

Local Potential-Integrated Augmented Reality Booklet to Facilitate Student's Curiosity and Learning Interest

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The use of Augmented Reality (AR) in education combined with local potency such as Naturindo Herbal Garden located at Sendangsari Village, Pengasih District, Yogyakarta, Indonesia as a center for the herbal medicine industry and learning resource for human digestive was identified as an important strategy for developing student learning outcomes. The purpose of this research was to integrate Naturindo Herbal Garden integrated AR booklet to encourage student's curiosity and learning interest about human digestion for grade eleventh. The AR-digestive booklet was developed by author in previous research then used in this research as learning media. This research was a quasi experiment, determination of research sample used simple random sampling to determine the control and experimental classes with 74 students, 3 biology teachers by giving questionnaires to collect students' interests, curiosity and teacher's response. The learning material in the booklet was conceptually correct, equipped with clear and engaging AR animations to support the learning process. The results showed that the local potential-based digestive system AR-booklet was effective for encouraging student's interest (87.5) and curiosity (91.6) with the results of in the high category and t-test value was below 0.5. Teachers stated the use of AR booklet had achieved remarkable results and was very effective. This study recommended the implementation of local potential-integrated AR booklet to facilitate student's curiosity and learning interest as an innovation in the biology learning process.

Keywords: augmented reality, booklet, curiosity, interest, local, potency

INTRODUCTION

Today, people need to be trained to acquire increasingly complex knowledge and skills, and to keep up with rapid changes in information. In addition to the rapid growth of knowledge, since 21st century skills are technology-oriented, the question of how to use information technology to support and enrich education has attracted research in education and educational technology in recent years (Kozma & Anderson, 2002; Alalimi, 2020; Ersoy *et al.*, 2023). Students of the 21st century known as digital natives, differ from previous generations in characteristics such as a desire for quick access to information, playing games instead of serious study, visual and graphic elements instead of long texts, parallel cognitive structures, and more multi-capacity instead of one job at a time (Suchyadi, 2020). These innate characteristics of digital natives have also led to innovations in the world of education, and a new culture of learning has emerged (Fayanto, 2023). In this sense, while the teaching process is structured, new technological approaches are favoured. For these reasons, it becomes crucial to understand the characteristics of the new generation and design teaching processes using pedagogical

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methods adapted to their characteristics, redesigning courses and environments to allow the use of innovative technologies (Ketsman, 2018).

Some of biology topics are abstract and difficult to be understood especially about the process of human system. For this reason, teachers need to use the innovative learning media which collaborate biology principles with the actual world in comprehending the summary ideas in biology, and as a result, media instruction is suggested to build clinical knowledge thru use of concrete materials (Alzoebi *et al.*, 2023). One of the media which has ability for use is augmented learning media. Augmented Reality (AR) is a technology that provides virtual items into the actual environment in actual time, in order that the boundary among them becomes real like with adding digital objects integrated into the actual global. AR permits users to view the actual surroundings with digital gadgets which can be brought or integrated. One capacity utility of AR is currently within the field of studying media or education by means of using mobile applications.

Subakti *et al.* (2021) stated that a local potential is a resource specifically owned by only a certain area in the form of natural resources, human resources, technology and culture which can be applied in teaching strategies that meet specific needs of learners (taking into consideration their diversity in terms of culture, location and so forth). Local potency instruction collaborates additional information from common local beliefs and sayings stating their cultural meanings and relating them to science concepts being taught and learnt while also assessing and obtaining additional information from the learners and allowing them form their own opinion on the concept (Susilo & Yuningsih, 2022). Learners would also be allowed to utilize additional instructional materials reflecting local beliefs and expressions (Tarigan, 2022).

The local wisdom found in Naturindo Herbal Garden, Pengasih District, Kulon Progo Regency, Special Region of Yogyakarta, Indonesia as the centre of jamu products or traditional medicine to treat several diseases, especially those found in the human digestive system such as ulcers, canker sores, constipation. Students collaborate with the environment to solve the problem which commonly happens in the human digestive system. This activity will develop a student's positive attitude to the environment. Besides that, AR makes the coaching and mastering process greater fun, more interactive in growing a mastering lesson topic (Wahyu, 2020). The quality and effective of biology teaching and learning has been a major challenges and concerns of researchers.

Purpose of the Study

This research focused in studying and investigating the effect of local potential-integrated AR booklet on student's curiosity and learning interest.

Research Question

Based on the background of study, the research question is whether a significant effect of local potential-integrated AR booklet use on student's curiosity and learning interest in human digestive topic?

Research Hypothesis

The hypothesis in this study was as follows:

(Ho) There was no significant effect of local potential-integrated AR booklet use on student's curiosity and learning interest in human digestive topic.

(Ha) There was significant effect of local potential-integrated AR booklet use on student's curiosity and learning interest in human digestive topic.

METHOD

Research Type and Design

The design of this study was quasi-experimental with a pretest-posttest non-equivalent control group. This research was conducted in control class applied text book without integrated local potential and AR, the experimental class applied the local potential-integrated AR booklet. The following table was the research design. Research data was collected by observation and distributing questionnaires which conducted before and after treatments.

Table 1
Design for pretest-posttest non-equivalent control group

Group	Pre-Test	Treatment	Post-Test
Experiment	O ₁	X ₁	O ₂
Control	O ₃	X ₂	O ₄

(Resource: Creswell & Creswell, 2018)

Description:

O₁ = Pre-test Curiosity and Learning Interest in the Experimental class

O₃ = Pre-test Curiosity and Learning Interest in the Control class

O₂ = Post-test Curiosity and Learning Interest in the Experimental class

O₄ = Post-test Curiosity and Learning Interest in the Control class

X₁ = Biology Textbook without Local Potential and Integrated AR

X₂ = Local Potential-Integrated AR Booklet

Study Group

The research was implemented at two public schools' grade eleventh - majoring in science were located in Pengasih Region, Kulon Progo Regency, Special Region of Yogyakarta, Indonesia. The first school as the place to validate the instruments and the second school as the research place. Determination of the research sample using simple random sampling to determine the control and experimental classes. The use of simple random sampling has advantages such as being free from misclassification and requiring minimal population knowledge, everyone has the same opportunity to represent the population (Bayır *et al.*, 2022). The following was the result of the homogeneity of variance test based on the daily test of grade eleventh science major.

Table 2
Test results of homogeneity test

Variable	Levene Statistic	Sig.	Description
Daily Test	0.701	0,834	Homogeneous

Based on these findings, it could be considered that all participants were equivalent in terms of student's curiosity and learning interest on human digestive system topic. Sample was two classes of grade eleventh in science department with 37 students in each class and 3 biology teachers. First class used AR-booklet and second class only used textbooks.

Data Collection Tools

Validity and reliability test of research instruments were conducted by 100 students in the first public school. This stage was carried out before the research stage with different research population in the second public school. The validity and reliability coefficient values were greater than 0.6 which presented in Figure 1 and Figure 2. The validity of the instruments was also assessed by expert judgment. Some items both in curiosity and learning interest were disqualified as items for data collection. Besides that, the final items of curiosity were 40 items from 47 items and learning interest were 30 items from 40 items.

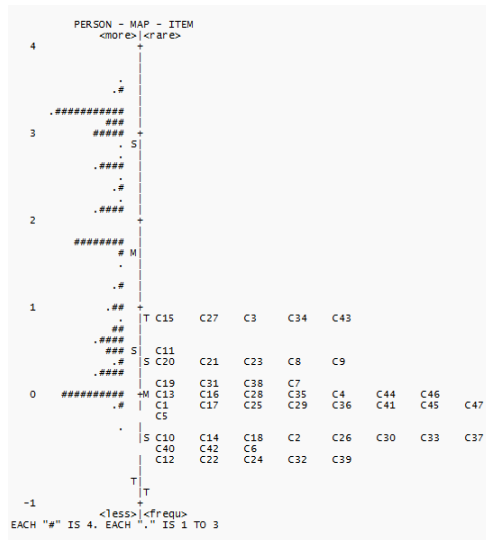


Figure 1
Reliability result of curiosity

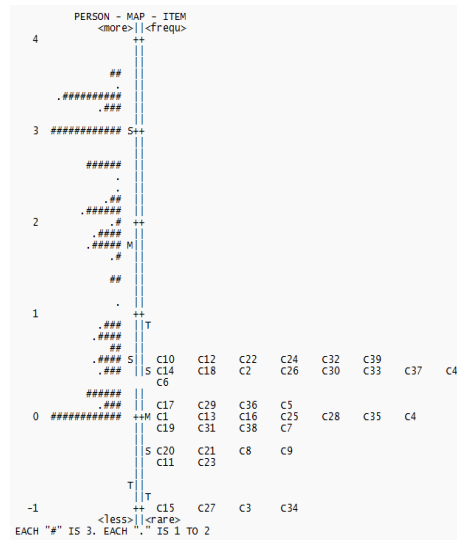


Figure 2
Reliability result of learning interest

Data collection techniques carried out as follows:

- a) Data regarding the need for learning resources in the form of local potency-based digestive system booklet integrated AR in Naturindo Herbal Garden, Kulon Progo Regency was collected through analysis of the Merdeka Curriculum and through questionnaires.
- b) Data regarding the potential of schools or regions and their characteristics that are relevant to the needs of local potency-based learning resources in the form of teaching materials from school were collected through: (a) Questionnaires (b) Direct investigation/observation to the location to obtain information about the characteristics of local potency of the Naturindo Herbal Garden as content and context of digestive learning resources in grade eleventh.

Table 3
Instrument sheets

No	Instrument	Number of Items
1.	Student's Response Questionnaire	15
2.	Curiosity Questionnaire	40
3.	Curiosity Observation	40
4.	Learning Interest Questionnaire	30
5.	Teacher's Response Questionnaire	10

The instruments were adopted from the previous research (Nugraheni & Marianti, 2022) by revising according to the student's characteristics. Questionnaires were given directly at the beginning and the end of the lesson. Analysis of the results of filling out the interest questionnaire was carried out by scoring each item in the filling out questionnaire. Furthermore, the score of questionnaire scores were analysed according to the criteria adapted from the assessment guideline (Riduwan, 2007).

Implementation Process and Data Collection

At the beginning of application, the student’s curiosity and learning interest were prepared and given to grade eleventh class A and B as a pre-test. The biology course was made about a four-hours course per week for five weeks. Assembler Edu mobile application was installed on the students’ phones of grade eleventh class A by creating personal accounts. Finally, they are asked to collaborate together for accessing the AR booklet and finishing projects given in the e-booklet. In class B, the lessons continued in line with the current program provided by biology text books which was explained by the teacher without integrated AR and local potency.

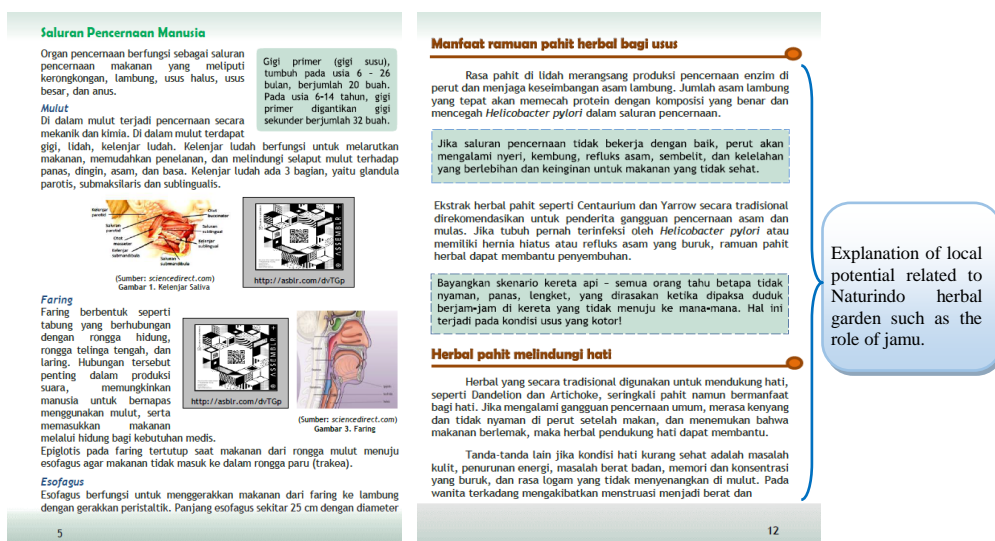


Figure 3 Local potential-integrated augmented reality booklet. students can access the QR code to see the AR media

Data Analysis

Data analysis used t-test to test the primary data, which was the effect significance of independent variable on the dependent variable. Hypothesis testing was carried out at a significance level of 5% or = 0.05 using SPSS 22 software for windows.

FINDINGS

The Prerequisite Test Analysis

The significance value of the normality test is determined based on the Shapiro-Wilk test. The normality test result for curiosity in experimental class (Pretest = 0.068 and Posttest = 0.074) and control class values (Pretest = 0.067 and Posttest = 0.075). The normality test result for learning interest in experimental class (Pretest = 0.069 and Posttest = 0.088) and control class values (Pretest = 0.065 and Posttest = 0.089). Normality test result showed that the pretest and posttest data were normally distributed with a significance value was greater than 0.05. After the data is normally distributed, the next step is to test the homogeneity.

The homogeneity of pretest (0.233) and post-test (0.983) for curiosity and the pretest (0.269) and post-test (0.889) for learning interest showed those all-homogeneous variances were homogeny distributed as presented in Table 4.

Table 4
The differences in homogeneity and normality of sample

Sample	Homogeneity	Normality		Description
		Experimental	Control	
Curiosity	0.983	0.074	0.074	Fulfilled
Learning Interest	0.889	0.088	0.089	Fulfilled

Effect of Local Potential-Integrated Augmented Reality Booklet on Curiosity

The field test to determine student's curiosity was carried out in 2 classes, namely class A and B each consisting of 37 students. The results of the assessment were obtained from a questionnaire which could be seen in detail in Figure 4. The attractive appearance design of AR booklet integrated with local potential of Naturindo Herbal Garden equipped with many pictures, and concise made students more motivated and enthusiastic to learn which enhanced student's curiosity. Digestive system booklet provided summaries and important points on digestive material integrated AR based on local potency. This is in line with the opinion expressed by (Yuningsih *et al.*, 2022), that professional teachers should have skills and knowledge that are constantly being developed by utilizing available technological resources such as computers or smartphones in order to be able to apply learning media in accordance with the times accepted by students, so that students feel more enthusiastic about learning (Torres & Ortega-Dela, 2022).

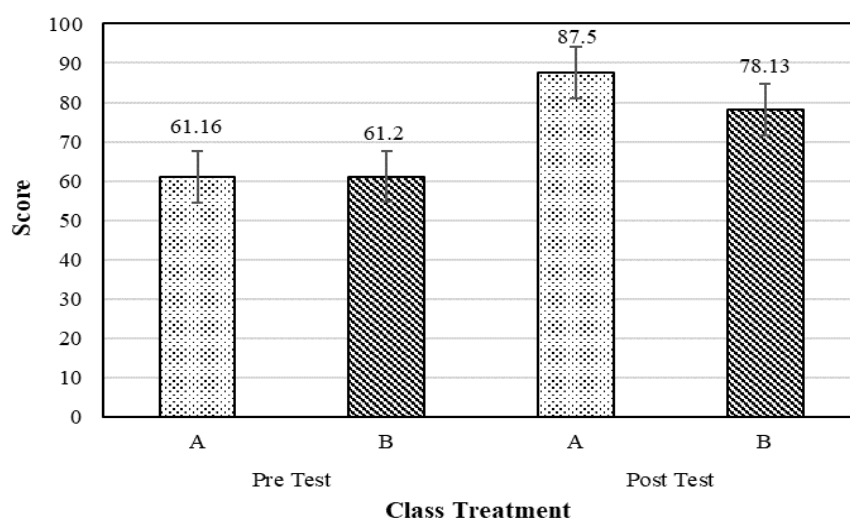


Figure 4

The score of student's curiosities which was analysed from questionnaires in Class A and B. Class A used local potential-integrated AR booklet (n=37) and class B used biology textbook without local potential and AR (n=37)

The score of student's curiosities in Class A as experimental group was higher than Class B as control group. It was proven by mean of post-test curiosity in Class A was 87.5 ± 5.1 , Class B was 78.13 ± 3.76 . Hypothesis testing was conducted to determine the difference in curiosity between students who were treated with digestive system booklet integrated AR based on local potency and those who used biology textbook without any AR media. The hypothesis test carried out with the independent t test significance $\alpha = 0.05$. The results of the t-test of curiosity during post-test found that the value of sig. was $0.000 < 0.05$, then H_0 was rejected and H_1 was accepted as presented in Table 5. This meant that

digestive system booklet integrated AR based on local potency has an effect on students' curiosity in learning.

Table 5
Analysis of the post-test score

Variable	N	Post Test		t-test
		Class A	Class B	
Curiosity	37	87.5 ± 5.1	78.13 ± 3.76	0.000
Learning Interest	37	91.67 ± 2.27	80.56 ± 1.57	0.000

The attitude of student's curiosity was observed through observation sheet. The result showed the score of curiosity attitude observation in Class A was higher than Class B as shown in Figure 5. The results of students' responses to booklet integrated AR implementation were that students stated 4% (good) and 86% (very good) used in the learning process. The results of teachers' responses to booklet integrated AR implementation showed that 11% (good) and 89% (very good) used it in the learning process.

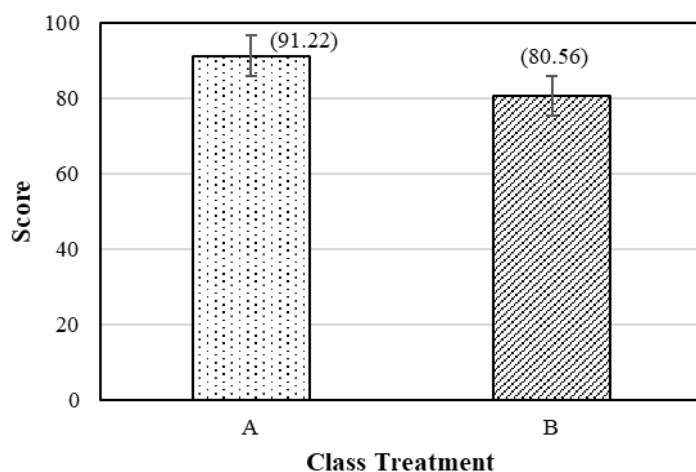


Figure 5

The score of student's curiosity attitude observation which was analysed from observation sheets in Class A and B. Class A used local potential-integrated AR booklet (n=37) and class B used biology textbook without local potential and AR (n=37)

Effect of Local Potential-Integrated Augmented Reality Booklet on Learning Interest

The score of student's learning interest in Class A as experimental group was higher than Class B as control group. It was proven by mean of post-test curiosity in Class A was 91.67 ± 2.27 , Class B was 80.56 ± 1.57 . The 3D animation on this booklet could enrich students' insights regarding the concepts of digestion and food substances being studied. The test of learning interest was carried out using a questionnaire and was given directly to students for the class A and B. The results of the percentage of learning interest assessment class treatment after learning could be seen in Figure 6.

The increase in students' interest in learning could be seen from the four indicators of interest in learning (Figure 6). Hypothesis testing was conducted to determine the difference in learning interest between students who were treated with digestive system booklet integrated AR based on local

potency and those who used biology textbook without any AR media. The hypothesis test carried out with the independent t test significance $\alpha = 0.05$. The results of the t-test of learning interest during post-test found that the value of sig. was $0.000 < 0.05$, then H_0 was rejected and H_1 was accepted. This means that a digestive system booklet integrated AR based on local potency has an effect on students' interest in learning.

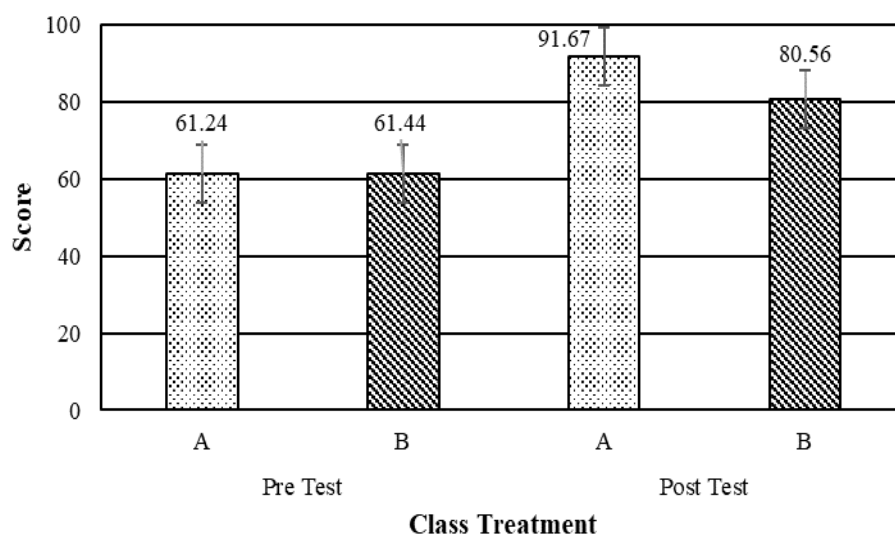


Figure 6

The score of student's learning interest which was analysed from questionnaire sheets in Class A and B. Class A used local potential-integrated AR booklet (n=37) and class B used biology textbook without local potential and AR (n=37)

DISCUSSION

Data of pre-test showed the average curiosity and learning interest scores of students respectively reached 62 and 63. Data of post-test showed there was an increase in student's curiosity and learning interest. The scores of students' curiosity and learning interest respectively reached an average of 87.5 and 91.6 with significance value was 0.000. It meant there was a significant result in the use local potential integrated AR booklet so that it can be said that the use of teaching materials based on local potential was very effective.

This is in accordance with the opinion of Wahyuddi *et al* (2022) teaching material development materials are said to be effective if the level of completeness of the after-test results is greater than the results of the previous test. Through these learning resources students could get to know their environment and can increase their direct understanding of concepts. This was in line with the opinion of Aminatun *et al* (2022) who explained that an ideal learning resource must meet several criteria including local potential in the environment aimed at inviting students to have direct contact with biological material objects in the form of activities and experiments.

The digestive system in the booklet was obtained from marker code containing a 3D animation database as an aid in finding any organs that affect the digestive system. The use of AR allows virtual objects into the real environment to facilitate real time interaction (Toraman, 2021; Enikanolaye, 2021). Media is a teaching material that serves to convey messages and information in learning

(Mailizar & Johar, 2021). Animation of 3D Augmented Reality could be observed in the developed booklet. This innovation was made to differentiate this booklet from the previous booklet. This innovation was also carried out to increase the attractiveness or interest of students to take part in learning which is rooted by high curiosity. As a consequence, learning becomes easier to learn. In addition, 3D animation could also add insight and make it easier for students to find and understand the concepts being studied. All designs are well structured and related to each other to produce better motivation from the students themselves (Pipattanasuk & Songsriwittaya, 2020). AR media can make it easier for students to learn and attract students' attention in learning (Jarrah & Alkhasawneh, 2023; Tsai, 2020).

AR can provide highly interactive experiences and can result in authentic learning activities and interactions. The factors that influence the emergence of interest in learning are 1) the lesson will attract students if there is a relationship between the lesson and real life, 2) the assistance provided by the teacher to his students in achieving certain goals, 3) the opportunity given by the teacher to students to play a role which proven by the score of student's curiosity attitude observation in experimental class reached was 91.22, 4) the attitude shown by the teacher in an effort to increase student interest. The results of the study found that the AR application could positively increase the students' curiosity which gave a direct positive impact to learning interest which proven by score of curiosity and learning interest reached 87.5 and 91.67 respectively in experimental class. The student's interest was initially at a moderate level, however, using the AR application, the student's interest increased to a higher level. This was because the use of AR made students' interest increase to a higher level. Students were more focused, confident, and satisfied with the booklet used. The study also found that the use of learning materials integrated with AR was suitable for today. Therefore, it was recommended for teachers to master and maximize the use of AR technology to ensure a better and effective learning environment.

CONCLUSION

The local potential integrated augmented reality booklet as teaching material on digestive system material for grade eleventh could improve the performance of students such as curiosity and learning interest in biology lesson. The local potential integrated augmented reality media can be used further as an innovative learning media in school to make students easier understand the material independently.

SUGGESTIONS

It has been determined that biology lessons taught with AR activities are more effective in increasing academic achievement than the lessons taught with the activities of the current program. For this reason, it is thought that including AR applications in curricula and lesson plans, focusing on the use of activities with AR applications in the lessons will increase the academic achievement of the students and a high level of efficiency will be obtained from the teaching activities carried out in this way. The important thing here is to ensure that AR applications are suitable for the level of students. It can be said that the implementation of activities supported by AR in educational institutions will bring a different perspective in terms of the integration of technology into education. It was concluded that there was a significant difference in favour of the experimental group in the "anxiety in exams" sub-dimension of the motivation questionnaire, and the AR activities applied to the experimental group students caused the students to worry about the exams. It is normal for students who are introduced to a new application to worry about what they will do and what they will encounter in the exams. It is thought that such anxieties of students will decrease with the use of similar technological applications more in lessons.

SCIENTIFIC ETHICS DECLARATION

The authors declare the legal responsibility of this article published in the journal belongs to the authors.

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