Effects of Smart Sewing Augmented Media Learning Applications in Design and Technology Subjects Against the Achievement of Year Five Pupils in Primary School

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Abstract

This study tested the effect of the use of the Smart Sewing Augmented Reality (AR) learning media application on the achievement and motivation of Year 5 pupils in primary school in Design and Technology (RBT) subjects for Sewing topics. Application (AR) is a learning based on 21st-century education. A quasi-experimental design was used to determine the effect of the Smart Sewing Application on student achievement. The study instrument for the achievement aspect uses the stitch topic test question, while for the motivational aspect, the questionnaire was used. The pilot study found that the reliability of the study question (Cronbach's Alpha) was 0.775. The quasi-experimental quantitative approach in this study involved a control and treatment group of sixty Year 5 primary school students who studied randomly selected RBT subjects. The data was analysed using the inference statistical method, which is SPSS software version 23.0. An analysis of the achievement aspect of pupils using paired t-tests showed that there was a significant difference in the mean scores of pre- and post-test test results for the control. The study instrument consists of pre and postal tests as well as a set of questionnaires. The study instruments were verified through the validity of the content and construct by the experts and the reliability index of the tests and questionnaires was high (> 0.75). An analysis of the achievement aspect of pupils using paired t-tests showed that there was a significant difference in the mean scores of pre- and post-test test results for the control group and treatment group pupils. As for the motivational aspect of pupils, paired t-tests showed that there was a significant difference between the mean motivational scores of pupils in the treatment group before and after using this Application (AR). Based on the findings of the study, it can be concluded that the use of the Smart Sewing Augmented Reality (AR) learning media application is relevant to improve students' achievement, motivation and skills as well as to help teachers to improve teaching process especially facilitate teaching in sewing topics. In addition, the Ministry of Education Malaysia (MOE) can also apply this AR learning medium through activities in the school curriculum.

Keywords: 21st Century Learning, Augmented Reality Media Learning (AR) Apps, Achievement, Motivation.

Introduction

Design and Technology (RBT) is a subject taken by all primary school year five pupils in Malaysia (Revised, 2017). Sewing articles are a sub-topic in the components of Household Technology in theory and practice. Learning through practice can assist students in developing psychomotor sewing skills as well as understanding the whole sewing process (Alwi et al., 2019). Practical work can build inquiry knowledge and scientific skills among students (Shilvia, 2016). There is a critical skills gap identified, which is a lack of technical knowledge, sewing skills, and lack of confidence when performing sewing practice (Bujeng et al., 2019; Allsop & Cassidy, 2019). The conventional method of sewing learning process cannot clearly describe difficult and abstract concepts, and teachers are forced to redo the demonstration process to ensure that students understand the processes and skills (Bujeng et al., 2018). Based on the findings of the needs analysis study by previous researchers, the students' basic sewing and embroidery skills were found to be at a weak level. The students lacked the knowledge and skills related to the materials, equipment, techniques, methods, and procedures needed to produce sewing products (Momota & Ogawa, 2018; Asar & Awang, 2018). Based on these findings and views, the challenges faced in this topic require a paradigm shift that aligns with the 4.0 industrial revolution (Sahaat & Nasri, 2020).

The needs analysis conducted on RBT teachers found that the need to develop the AR Media Learning Application was at a high level. Teachers strongly agreed that this application needs to be developed as one of the conventional learning alternatives during learning process. Therefore, the importance of developing this application can help teachers solve the problems faced in teaching, especially those involving learning new titles (Ramli & Tajudin, 2021). The use of AR technology in education can help increase motivation and actively engage students in the classroom (Farhana & Fariza, 2017; Khakimova, 2020). In addition, AR can help pupils learn to understand and read instructions while trying to learn sewing techniques in more detail. Thus, the use of AR as a medium of learning can help in their achievement as it can increase positivity and motivation among students.

Achievements

Students' achievement can be improved if the teacher can use interesting and encouraging teaching and learning methods. They can improve the cognitive and psychomotor skills of the students. The failure of pupils in the field of PTV can be attributed to the teaching methods in the classroom (Tee & Ong, 2016; Cyril, 2016). Most teachers use teaching methods in the form of lectures and demonstrations. Thus, Yip et al (2018) found that the use of AR applications has had a positive impact on students' learning and achievement, especially when learning complex tasks or concepts, to improve the quality of learning. Media Augmented reality as a medium of learning can improve students' understanding of learning as compared to using only pictures or images as a medium of learning (Arshad et al., 2023; Cahyaningtyas, 2020; Pramono & Setiawan, 2019). In this context, the pupil's achievement towards understanding the concept can explain an idea more clearly, and the pupil can improve his sewing skills better.

Motivation

Motivation is an internal state that stimulates, directs, and maintains behavior (Rokeman & Kob, 2024; Noriati et al., 2017; Woolfolk & Margetts, 2013; Woolfolk, 2010). It can move a desire to achieve success in life. Motivation also needs to be emphasized in every pupil's learning process, as learning motivation affects academic performance and achievement

(Rokeman et al., 2024; Wingo et al., 2015; Nesterov et al., 2017) showed that the implementation of AR can stimulate students to learn on their own to explore knowledge, increase motivation and interest students, and develop inspiration to learn when using more sophisticated laboratory equipment and have multimedia elements. Through AR applications, teaching materials can be produced more efficiently; teachers can provide more effective, interactive, and productive teaching approaches. Various teaching techniques can be applied in the classroom. While Mustaqim (2016) found that with the use of media, Augmented Reality can stimulate students' critical thinking as well as create high motivation through a more realistic virtual learning environment that is interactive, engaging, and effective (Wahab et al., 2020).

Among the skills that need to be mastered in 21st-century teaching and learning are AR application media learning skills and technology aimed at producing students who are proficient in the consistent use of information and communication technology (ICT) in the field of education through the 4.0 industrial revolution (Rokeman & Kob, 2024). This is to ensure that the learning session takes place more effectively. For example, once upon a time, where teachers only used chalk to write on blackboards to teach students, but nowadays, it is more modern because teachers have used laptops with Liquid Crystal Display (LCD), which can transmit pictures and video shows with colour and sound. The same will make the learning process more fun and attract students to learn about the subject (Bayani, 2023).

Objectives of the Study
The purpose of this study is as follows
1. Testing the effect of using Smart Sewing Augmented Reality (AR) Media Learning App on achievement in RBT subjects for fifth-year pupils.
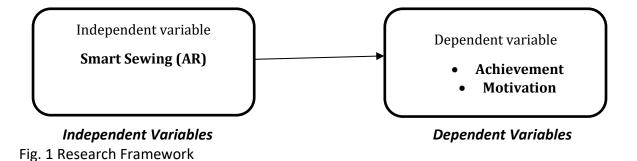2. Testing the effect of using Smart Sewing Augmented Reality (AR) Media Learning App on motivation in learning for RBT subjects for fifth-year pupils.

Hypotheses of the Study
Ha1: There was a significant difference in the mean score of the pre-test and post-test tests for the pupils of the control group.
Ha2: There was a significant difference in the mean score of the pre-test and post-test for the pupils of the treatment group.
Ha3: There was a significant difference between the mean motivational scores of pupils in the treatment group before and after using the Smart Sewing Augmented Reality (AR) Media Learning App.

Independent variable **Smart Sewing (AR)**	→	Dependent variable • **Achievement** • **Motivation**
Independent Variables		*Dependent Variables*

Fig. 1 Research Framework

Methodology

The study was conducted to test the effectiveness of the use of the Smart Sewing Augmented Reality (AR) Media Learning Application on the achievement and motivation of RBT Year Five students. This study used a quantitative approach under the quasi-experimental design of a separate sample group (quasi-experiment one separate sample group) through pre-testing and post-testing (Creswell & Poth, 2016) involving 60 students, 30 control groups, and 30 treatment groups. The quasi-experimental design differs from the actual experimental design in terms of the existence of the control group and the treatment group involved in the study. The selection of respondents who are not random clusters has also contrasted the quasi-experimental design with the actual experimental design (Cook, 2015; Creswell, 2014; Holmes, 2014). To overcome the problem of bias toward the findings, this design was replicated against two separate groups (Campbell & Cronbach, 2002), and different teachers taught these two sample groups. Pupils who belong to the experimental group will be given exposure to mobile device technology-assisted learning methods using the Smart Sewing AR learning media application. Meanwhile, the students who were categorized in the control group only used the existing learning method, computer-assisted learning with textbooks.

Population and Sample

The study population consisted of 3325 fifth-year Technology Design (RBT) students at the national primary school in Kubang Pasu District, Kedah, Malaysia, in 2021. A total of 60 students were selected using the group random sampling method. The selection of a sample size of more than 30 people per group is sufficient to meet the minimum sample requirements for each experimental method group (Fraenkel & Kleinb, 1996; Othman & Talib, 2015). These students were divided into two groups: 30 treatment groups and 30 control groups. These groups consisted of different races and were selected from two different primary schools but in the same category. In the context of this study, RBT teachers taught both treatment and control groups in terms of educational background as well as RBT subject teaching experience of more than 5 years. Researchers used random sampling of clusters through batch sampling techniques (Cluster sampling). Random clusters divide the location or institution where the sample is located. Researchers grouped fifteen states in Malaysia as clusters. Of the fifteen states listed, researchers used a simple random sampling technique to select one state as the study location. Having chosen a state, the selection of divisions and the selection of schools was also carried out using the same procedure. Random sampling techniques are used again to determine which schools will be control groups and treatment groups.

Quasi-Experimental Study Procedure

The quasi-experiment study took eight weeks, with one week used to brief the teaching teachers and another eight weeks used for teaching based on treatment groups and control groups. The validity of this study was divided into two, namely, internal validity and external validity. In accordance with the Campbell and Stanley (1963), internal validity refers to the degree of difference observed in the dependent variable caused directly by the manipulation of independent variables. External validity refers to the degree of results that can be manipulated or applied to other groups or other environments outside the experimental environment. Therefore, these factors are very important to observe and control while controlling the processing of non-dependent variables.

Data Analysis

The statistical method of inference was used to analyse these data, which is to identify the difference between dependent and non-dependent variables. Paired t-tests were used to study hypotheses 1, 2, and 3.

Results and Discussions

Ha 1: There was a significant difference in the mean score of the pre-test and the post-test test for the pupils of the control group.

Based on Table 1.1, it was found that the paired t-value of the pre and post-test paired t-test results of the control group were equal to -5.277 and the significant level equal to p = .000 which is smaller than .05 (p < .05). The paired t-test results show that t (29) = -5.28, p < .05. From those results, a p-value smaller than 0.05 showed that there was a significant difference in the mean of pre-tests and post-tests for the control group. Thus, the Ha1 hypothesis was accepted, showing a significant difference in the mean score of the pre-test and the post-test test for the students of the control group. These results showed an increase in post-test results compared to pre-tests, with an increase of 15.40. Thus, the use of the Smart Sewing AR Media Learning Application in RBT subjects will improve the achievement of the students compared to those who are still using conventional methods, and this finding was supported by Arshad et al (2023); Cahyaningtyas (2020); Pramono & Setiawan (2019) i.e. students' achievement can be improved in terms of cognitive and psychomotor skills if teachers are able to use interesting, encouraging teaching and learning methods using pictures or images.

Table 1.1
T-test for the Mean comparison of pre-and Post Tests for the Control Group

		Paired T-test		
		t	df	Sig.
Control group	Pre and Post	-5.28	29	.000

Significant *p* < .05

Ha 2: There was a significant difference in mean pre-test and post-test scores for the treatment group pupils.

Based on Table 1.2, the study found that the paired t-value of the pre and post-test results of the treatment group were equal to -20.868 and the significant level equal to p = .000, smaller than .05 (p < .05). The results of the paired t-test show that t (29) = -20.868, p < .05. Based on the results, p-values smaller than 0.05 showed a significant difference in the mean of pre-tests and post-tests for the treatment groups. Thus, the Ha2 hypothesis was accepted, showing a significant difference in the mean score of the pre-test and the post-test for the treatment group. This result shows that the use of the Smart Sewing AR Media Learning App can improve the achievement of Year Five pupils in RBT subjects, with a mean increase of 34.27 compared to the pre-test results. This is supported by the findings of the study by Arshad et al (2023) that showed that the AR application can improve the understanding of concepts and information retention where pupils can see and learn something elusive that is invisible to the real world through the digital world. This finding is also supported by (Yip et al., 2018). The use of AR Applications in this study has a positive impact on student learning and achievement, especially for complex concepts, with the presence of this AR App to further improve the quality of teaching and learning.

Table 1.2
T-Test for Mean Comparison of Pre and Post-Tests for Treatment Group

		Paired T-test		
		t	df	Sig.
Treatment group	Pre and Post	-20.868	29	.000

Significant *p* < .05

Ha3: There was a significant difference between the mean motivational scores of pupils in the treatment group before and after using the Smart Sewing Augmented Reality (AR) Media Learning App.

Table 1.3 shows the paired t value for the motivation level of the pupil before and after using the Smart Sewing Augmented Reality (AR) Media Learning App. The value of the t obtained is equal to -72.516. The significant level is equal to p = .000, which is smaller than .05 (p < .05). The results of the paired t-test show that t (29) = -72.516, p < .05. From those results, a p-value smaller than 0.05 showed that there was a significant difference in pupil motivation before and after using the Smart Sewing AR Media Learning App. Thus, the Ha3 hypothesis was accepted that there was a significant difference between the mean motivational scores of pupils in the treatment group before and after using the Smart Sewing AR App. This finding is supported by the studies of Wahab et al (2020) found that the use of AR can increase high motivation through a more realistic virtual learning environment that is interactive, engaging, and effective in teachers learning process. The Mustaqim Study (2016) also supports this finding that using the AR App can stimulate students' thinking to be more critical of everyday problems and events, as the nature of media learning can help students in the learning process that can be implemented anywhere and at any time desired.

Table 1.3
T-Test for Pre- and Post-Motivational Mean Comparison for Control Group

		Paired T-test		
		t	df	Sig.
Control group	Pre and Post	-72.516	29	.000

Significant *p* < .05

Conclusion
This study proved that the use of Smart Sewing AR Media Learning Application in the learning process in the sewing title has improved pupil achievement, improved comprehension, and increased motivation. Teaching materials such as multimedia applications cannot replace teachers' places but can be used to attract students to learn. In conclusion, the use of the Smart Sewing AR Media Learning App is appropriate for educators to implement as they always use netbooks, tablets, and smartphones. It also goes hand in hand with time, and all human beings need the convenience of mobile applications in life. Thus, the Smart Sewing AR Media Learning Application is highly relevant in schools as it aligns with the current technology. Furthermore, future research that includes in-depth analysis of AR Applications should be continued in all subjects, not only covering RBT subjects. To facilitate teachers' learning process sessions, the use of the AR App should be included in the syllabus for all subjects to help pupils see and learn something elusive that is only visible through the digital world. It can help pupils look at it from the perspective of the real world. The learning sessions

experienced by these students can help them to increase their interest and achievement in all subjects.

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