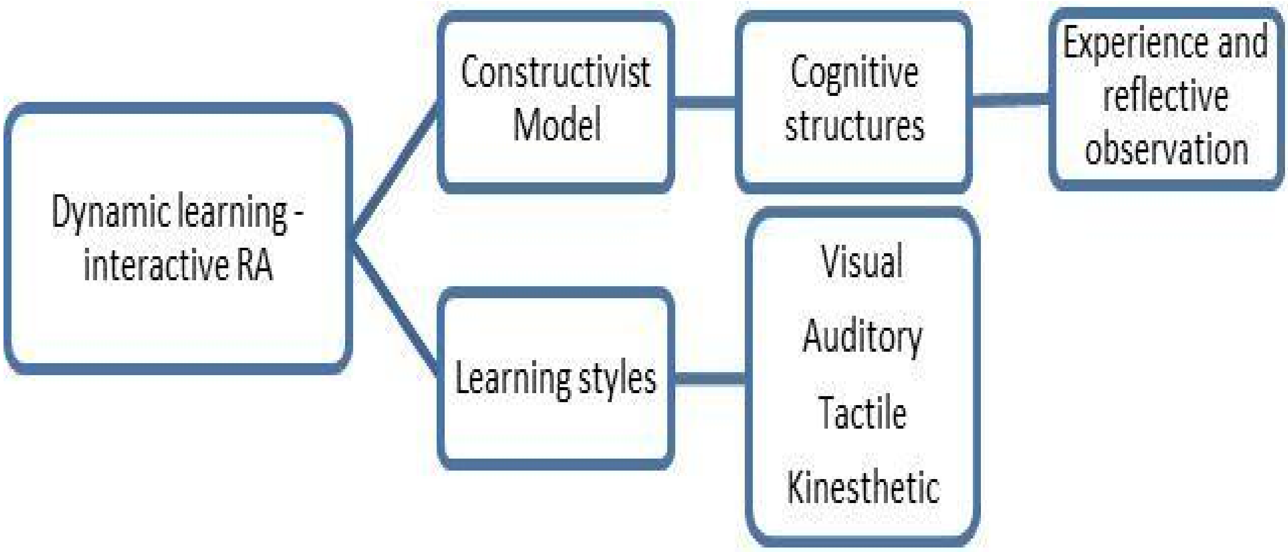

Fig. 5. Summarizes AR's fundamental characteristics that benefit the learning process

4. Methodology

The subject of the study is Mobile Augmented Reality based on Cloud Computing which is applied to learning. The stages of the research process can be seen in the process flow diagram in Figure 6.

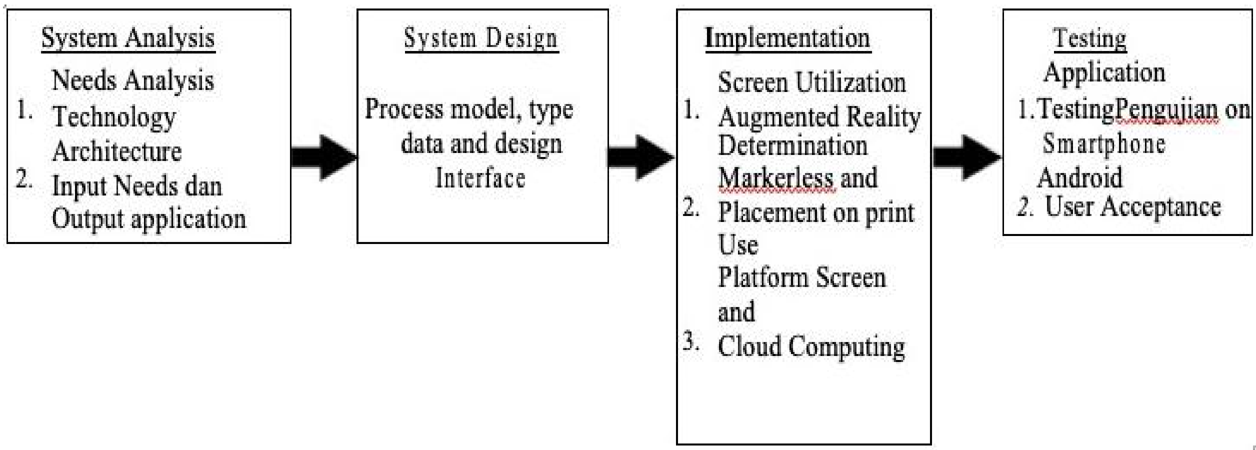

Fig. 6. Research Flow Chart

The analytical method used in this study aims to provide a more specific picture of the evaluation of system performance, technological capabilities, and learning outcomes from Augmented Reality (A.R.) applications in independent learning using mobile technology. For this reason, this study adopts a combination approach between quantitative and qualitative methods, which is carried out through detailed steps. Details of research procedures regarding participant recruitment to data analysis are discussed below

4.1 Statistical Studies

For quantitative evaluation of system performance and learning outcomes, data obtained from pre-test and post-test questionnaires will be analysed using descriptive statistics and paired t-tests. Descriptive statistics will be used to summarize the mean score, standard deviation, and distribution of participants' responses to questions related to their perception of the experience of using the A.R. application.

4.2 Qualitative Studies

Evaluation of technological capabilities and learning experiences in the context of A.R. will be analysed qualitatively through in-depth interviews with a number of participants. This qualitative data will be analysed using a thematic analysis approach. Key themes emerging from the interview will be identified and explained in more detail to gain in-depth insight into how participants perceive benefits, constraints, and opportunities in the use of A.R. in self-directed learning.

4.3 Research Design

The study used a pre-post-test approach, where each participant underwent two phases of testing. The pre-test phase is carried out before the administration of Augmented Reality (A.R.)

interventions, while the post-test phase is carried out after participants interact with the developed A.R. application

4.4 Data Flow Diagram

A data flow diagram will be compiled to visually illustrate the steps of the research process from start to finish. This diagram will detail the steps, including participant recruitment, quantitative and qualitative data collection, data analysis, and interpretation of results. This diagram will help the reader understand the logical sequence of the whole study and how the different components are connected to each other.

4.5 Detailed Research Procedure

Participants in the study were selected from a variety of educational levels and backgrounds, including school students, college students, or groups with experience in mobile technology and learning. In this process, the diversity of participants is prioritized to obtain a comprehensive view.

4.6 Data Collection

Data was collected through a variety of tools, including questionnaires, interviews, and observations. The questionnaire was used to measure participants' perceptions and levels of satisfaction with the use of A.R. in independent learning. Interviews were used to gain deeper insights into participants' experiences and their views on A.R. applications. Observations were made during learning sessions using A.R. applications to observe participant interactions and track technology use live.

4.7 Data Analysis

Data from questionnaires were statistically analysed using descriptive and inferential analysis techniques. Comparisons between pre-test and post-test were performed with paired t-tests to measure significant differences in participants' perception and satisfaction. Qualitative data from interviews were analysed using a thematic approach to identify common patterns in participants' responses. Through this combination of analytical methods, this study aims to provide a comprehensive picture of the impact of A.R. applications on self-paced learning with mobile technology.

5. Findings and Discussion

The results achieved by previous research are changes in

i. future-oriented curricula
ii. professional teaching staff
iii. new agreements on lifelong learning
iv. openness to educational innovation
v. learning using various applications to attract students.

From the presentation of learning activities with the A.R., the application is an education that can do the most common way of developing the nature of understudies created through

Appropriate Technology to support the Development of Science and Technology of Social and Cultural Development by liberating understudies from obliviousness, ineptitude, powerlessness, the trustworthiness of handicap and awful ethics and confidence. Quality instruction is brought into the world from a sound arranging framework with materials and a decent administration framework, conveyed by great instructors with quality instructive parts, particularly teachers. A.R. applications are ready to create, innovate, and network inventions to develop information technology-based science and technology products in supporting the educating and growing experience framework.

Hardware needs analysis aims to find out exactly what hardware is required to build and run the system to be made as for the recommended hardware for building and running A.R. Smartphone applications. Following the application's needs, technological devices and their supporters are needed. Such technical and supporting devices include personnel, equipment, and equipment. The minimum specifications of smartphones that can be used are:

Processor	: 600 MHz;	Display	: 256K colours,480x320 pixels
Memory Internal	: 256 MB RAM;	Memory External	: micro SD up to 32GB
Connectivity	: HSDPA, 3G, GPRS, WIFI;	Camera	: CMOS, 5.0 Megapixel
Audio	: MP3/AAC+/WAV/WMA player;	Browser	: HTML
Video	: MP4/H.264 player/YouTube Player		
Operating System	: Minimal Android OS – Verse 2.2 Froyo		

Mobile augmented reality (MAR) applications can determine what images will be used as application markers and upload content displayed on those markers as Augmented Reality information. The flow of the cloud computing-based increased reality mobile application system is depicted through the use case diagram as shown in Figure 7.

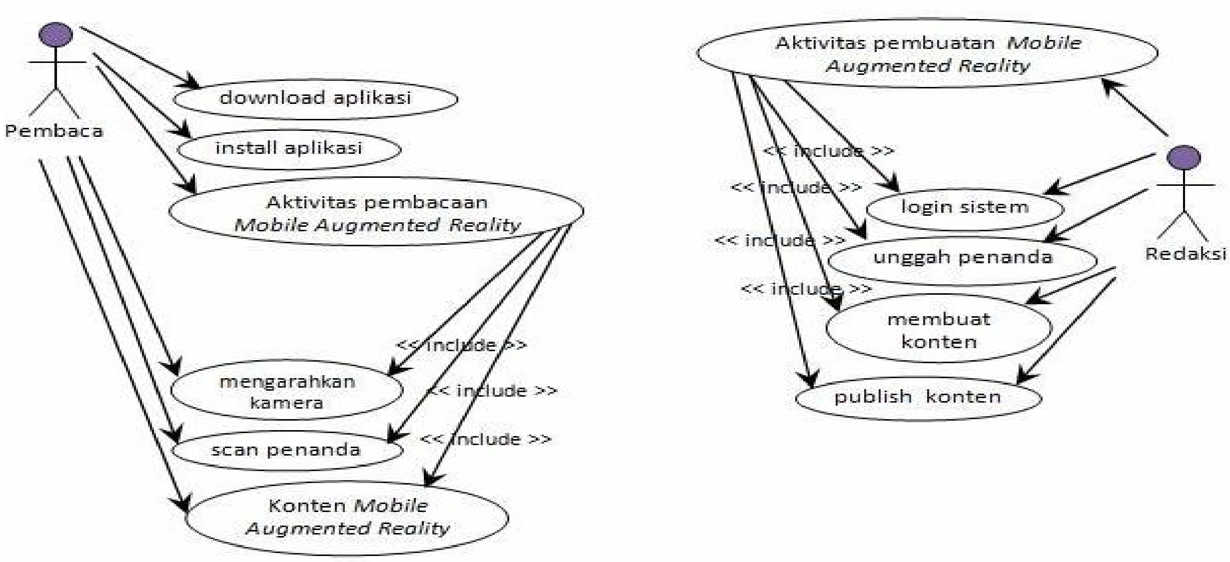

Fig. 7. Use case diagram

The first step in implementing the application is to determine, design, and create images as a marker that the image contains mobile augmented reality content. After the marker's plan and the idea were completed, the image upload and content creation on the Mobile Augmented Reality Browser Screen were uploaded. Content mobile augmented reality (MAR) can be known by the presence of a sign in the form of a Screen logo. After running the App Screen app for Android, point the camera at the image. The results and process of scanning mobile augmented reality content as mobile augmented reality marker displays virtual buttons to play the video after scanning so that the video can be played and enjoyed. A test of the system's function is conducted to determine whether it has run according to its original purpose. This test was performed on the content displayed on mobile augmented reality, which is shown in Table 1 below:

Table 1
System Functionality Testing

No	Test Scenarios	Test Case	Expected Results	Test Results	Conclusion
1	Image Scanning Markers Virtual Buttons Play	Getting Content	The App for Android Screen shows content	As Expected	Accepted
2	Video Virtual Buttons Image	Appear & Play Video	Video content goes live on Smartphones	As Expected	Accepted
3	Carousel Virtual Buttons Share FB	Image slides appear	App displays Images	As Expected	Accepted
4	Virtual Buttons Call now	FB page	The application takes the reader to the FB page	As Expected	Accepted
5		Phone Number	The application brings to be able to tell	As Expected	Accepted

5.1 Raw Data Analysis

The graph above illustrates the results of using A.R. applications in self-learning. From the graph, it can be seen that there is an increase in students' average performance scores by X% after interacting with the A.R. application.

5.2 Chart Analysis

Graph 1 illustrates the increase in self-learning experience perception score after the A.R. intervention. From the graph, we can see that the majority of participants experienced an increase in post-test scores, indicating that the use of A.R. Apps has had a positive impact on their learning experience. These results suggest that the use of A.R. applications have a positive impact on independent learning. Improved student performance shows that A.R. applications are effective in helping students understand and master subject matter. This may be due to interactive and visual elements in A.R. applications that can help students visualize complex concepts better.

5.3 Interpretation of Results and Consequences

These findings have important implications for independent learning practices. The use of A.R. technology provides new opportunities to improve learning effectiveness. Overall study participants showed positive responses to the experience of using A.R. in learning, which suggests that technology adaptation in learning contexts can motivate students to engage more actively in the learning process. The A.R. use case graph also illustrates that students have a higher level of engagement when using A.R. in learning. This suggests that the use of technology that is interactive and supports visualization can encourage higher learning motivation and improve learning outcomes. Thus, these findings support the idea that A.R. can be integrated successfully in a self-directed learning environment. The implications could stimulate further development in the development of A.R.-based learning tools, harnessing their visual and interactive potential to support better learning outcomes and encourage student participation in the learning process. Object-situated getting the hang of, prompting doing different learning techniques, yet deciding the viability of examining the assessment of the consequences of its utilization, and there are supporting instruments that can remain closely connected with the direction of an educator, another worldview in which clients foster applications, decide activities and conditions in reality without utilizing a workstation [37]. Among the devices used have Scratch Community Blocks to get to, break down, and picture code execution by hauling less unmistakable orders as far as anyone is concerned level and taking a gander at the comparing movements [38], different subsidiaries, for example [39], another model is the instructive robot Thymio, wherein understudies through tablets survey continuously the occasions of the executed robot, which assists with having the rationale of taking care of events [40]. Presently, various devices help advance and further develop it by directing tests and reviews, just like the Being—Co site, which plans to work with learning briefly and pleasantly [41].

6. Conclusions

Implementation of Augmented Reality for Independent Learning with Mobile Learning enhances the self-learning experience. a theoretical model based on the theory of planned behaviour was created to investigate students' choices of A.R. applications in digital learning innovation. Mobile learning integration shows positive results, students experience positive cognitive benefits, ease of use, and interactivity. Theoretical Progress: to understand students' choices in adopting A.R. applications for digital learning; Practical Application: A.R. integration into mobile learning results in positive perceptions in cognitive and interactivity aspects; Future Research: This research opens the door for further exploration and development of A.R. its application in the field of education; Limitations: This study may lack comprehensive insight into the potential challenges or weaknesses of A.R. integration, which could be a focus for future research. Use of A.R. in independent learning has the potential to improve student learning outcomes. By providing a more interactive and visual learning experience, A.R. help students understand concepts better, which in turn can improve the quality of learning. As well as developing science and technology products by improving infrastructure, learning facilities, and learning processes, then crystallizing the right integration to answer these challenges. challenges in the development of science in accordance with the times. The research findings show that the implications of A.R. the application is implemented on a cell phone, so the time is not limited to adding appreciation.

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