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Development of an Augmented Reality Mobile Application to Enhance the Pedagogical Approach in Teaching History

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Development of an Augmented Reality Mobile Application to Enhance the Pedagogical Approach in Teaching History

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Abstract. The rapid advancement of technology nowadays opens new opportunities for schools and universities worldwide to improve the quality of teaching and learning experience using Augmented Reality can help make classes more interactive and allow learners to focus more on practice instead of just theories. The researcher identified the problem that pedagogy has not been learner-cantered in most approaches in teaching and that teachers need to adapt to the new method of teaching. The goal of the study is to develop an Augmented Reality (AR) mobile application to enhance the pedagogical approach in teaching. This will use a marker-based method for transmitting virtual objects into the realworld. Blippar was used in the development of AR. This resulted in the form of instructional material and technology that can be used in teaching. During the testing of the material Students' interest was aroused and it even makes them more eager to learn the subject. End-users and experts also deem that the AR mobile application as usable and acceptable with a rating of 78% using the System Usability Scale (SUS). This is an excellent contribution to the educational domain through augmented reality and improving the pedagogical approach in teaching.

1. Introduction

History aims for students to understand the present existing social, political, religious, and economic conditions of people. The educational activity of history helps the students to explain the present, to examine it and to trace its course. To make it full of life, there is a need to embrace a technology that could save the lesson lively using Augmented Reality.

Augmented Reality (AR) is one of the most recent advances that offer another way to educate [1] an innovation that gives the environment of the existing real-world by utilizing sensors, sound, video, illustrations, pictures, Global Positioning System (GPS) and content.

Considering the traditional method of teaching and learning history subject, nowadays,it does not give meaning to learn of younger generations who are much more inclined to use mobile phones and gadgets. Instead of depriving these students in using their mobile phones, why not use it in the teaching-learning process using augmented reality. Educators need to maintain abreast of change and embrace curriculum design and pedagogical approach using AR technology. Educators should recognize that the learning process is about creativity and collaboration. Teachers' goal is to bring students interested in a field of study. For a generation that's been produced on shared technologies bringing AR into the classroom and curriculum can also help encourage active engagement and contribute to students' retention [2]. AR content provides students who are visual learners gain a fuller intellect and knowledge in History [2]. Educational activity and learning theory subjects such as history is a major worry because it has stories, dialogues, images, and the bulk of the contents are

paragraphs lots of paragraphs. This is likely the reason history is one of the less favored subjects by the students. For teachers, letting students understand history lessons is a challenge.

The usage of AR in education has become more popular [3].The study [4] focuses on answering difficulty in reading human body shape. In paper [7], teaching tourism and history get a new way of delivering the lessons through the emerging of new technologies. Composition [8] is a work that creates instructional media in Indonesia through augmented reality. In paper [9], and AR was used to discover information about historical graffiti in the Temple of Debod. Some other field of AR [10] is disrupting the present with remnants of history. The majority results of the different studies using augmented reality in education arouse the interest of the students to take the example [2], [5], [6]. Most research papers prove that Augmented Reality improves the caliber of instruction and learning experience [1], [5], [6], [7], [9], [14], [15].

The researcher identified the problem that pedagogy has not been learner-centered; students are less interested in learning history.

The end of the work is to develop an Augmented Reality (AR) mobile application to enhance the pedagogical approach in teaching history and would satisfy the interest of the students in learning history.

2. Methodology
The Instructional System Design is the systematic approach to the Analysis, Design, Development, Implementation, and Evaluation of learning materials and actions. The instructional design aims for a learner-centered rather than the traditional teacher-focused access to teaching so that efficient learning can take place [11]. This intends that every element of the command is governed by the learning outcomes, which have been decided after a thoroughgoing analysis of the learners' needs. The educational content using Augmented Reality (AR) technology was produced according to the ADDIE model [12]. This is an iterative instructional design process, where the results of the formative evaluation of each phase may lead the instructional designer back to any previous phase.

2.1. Analysis
The definition of the problem is the source of the analysis phase, followed by identifying the root of the problem and determining possible answers. The result of this phase will be the input in the development phase.

2.2. Design
Educational content is included in the conception stage, and it should incorporate several media elementsto apply to diverse learning modes. Designing augmented reality application [13] that will be practiced, should be thoroughly thought of and meticulously planned. The user should be the priority, what the purpose and outcomes are identified in designing and developing these tools. The study of [14] discusses the iterations of creating a mobile augmented reality (MAR) application for the tourism context. To indicate who will utilize the AR technology, a use case will be made. And to fully understand the flow, an activity diagram will be produced. The author proposed a system model for creating a mobile application.

Using the Blippar to develop the AR is the idea, Blippar's working principle that is a marker-based [15]. This entails that the marker is needed.

2.3. Development
Methods and processes employed by the researcher in developing the AR technology are discussed in this phase.Names and thumbnails of historical sub-topics should appear when scanning the marker image using the Blippar application that is installed on a mobile device. Methods for developing AR applications applyto different pedagogical approaches that are compatible with the "Active learning" framework: constructivist learning, situated learning, game-based learning, and inquiry-based [15].The

development of AR comprises of creation of multimedia elements that would be mixed during the execution. Some papers [1], [4], the researcher uses marker-based AR on Android smartphones.

2.4. Implementation
After all, the multimedia elements have been created in the Blippbuilder Studio. This will now be tested.

2.5. Evaluation
Due to time restriction, purposive sampling will be used. A System Usability Scale survey questionnaire will be distributed to the respondents.

3. Discussion of Findings

3.1. Analysis
The pedagogy has not been learner-centered; students are less interested in learning history subjects.The solution to the problem is to develop an Augmented Reality (AR) mobile application to enhance the pedagogical approach in teaching history and would satisfy the interest of the students in learning history.

  The tool used to create the AR application was the Blippar,an augmented-reality mobile app.The instructional content was chosen on the CMO No. 20, series 2013, Readings in Philippine History specific topic on "one past, but many histories": controversies and conflicting views in Philippine history. This has four (4) sub-topics 1) Site of the First Mass, 2) Cavite Mutiny, 3) Retraction of Rizal and 4) Cry of Balintawak or Pugadlawin. The target users are secondary or tertiary students who should demonstrate the ability to formulate arguments in favor of or against a particular issue using primary courses.

3.2. Design
All the educational content was prepared; it contains different media textual, acoustic, animated, video, and imaginary, to be adapted to different learning styles.

  A Use case diagram was created for the respective role of Teacher and Student in using the AR technology. The teacher is responsible for creating/editing the course materials that will be uploaded to the studio. Create the AR technology, publish, provide the code to the student, as well as save and test. The student will download and install the Blippar application into their mobile phone, open, enter the blipp code,and start blipping and interact with the AR technology. The Internet is required to use the apps.

  Every registered user should be provided with a username and password for authentication purposes, and this will also serve as a security measure to the project created.

  Fig. 1. is the specific activity of the teacher, using Blippbuider AR creation a simple drag-and-drop interface makes it very fast and comfortable for history teachers to create powerful augmented reality, even if the teacher has no coding skills. The teacher is responsible forsourcing, preparing, creating, editing, deleting, and uploading the course content into the AR tools. Blippar could add the power of augmented reality into the mobile app. The Augmented Reality Software Development Kit (AR SDK) allows leveraging any AR content within the existing app. The teacher can easily create these augmented reality experiences using the AR creating tools – Blippbuilder and Blippbuilder Script.History teachers have access to all functionalities without limitations.
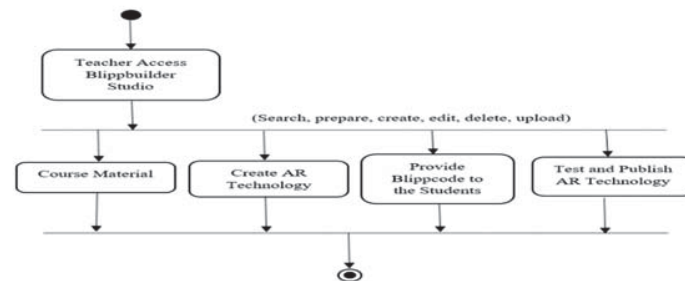
Figure 1. Activity diagram of the teacher

Another activity flow for the student using the Blippar. Student should acquire the blipp code from the teacher, go to setting menu select and enter blipp code, tap the mobile screen to start blipping and focus the mobile phone camera to the marker and start scanning, once the augmented reality overlay is already visible on the screen user can now remove camera away from the marker. One thing good about this Blippar is you do not need to keep on focusing on the tag to see the content of the AR technology. Interact with the AR content by tapping on the thumbnail on the screen.

Fig. 2. shows the architecture of the system model. The application was developed using Blippbuilder and Blippar (SDK). Blippbuilder is used to make the application, and the Blippar SDK is used to link the augmented reality camera and the image and the image tracker. The tracker is used to detect the picture which is stored in the database. Assets and scripts were working along with entree to the object database. Open the application using a mobile phone, scan the image. The scanned image is sent to the picture capturing model for identification. If the icon is detected, it is transported to the processing model. The processing model then finds the marker post and carry it to the tracker model; it then identifies the marker and sent it to the rendering model. Rendering model using picture detection will mark a virtual object to the marker, and hence, the augmented video or image will be exhibited.
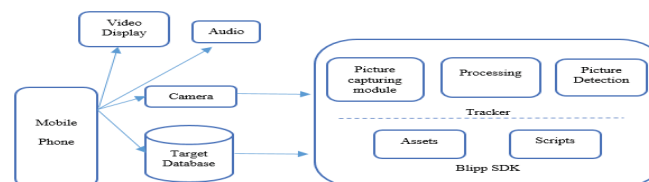

Figure 2. The architecture of the System Model

The Philippine flag will be used as a marker. By scanning the image using Blippar, the application should display corresponding thumbnails of Philippine history sub-topics. Tapping the thumbnail of a particular topic, an augmented video will be played, or history with animated text accompanied by the narrative.

3.3. Development
The process begins by selecting the Create Blipp option that is visible in Fig. 3. When this option is selected, it is necessary to upload a trigger image that will serve as the marker.
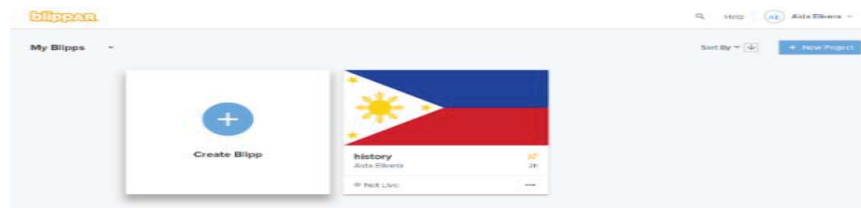
Figure 3. Create a Blipp

The next step is to add an overlay to the marker. Overlays are implemented one by one; it could be adding created multimedia elements. Fig. 4 shows how the first overlay has been implemented.
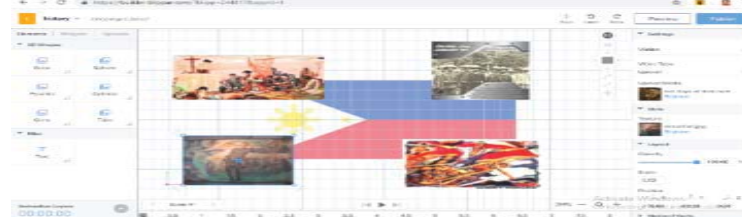

Figure 4. Overlays implemented in Blippbuilder studio

Later on, adding the overlays, the actions are put to them. All overlays are covered so that they do not appear when a mark image is scanned. Scanning the marker image using the Blippar thumbnails of the historical sub-topics should appear. These four overlays and a marker image are presented in Fig. 5.When the overlay is tapped, the augmented video is displayed.

Figure 5. Marker image with four overlays

3.4. Implementation

After finishing the blip with history sub-topics in Blippbuilder studio, created AR was tested for its functionality. The Blippar application was installed on a mobile phone, an internet connection was established. Blippar was opened; this was positioned in front of the flag image on the laptop screen. Start the blipp, tap the screen, start scanning the image. To interact with the content of the AR, the thumbnail should be touched, and the content will be displayed, as shown in Fig. 6.
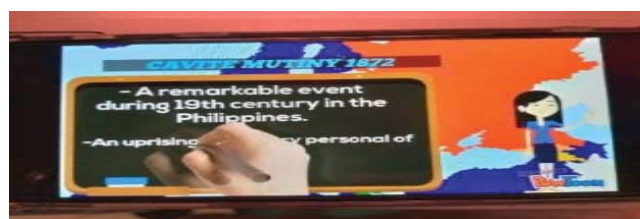

Figure 6. The result of tapping the thumbnail

3.5. Evaluation

The researcher conducted a System Usability Scale survey on a purposive sampling of (30) students and 3 instructors. To rate the students' and instructors' responses, a five-scale Likert scale (Strongly Agree {5}, Strongly Disagree {1}) was used. Based on the result, it has an average of 78.27, which was converted into a percentile rank of 78%, and with a grade of B, as shown in Fig. 7. AR technology is assumed to be usable and acceptable.
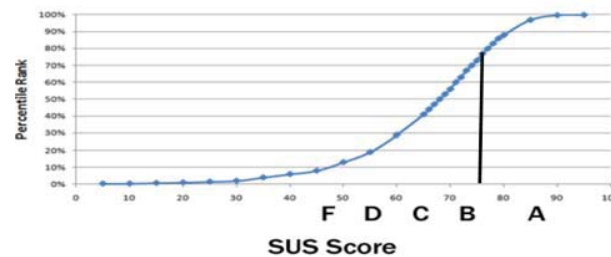

Figure 7. The result of tapping the thumbnail

4. Conclusion

A form of instructional media material for teaching history subject is the result of the research. This paper intends to arouse students' interest and encourage them to learn history through augmented images and videos as the result of a portable application of augmented reality. This is a great contribution to the educational domain through augmented reality and improving the instructional approach of teaching.

References

[1]   Algawari F, Alslamah W, Alhabib A, Altehaid A and Ibrahim D 2018 Applying augmented reality technology for an e-learning system *World Acad. of Sci. Engg. and Tech. Int. J. of Comp. and Info. Engg.*Vol **12** No 3

[2]   Klimova A, Bilyatdinova A and Karsakov A 2018 Existing teaching practices in augmented reality *Proc. Comp. Sci.* **136** pp 5-15

[3]   Badni K 2018 Augmenting history: Case study measuring the motivation of students using augmented reality apps in history cases *World Acad of Sci., Engg. and Tech. Int J. of Educ. and Pedag'l. Sci.* Vol **12** No 6

[4]   Layona R, Yulianto B and Tunardi Y 2018 Web-based augmented reality for human body anatomy learning *Proc. Comp. Sci.* **135** pp 457-64

[5]   Salinas P and Pulido R 2015 Visualization of conics through augmented reality *Procedia Comp. Sci.* **75** pp 147-50

[6]   Raghaw M, Paulose J and Goswami B 2018 Augmented reality for history education *Int. J. of Engg. and Tech.* Vol **7** Iss 2.6 pp 1-5

[7]   Kysela J and Storkova P 2015 Using augmented reality as a medium for teaching history and tourism *Procedia – Soc. and Behav'l Sci.* **174** pp 926-31

[8]   Izza N and Fuada S 2014 Augmented reality applications in learning history of Indonesia *Int. Sem. of Education Technology (ISET) 2014* Semarang June 2014

[9]   Gutierrez J, Molinero M, Martin O and Medina C 2015 Augmented reality technology spreads information about historical Graffiti in the temple of Debod *Proc. Comp. Sci.* **75** pp 390-97

[10]   Johnston E, Richison M and Vujnovic M 2015 Augmented Asbury park: Disrupting the present with remnants of history in augmented reality *Proc. of the 21st Int. Symp. on Elect. Art ISEA2015* ISSN: 2451-8611 ISBN: 978-1-910172-00-1

[11]   Hawkinson E and Artemciukas E 2018 Simplified mobile AR platform design for Augmented tourism *World Acad. of Sci., Engg., and Tech. Int. J. of Soc. and Bus. Sci.* vol **12** No 1 2018

[12]   Kurniawan M, Diana S and Witjaksono 2018 Human anatomy learning system using augmented reality on mobile application *Proc. Comp. Sci.* **135** pp 80-8

[13]   Castellanos A and Perez C 2017 New challenge in education: Enhancing student's knowledge through augmented reality *Augmented Reality* ed J M Ariso p 273 (Berlin: De Gruyter)

[14]   Augmented Reality & Computer Vision Company 2019 (Online) Available: https:www.blippar.com/ (Accessed: 20-March-2019)

[15]   Pantelica A and Vukovac D 2017 The development of educational augmented reality application: A practical approach *Proc. of ICERI2017 Conf. 16th-18th* November 2017 pp 8745-52 DOI: 10.21125/iceri.2017.2399