Research

Argument Reality application make students more interested in learning

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Bachelor of Creative Software
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Investigative Studio 1
(NZQF Level 6, 30 credits)

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1. Introduction

Throughout the whole world, smartphones have become part of people's day-to-day life. Studies around the world show that this is not only in adult people's lives, and that young people's usage of smartphones is growing more and more.

Starting from a young age, 46% of children across Europe aged 9 to 16, had a smartphone in 2015 (Mascheroni, G., & Ólafsson, K., 2016). In the US, 88 % of teens aged 13 to 17 have access to a smartphone, and 73% of them own their own smartphone (Lenhart, Amanda, Pew Research Center, April 2015). Also in the US, 98% of adults aged 18 to 24, 97% of adults aged 25-34, 96% of adults aged 35-44, 89% of adults aged 45-54, and 80% of adults aged 55-64 use smartphones (The Nielsen Company, 2016).

These graphs of adults with smartphones matches with curve in the graph of adults studying in New Zealand, the youngest ones being the most present in studies (Statistics New Zealand, 2013). The percentage of children and teens studying are obviously higher thanks to the obligation implied by many countries for these young ages to be at school. Also, a statistic produced by The University of Auckland shows that, in 2018, 59.71% of the students were aged between 19-23 (The University Of Auckland, 2019) . In the US the numbers are very similar, showing that university students up to 24 years old correspond to 59.29% of all students (McCubbin, 2018).

Seeing both of the graphs together, it is possible to create a correlation between them and use smart devices to improve extant (and create new) study methods to help the development and learning process for students.

2. Literature review

2.1 The use of mobile learning in higher education: A systematic review [1]

This study brings a structured analysis of another 72 studies, of which 23 were specifically focused on the impact of mobile learning on students' results. In Figure 1, the impressive results of the studies are shown, where 16 out of these 23 studies (70%) gave positive feedback on students' outcome. The studies occurred in 21 countries and in 5 continents, as per Figure 2.

The study also affirms that the largest demographic of mobile user is typically at the age of college attendees, between 18 to 29. And that is why higher education faculties are determined to expand their teaching possibilities beyond the classrooms by using mobile learning.

However, many different factors can influence students' learning difficulties with using mobile devices. These circumstances, among other things, can be the length of time the device was used by the student, their expertise with the device, and the experience and skills the teacher has with the device.

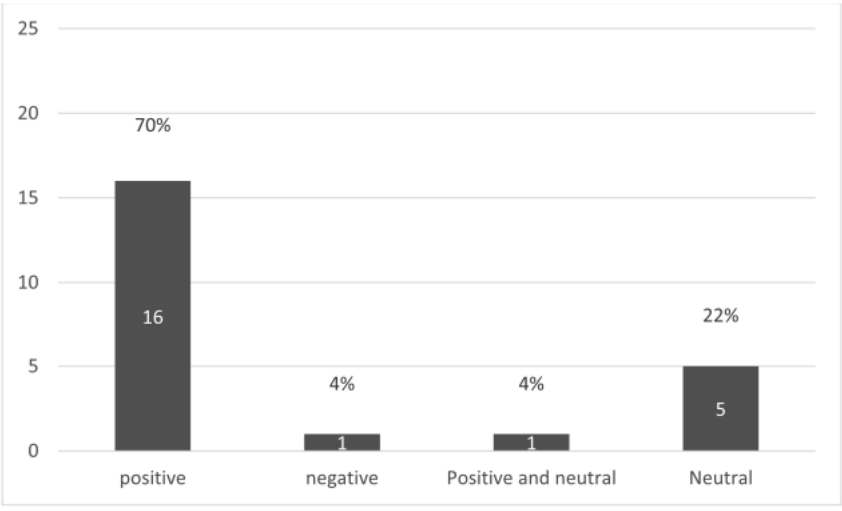


Figure 1

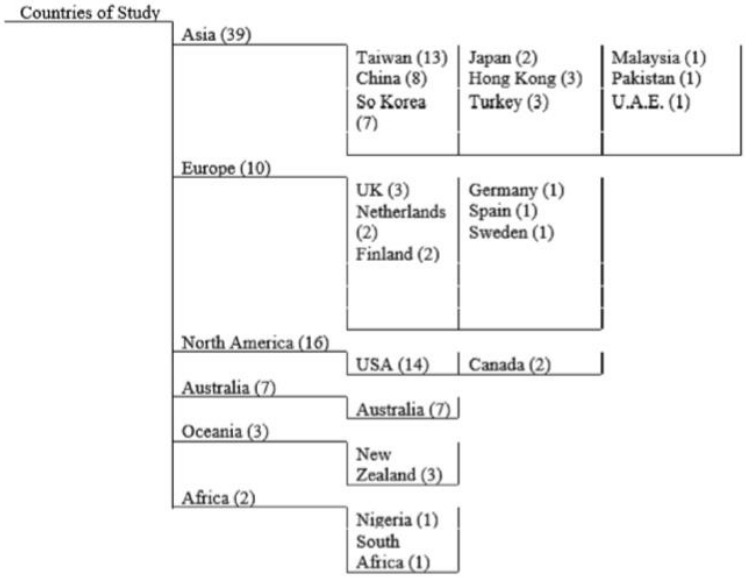


Figure 2

2.2 Improving quality of teaching and learning in classes by using augmented reality video [2]

A study conducted by The Hong Kong Polytechnic University was implemented to enlarge students' learning experience and develop their comprehension in complex issues by using an augmented reality (AR) mobile application in a sewing workshop. Including 46 freshmen, this study's objective was to facilitate better learning against the traditional approach. The main goal of this study was to present an alternative approach in pedagogy which shows how AR technology is implemented in classroom and laboratory settings in the discipline of textiles and clothing by the effective use of augmented multimedia. The traditional teaching approach was compared with the results of this technology to clinch whether it raised students' concentration and subsequently facilitated motivation and stimulated students' interest in learning the discipline.

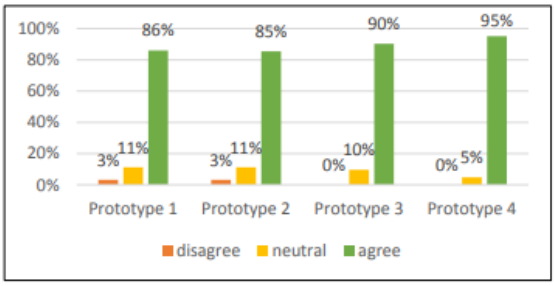
One group of students was given a handout while the other watched an AR video. After learning period, a questionnaire was handed, and the results reflected in a significant difference of understanding of the task by the 2 groups. A lot of feedback showed higher learning efficiency with the use of AR videos. Overall, AR videos gives better results in terms of learning competence and achievement as well as satisfaction during learning period. The results show the rise of students' interest in learning the subject and helped with the understanding of complicated concepts.

2.3 Students' motivation, concentration and learning skills using Augmented Reality [3]

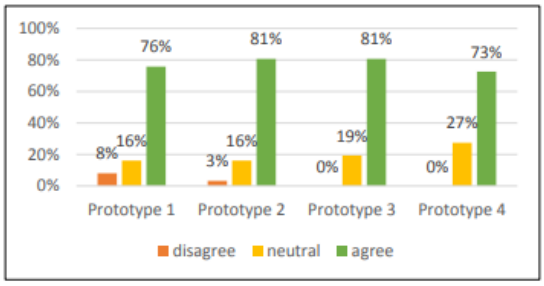
This study conducted in Portugal aimed and successfully showed through four prototypes using Augmented Reality (AR), a great interest of the students to interact with the programmatic content and also added a higher motivation to solve the tasks proposed by the teacher. The main objectives of the study were to: find, explore and evaluate different strategies to integrate AR devices and its features in the process of learning and teaching of an Information Communication Technology (ICT) subject; grade the impact on motivation and learning competencies; and propose a guideline for the integration of the process of teaching and learning to AR systems.

During the tasks, the students' use of the prototype showed a high level of concentration for their achievement. It showed that they were deeply interested with the chance of interacting with the methodical and regular content which increased an extra and relative motivation to resolve exercises introduced by their teacher.

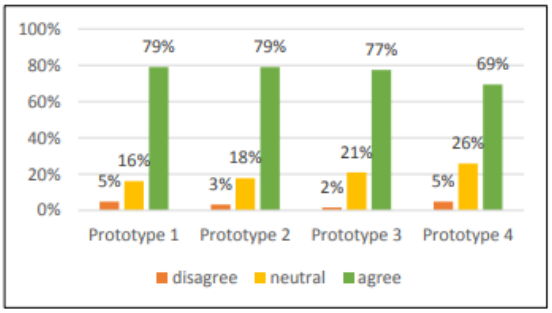
At the end of each research cycle, the students had to complete a questionnaire about the usage of the prototype. The results are showed below in the form of graph. Graph 1 shows where the students felt motivated while using the prototype. Graph 2 shows whether the student understood the content by using the prototype. Graph 3 shows whether the student felt concentrated in the task while using the prototype.



Graph 1. Were the students motivated using the prototype?



Graph 2. Did the students understand the content using the prototypes?



Graph 3. Were the students concentrated using the prototype?

3. Project proposal

The project intends to endorse the studies that show the improvement that AR and mobile education can help students to learn and be more interested in learning. Also, it opens a study case where it is going to check if people facing the opportunity to use the app and learn will do so.

It is going to be a flag recognition application where the user will use the AR camera to find out where a flag is from and some important information of that country, such as name, population number, continent it belongs to, its HDI and its capital.

3.1 Vuforia vs ARCore vs EasyAR

For the application prototype, three AR developing platforms were tested: Vuforia, ARCore and EasyAR.

Firstly, Vuforia was tried, which did not correspond to flag reading very well, mostly because of its limitation of tracking only black and white images. However, that limitation is found in most of the augmented image tracking platforms at this time.

The next platform used was ARCore, which was promising as it can detect both color and black & white. However, it was very bad at detecting flags, and not used in the project.

Unfortunately, most of the Augmented image platforms cannot read some flags because of flags' simplicity, with not many details to be recognised and because they contain sparse and repetitive features.

EasyAR was the last platform tested and presented some decent results. It still did not detect all the flags, but with a higher percentage of recognition than the other two platforms.

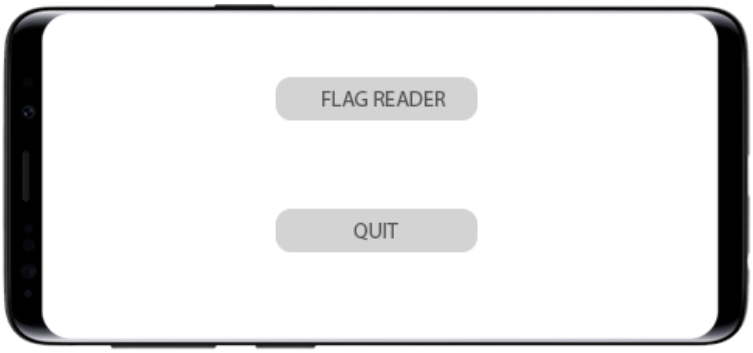
Flags country	**Vuforia**	**ARCore**	**EasyAR**
Australia	Yes*	No	Yes*
Brazil	Yes	No	Yes
Fiji	No	Yes	Yes
Japan	No	No	No
New Zealand	Yes*	No	Yes*
Thailand	No	No	No
USA	No	No	Sometimes

* Australian and New Zealand flags can be mistaken as a result of their similarities.

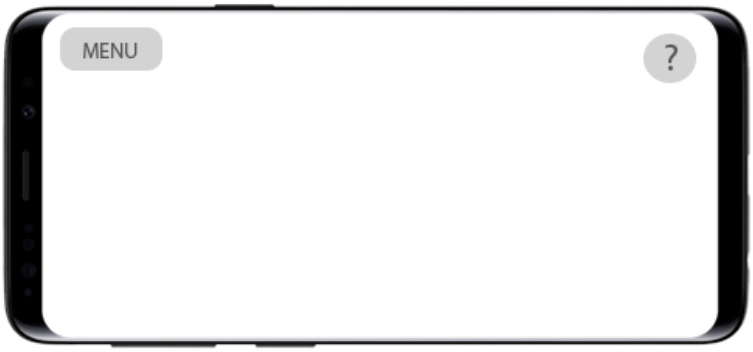
3.2 Wireframes

The wireframes used are non-diegetic UI.

3.2.1 Menu



3.2.2 Flag reader – no flag targeted



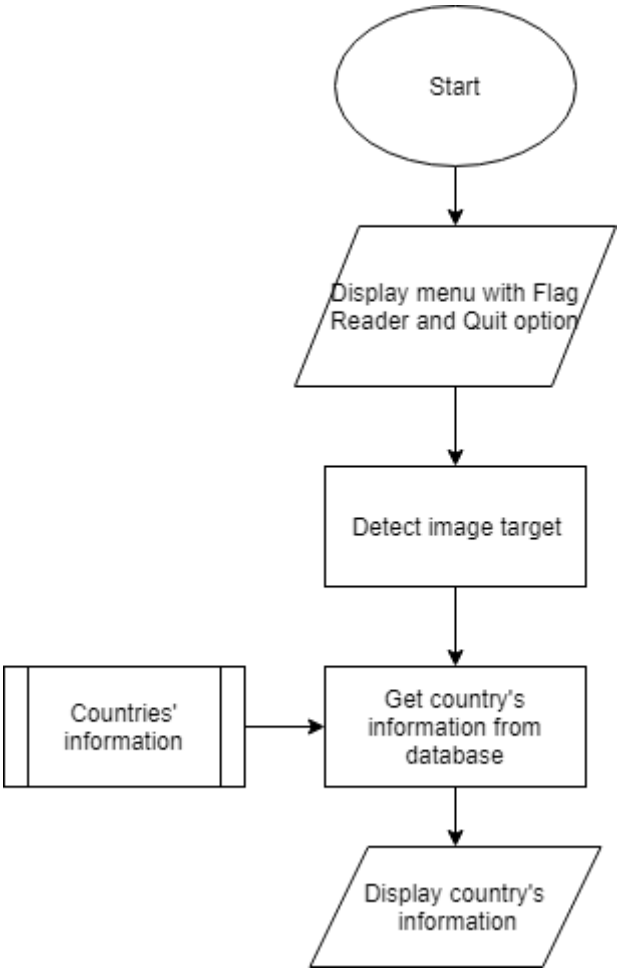
? = Opens help menu

3.2.3 Help menu

X = Closes help menu

3.2.3 Flag reader – flag targeted

3.3 Flowchart



4. Test and Questionnaire application

4.1 Method

Two questionnaires were made to be applied with some participants. The first questionnaire contains some personal questions, such as how old the participant is, if they are a student and if they consider themselves a flag expert. After that, there is a list of 21 country flags, in randomized order, for the participants to identify. This first questionnaire aims to get some data from the participants to see if the age can influence their results, and also to know the participants' previous knowledge of flags to compare with the second questionnaire. The second questionnaire contains the same flags of the first test, however, in different order. And after doing the second test, the participant will answer two questions:

If they think the app can be helpful to people who wants to know where specific flags are from.

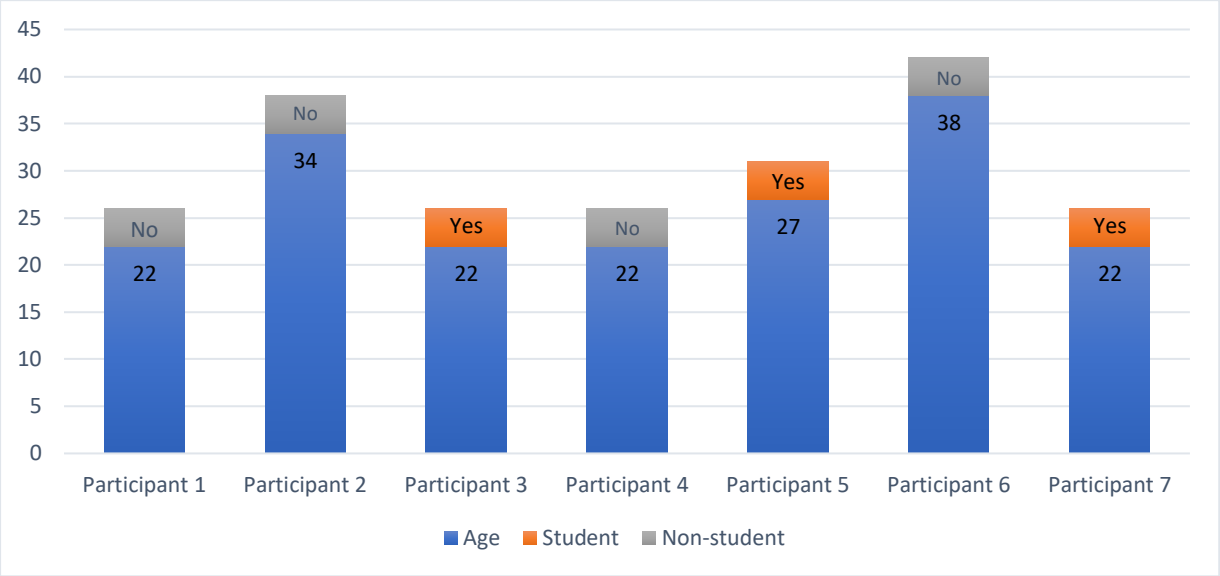
If they think they would use the app if they came across a flag they do not recognise.

After first questionnaire is completed the participant will have the chance to check their answer by using an AR mobile application which can recognise the flag and give some information about the country, including its name.

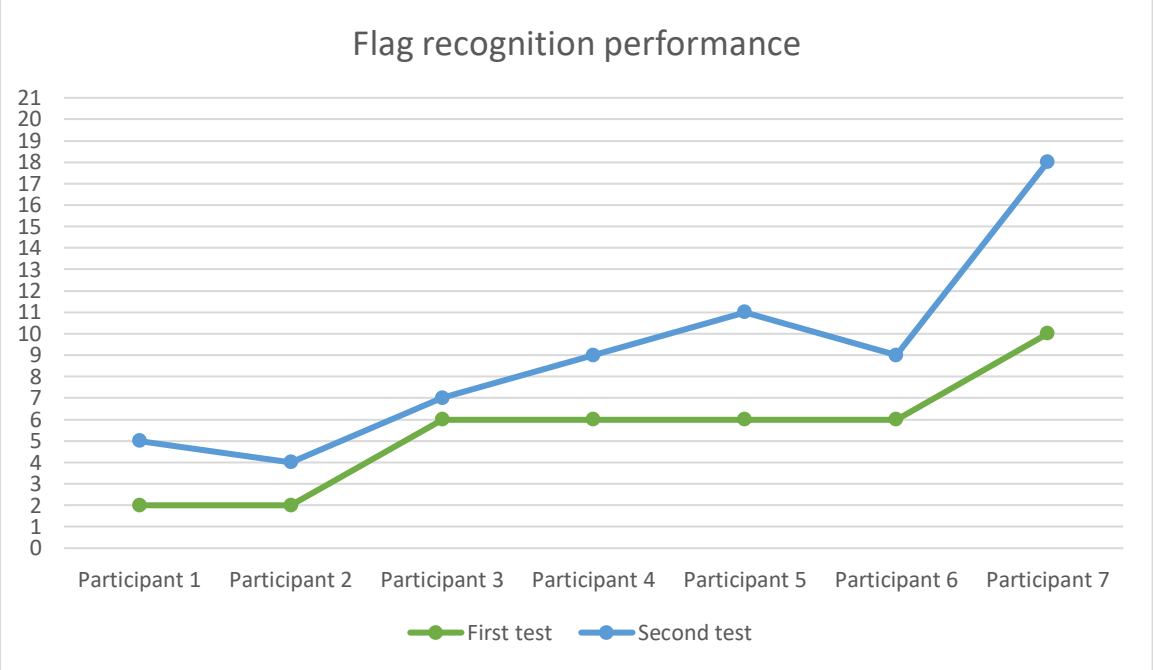
The flags chosen were considered hard to recognise, aiming to challenge the participant. Countries included are: Albania, Brazil, Canada, Croatia, Eswatini, Fiji, India, Kazakhstan, Kenya, Malaysia, Mexico, Mongolia, New Zealand, Papua New Guinea, Peru, Portugal, Saudi Arabia, Slovakia, Spain, Sri Lanka and Zimbabwe.

4.2 Application

This test had only 7 participants. The bar charts below present the age of the participants and whether they are students. Only participant 7 (the highest score) considered themselves a flag expert. All the participants had a mobile phone onto which the final version of the app could be downloaded and installed if wanted.



The results for the flag recognition test are drawn in the graph below and show the improvement the participants have from the first test (green line) to the second test (blue line) which was applied 1 day after.



4.3 Results

The results of this study are clear and gives a good feedback on the use of AR applications for learning. 100% of the participants could improve their score from the first to the second test. Also, the percentage of participants who believe the app can be helpful and can see themselves using the app if coming across an unknown flag, is unanimous.

Furthermore, the only participant who considers themselves a flag expert, had an outstanding result comparing to all others. However, the age of the participants, or whether they were students, did not influence their result in the test. Some of the participants showed a really high interest in the flags origin and also tried to create a relation with them.

See below the full results of both of the questionnaire and test.

FIRST TEST / QUESTIONNAIRE				
	Score	Age	Student	Flag expert
Participant 1	2	22	No	No
Participant 2	2	34	No	No
Participant 3	6	22	Yes	No
Participant 4	6	22	No	No
Participant 5	6	27	Yes	No
Participant 6	6	38	No	No
Participant 7	10	22	Yes	Yes

SECOND TEST / QUESTIONNAIRE			
	Score	App is helpful	Might use the app
Participant 1	5	Yes	Yes
Participant 2	4	Yes	Yes
Participant 3	7	Yes	Yes
Participant 4	9	Yes	Yes
Participant 5	11	Yes	Yes
Participant 6	9	Yes	Yes
Participant 7	18	Yes	Yes

5. Conclusion

The use of Augmented Reality (AR) application can be very beneficial for the educational process. It is shown in this study how the use of AR technology can motivate and increase the interest and focus of the user, them being a student or not. Participants of this study, as well as the literature reviews, gave very positive feedback on the use of this technology. The progress made by the participants, and the unanimous enthusiasm on using the application in the future, is very encouraging.

Nevertheless, the considerably small number of participants, and the limited amount of time to carry out this study, might be a concern. Future studies may take in consideration re-applying the test with a higher number of people divided in similar characteristic groups, such as age or academic students, and also over a larger period of time with a higher number of tests.

Despite the fact that AR is not commonly used in education, the interest of the participants in using this technology as part of the teaching-learning process can be a determining factor for the technology success. All these studies' results show a promising field of research. Many improvements are needed and might be applied for upcoming Augmented Reality projects. However, the results obtained so far in all studies relating AR application are undoubtedly satisfactory for the beginning of a new era of education using Augmented Reality as a tool for teaching.

6. Citations

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[1] Helen Cromptona, Diane Burke (2018), "The use of mobile learning in higher education: A systematic review", Elsevier Computers & Education: Volume 123, April 2018, Pages 53-64.

[2] Joanne Yipa, Sze-Ham Wonga, Kit-Lun Yicka, Kannass Chanb, Ka-Hing Wongc (2019) "Improving quality of teaching and learning in classes by using augmented reality video", Elsevier Computers & Education: Volume 128, January 2019, Pages 88-101.

[3] D. Sampaio and P. Almeida, "Students' motivation, concentration and learning skills using Augmented Reality," in 4th International Conference on Higher Education Advances (HEAd'18), Universitat Politecnica de Val ` encia, Val ` encia, 2018 `, 2018.