1. Sardi().docx

JVCE 8 (2) (2023) : 1-11

Journal of Vocational Career Education

https://journal.unnes.ac.id/nju/index.php/jvce

The Development of Android-Based Scar Media Differentiated Learning Model Anti Lock Brake System Material Light Vehicle Engineering Competence Class XII Vocational School

Sardi Sardi[1]✉, Samsudin Anis[2], Burhan Rubai Wijaya[2]

[1]SMK Wongsorejo Gombong, Jawa Tengah, Indonesia
[2]Pascasarjana, Universitas Negeri Semarang, Indonesia

Article Info

Article History :
Received
May 2023
Accepted
July 2023
Published
December 2023

Keywords:
Competency achievement; Android-based SCAR media development; anti lock brake system material; and psychomotor ability

Abstract

The achievement of student competence was still relatively low, one of the causes was the lack of maximum teacher creativity in developing innovative and creative learning media by utilizing digital technology in teaching and learning activities with differentiated learning models. One of the utilization of digital technology was the development of Android-based SCAR on ABS brake system material for class XII Vocational School. The purpose of this research was to improve students' cognitive scores and psychomotor/practical abilities that were abstract. This research applied the R&D (Research and development) method. The research design chosen was the ADDIE model, which consisted of five stages namely Analysis, Design, Development, Implementation, and Evaluation. The unit of analysis of this research was the development of Android-based SCAR. The instruments used in this research were (1) assessment sheet; (2) practicality questionnaire and (3) feasibility questionnaire. The validity of the assessment sheet was obtained from the CVR calculation and reliability using the ICC formula. The validity of the practicality questionnaire used the point biserial correlation coefficient formula, and the reliability of the questionnaire usef the KR20 formula. The validity of the effectiveness questionnaire used rhitung and reliability using Cronbach's Alpha formula. The data analysis used in this research were (1) categorial to determine the level of feasibility; (2) Guttman categorial; and (3) N-Gain and N-Gain difference test using t test. The results showed that the feasibility test of media expert and material expert responses was very feasible, the practicality test was very feasible, while the effectiveness test was quite effective and significant to improve students' cognitive scores and abstract psychomotor/practical abilities.

✉ Correspondence:
Jl. Yos Sudarso Timur No.16, Klapasawit, Wero, Gombong, Kebumen Regency, Central Java, Indonesia 54416
E-mail: spdsardi97@gmail.com

p-ISSN 2339-0344
e-ISSN 2503-2305

INTRODUCTION

The development of information technology was very rapid and very influential in various sectors. One form of information technology that continued to develop today was cellphones/Android. Previously, cellphones were only a means of communication, but now cellphones could have a broader function that could replace the function of a computer. One of the operating systems used by smart phones was Android. Android's capabilities were almost limitless as many people were developing Android's source code. What previously could only be done by a computer could now be done by a smartphone. The development of the digital world and technology was very supportive in the development of learning media including multimedia-based, websites, Android and 3D displays that would provide a visual and interesting images for students and teachers. The rapid development of information and communication technology, education required innovative transformations in learning methods (Agus 2023:3; Melati, 2023:6; Kestha et al, 2013:208). Teachers more easier to teach students impact positive performance that job satisfaction, motivation, job satisfaction, transformational leadership, work environment has a positive and significant effect on teachers' performance of vocational schools (Siswanto et al, 2023).

The use of Android in learning is by collaborating with the Smart Card Augmented Reality (*SCAR*) application. With the SCAR application, students would be able to access components forms that had been developed by researchers, in this case the ABS brake system material. The Augmented Reality learning process using smart card was effective for better understanding of a material (Sukma, 2023: 5; Wibowo et al, 2023: 5) . Through this learning media innovation, students could learn material by seeing the 3D form with smartphone before later doing practice direct. The right learning media was really helpful for students in the teaching and learning process so that it would provide an explanation of the learning material to be delivered and help communicate the message for the communicators and recipients (Adam et al. 2023: 2; Wulandari et al., 2023:05). The use of other ICT-based learning media such as electronic modules as teaching materials for students was considered creative, efficient, practical and effective (Aji, Hadromi, Wijaya 2020: 20).

The research location used was Wongsorejo Gombong-Kebumen Vocational School, which was still minimal in the use of technology as a learning media even though the school already had Android-based tablets or smartphones, so Android-based learning media was expected to help improve students' understanding. The SCAR application on students' Androids would make learning easier and more interesting so it was expected to increase students' understanding of the ABS brake system material and increase the learning outcome score that passed the cut score (KKM) by 75. The study of Ball, Joyce and Butcher5 explains that there are two important 21st century skills that need to be assessed, namely: (a) the 21st century life & career skills (21C-LCS); and (b) the 21st century skills classroom environment (21C-SCE). In the 21C-LCS, the aspects measured are: leadership and responsibility,working effectively with others, and adaptability. Important aspects of the measurement relate to 21st century skills, particularly in life skills and career development.(Siswanto et al. 2022)

METHOD

The media development design research was adopted from the ADDIE development model which consisted of five development stages, namely Analysis, Design, Development, Implementation, Evaluation. The ADDIE model was chosen because it had a simple nature (basic stages of development) and was structured systematically, making it easy to understand with stages of analysis, design, development, implementation, and evaluation. The five stages were interrelated and structured systematically (Aldoobie, 2015:68).

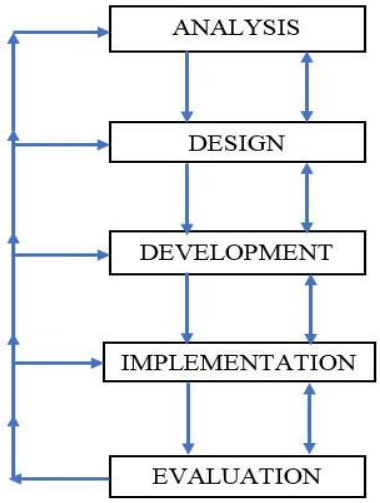


Figure 1. SCAR Media Development Procedure with the ADDIE Model

The first stage was Analysis. There were two main things in the analysis, namely problem analysis which aimed to find out and identify various shortcomings and weaknesses related to the learning media that were already running in vocational schools. Needs Analysis aimed to determine the need to develop interesting learning media by utilizing technology.

The Design Stage was an activity where the researcher began to design the learning media that would be developed. There were four steps at this design stage, including preparing an Android-based SCAR media framework, collecting and selecting references, designing an Android-based SCAR, and preparing an Android-based augmented reality smart card instruments.

In the Development stage of this research, the first thing that would be developed was Android-based SCAR media. This stage aimed to see the feasibility of the Android-based SCAR learning media that had been designed, then submitted to validators consisting of media experts, material experts and user responses (teachers and students). The media experts consisted of 1 BBPMPPV Yogyakarta and 1 media expert from the PT Ratih TV Kebumen industry and a Multimedia teacher. Meanwhile, the material experts were 2 industry parties, those were from PT Bumen Redja Abadi Motor Kebumen and from Nasmoco Cilacap and TKR teachers who taught the subject. Furthermore, the user responses in this research were 1 TKR teacher from SMKN 1 Gombong and class XII TKR A as a trial class. The step after the feasibility test and practicality test was the revision of the Android-based SCAR according to the notes and input from the validators, the next step was the development of an assessment sheet instrument to test the effectiveness of the Android-based SCAR to test its validity.

The Implementation stage was the application of media products that had been developed in the form of SCAR. The activity carried out in this stage was in the form of implementing Android-based SCAR media. The experimental class was class XII TKR A Wongsorejo Gombong Vocational School and the control class was class XII TKR 2 TKM Pertambangan Kebumen Vocational School. The process of determining research classes, both experimental and control classes, was based on lottery/random. The steps taken were giving a pre-test to the two respondents, then giving treatment to the experimental class in the form of Android-based SCAR, while the control class was not given treatment, after that giving a posttest as the final result of scoring the respondents' responses.

The Evaluation stage was the stage that was evaluated, in this stage divided into 2 evaluations, namely formative evaluation and summative evaluation. The formative evaluation was related to the feasibility and practicality test of the Android-based SCAR and the summative evaluation was related to the practical effectiveness test of the Android based SCAR. In the evaluation stage, the data obtained were analyzed to determine the shortcomings of the practicality of the Android-based SCAR that was to be created. The data resulting from the evaluation are in the form of suggestions and questionnaires. The validity and practicality sheets of this instrument uses a scale range of 5, namely strongly agree, agree, have no opinion, disagree and strongly disagree. The data was converted into qualitative data using the following criteria:

Table 1. Percentage range and Program Quantitative Criteria

Score Acquisition	Criteria
85% – 100%	Very practical
70% – 84%	Practical
55% – 69%	Quite practical
40% - 54%	Less Practical
0% - 39%	Impractical

Effectiveness data was obtained from the experimental class and control class learning outcome tests. The data of each class was tested for effectiveness using the N Gain Test and the independent t test. Then the learning completeness test was carried out to determine student success after using learning with Augmented Reality media for the experimental class and conventional learning for the control class. Before testing the effectiveness, the assumption (prerequisite) test was first carried out, namely a data normality test and a variance homogeneity test. The normality test was intended to test whether the data obtained came from a normally distributed population or not, so a normality test was used. The normality test in this study used the Kolmogrov Smirnov and Shapiro-Wilk tests. After the prerequisite tests were fulfilled, the t-test was then carried out. All tests were carried out with the help of the SPSS Version 25 for Windows computer program.

RESULTS AND DISCUSSION

Results

Research entitled the development of Android-based SCAR learning media could improve students' enthusiasm for learning and make it easier for students to understand the subject matter so that they could improve cognitive abilities and abstract psychomotor abilities. It had been implemented at Wongsorejo Gombong Vocational School in the even semester of the first academic year 2023/2024.

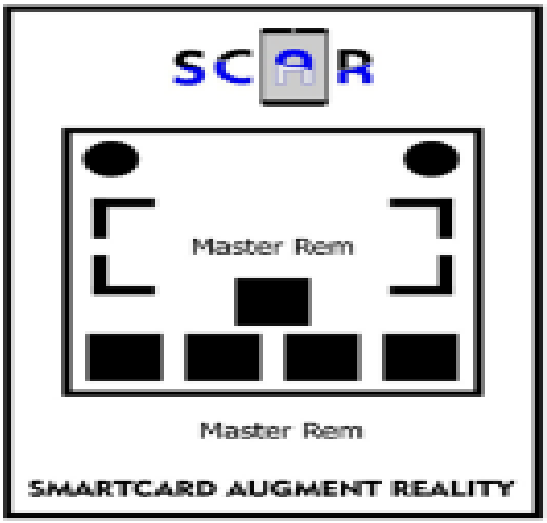
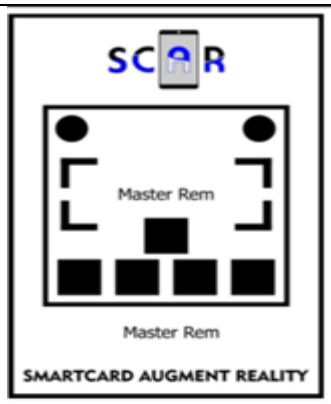
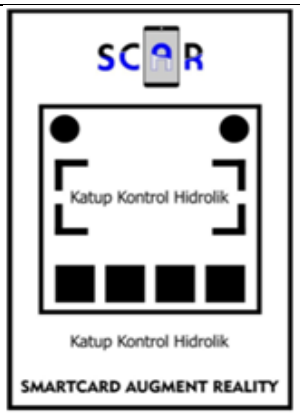
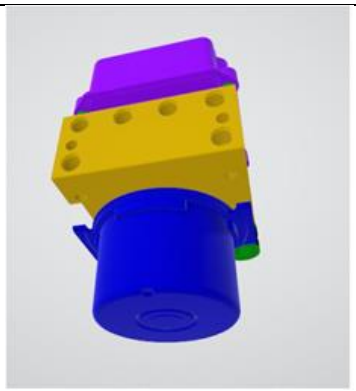
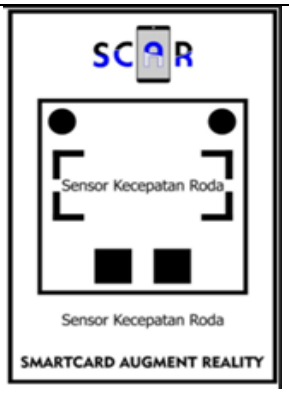
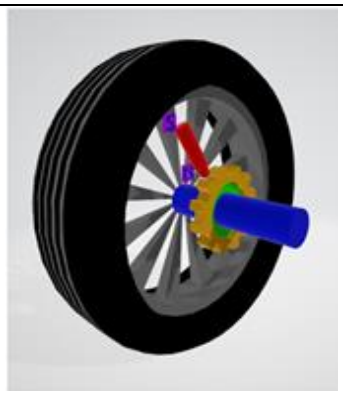
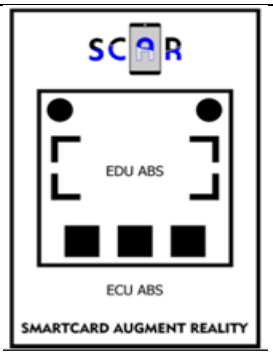
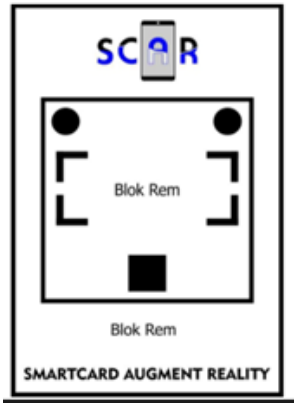
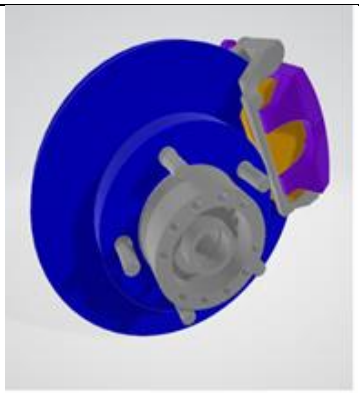


Figure 2 . Android-based SCAR learning media storyboard design.

The SCAR developed in this research was 5 cards, which when projected on an Android that had the APK application installed, an image would appear. The following was the display form of SCAR which was intended for visualization of the main components of the ABS Brake system. SCAR Display to Visualize the shape of ABS Brake Components.

No	SCAR	Visualization of ABS Brake Components
1		

2		
3		
4		
5		

Feasibility Test Results

Experts who provided assessment/validation in Android-based learning media using SCAR consisted of media expert validation and material expert validation. Media experts validated the design of the SCAR application display on Android, material experts validated the content of the ABS brake system

material included in the application. Validators for media experts, namely 1 person from BBPPMPV Yogyakarta, 1 person from Ratih TV Kebumen, 1 MM teacher from Wongsorejo Gombong Vocational School. Meanwhile, the material expert validators were 1 person from PT Bumen Redja Abadi Motor Kebumen, 1 person from Nasmoco Cilacap, and 1 TKR teacher at Wongsorejo Gombong Vocational School.

Table 2. Media Expert Assessment of Android-based SCAR

No	Assessment Aspects	Expert 1	Expert 2	Expert 3	Average	Criteria
1	Aspect of Software Engineering	4.53	4.86	4.86	4.75	Very feasible
2	Aspect of Learning Design	4.60	4.80	4.80	4.73	Very feasible
3	Aspect of Visual Communication	4.67	5.00	4.77	4.81	Very feasible

The results of the feasibility of learning media from media experts were seen from the feasibility of each aspect including software engineering aspects, learning design aspects, and visual communication aspects. 4.76 (95%) in the very feasible category.

Table 3. Material Expert Assessment of Android-based SCAR Products

No	Assessment Aspects	Expert 1	Expert 2	Expert 3	Average	Criteria
1	Aspect of Learning Design	5.00	4.11	4.94	4.68	Very Feasible
2	Aspect of Language Communication	4.75	4.00	4.25	4.33	Very Feasible

The results of the feasibility of learning media from material experts were seen from the feasibility of each aspect including aspect of learning design, aspect of language communication 4.51 (90%) in the very feasible category.

Practicality Test Results

Table 4. Practicality Test by Teachers and Students

No	Response Indicator	Validator Average		Average	Category
		Teacher	Student		
1	Appearance	91.3 %	91.3 %	91.3 %	Very practical
2	Presentation of Material	91.3 %	90.15 %	90.73 %	Very Practical
3	Benefit	100 %	91, 91 %	95.45 %	Very Practical
Overall User Average				92.49 %	Very Practical

Based on these results with the average validator consisting from teachers and students, the practicality test average score was $\bar{x}$= 92.49% with criteria very practical was used as learning support for ABS brake system material.

Effectiveness Test Results

Effectiveness Test Results Student learning outcomes data described in the research consisted of initial and final data. Initial data was obtained from the results of the pre-test scores and final data was obtained from the post-test results. In summary, the description of the learning outcomes of control and experimental class students was presented in table 5 below.

Table 5. Effectiveness Normality Test Android-based SCAR

Tests of Normality

	Kelas	Kolmogorov-Smirnov[a] Statistic	df	Sig.
Nilai Siswa	Pretest Eksperimen (SCAR)	.127	42	.088
	Posttest Eksperimen (SCAR)	.124	42	.108
	Pretest Kontrol (Konvensional)	.129	36	.138
	Posttest Kontrol (Konvensional)	.113	36	.200*

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Based on Table 5, it was known that normality test of the use of Android-based SCAR had significant score (Sig.). Kolmogorov Smirnov normality test for the experimental class obtained a pre test score of 0,088 > 0.05 and for the post test group 0.108 > 0.05. The results of the Kolmogorov Smirnov normality test for the control class obtained a pre test score of 0,138 > 0.05 and for the post test group 0.200 > 0.05. It could be concluded that in the Kolmogorov Smirnov normality test that the data was normally distributed.

Table 6. Homogeneity Test Results of Android-based *SCAR* Effectiveness Questionnaire

Test of Homogeneity of Variance

		Levene Statistics	df1	df2	Sig.
PRETEST RESULTS	Based on Mean	1,112	1	76	,295
	Based on Median	1,103	1	76	,297
	Based on Median and with adjusted df	1,103	1	73,740	,297
	Based on trimmed mean	1,123	1	76	,293

		Levene Statistics	df1	df2	Sig.
Posttest Score Results	Based on Mean	2,094	1	76	,152
	Based on Median	2,118	1	76	,150
	Based on Median and with adjusted df	2,118	1	74,564	,150
	Based on trimmed mean	2,172	1	76	,145

Based on Table 6, the results of the homogeneity test basis of mean Pre Test showed a significant value of 0.295, which means data > 0.05, so it could be concluded that the data was homogenous, while the score on the basis of mean Post Test showed a significant value of 0.152, which means the data > 0.05, so it could be concluded that data was homogeneous.

Table 7. N-Gain Score Test of Android-based SCAR

No	Experimental Class	No	Control Class
	N-Gain Score (%)		*N-Gain Score (%)*
Average	62.19	Average	43,44
Minimal	29.55	Minimal	29.55
Maximum	88.29	Maximum	74.47

Based on the results of the N-Gain score test calculation in this research, it showed that N-Gain average score for the experimental class was 62.19 with the minimum experimental class N-gain score of 29.55 and the maximum N-gain score was 88.29. While for the control class was

43,44 with the minimum control score of 29.55 and maximum N-gain score of 74.47. The score was then interpreted with the N-Gain effectiveness interpretation table as in the table 8 below:

Table 8. Interpretation of N-Gain Score

Percentage (%)	Interpretation
<40	Ineffective
40-55	Less effective
56-75	Quite effective
>76	Effective

(Arikunto, 1999)

Based on interpretation of the effectiveness of N-Gain scores above, it could be concluded that the average Gain score of the experimental class was 62.19 % so it could be concluded that the implementation of the Android-based SCAR application was moderately/quite effective for improving cognitive abilities and psychomotor abilities that were abstract cognitive scores of students. Meanwhile the conventional method showed the average Gain score of the control class that was 43.44% less effective to improve cognitive abilities and psychomotor abilities that were abstract in nature.

Table 9. Results of t test of the Control and Experimental Class

Data	Levene Statistics	t test	Level of Significance
N-Gain_Percent	0.152	5,560	0.000

Based on table output above, it was known that the significance score (Sig) on Levene's Test for Equality of Variances was equal to 0.152, so it can be concluded that variance data N-Gain (%) for the experimental and control class was same or could said homogeneous.

The calculation results obtained the calculated T value of N-Gain_Percent 5,560 with T table score at (df = 36 ; α = 5%) was 1.687. Because T count was greater than T table, so it can be concluded that before being given treatment using SCAR the Android-based SCAR application, there was no difference between the two classes being studied.

The results of the independent sample t test with the average N-Gain score entered in the table, showed that N- Gain_Percent data had a Sig (2-tailed) of 0.000 (smaller than significance level of 0.05), meaning there was a significant difference.

Discussion

From the results of data analysis, it could be seen that the development of the SCAR learning media application was very feasible for the ABS brake system material for Light Vehicle Engineering Competency Vocational School. Kurniadi (2019:146-157) in his research entitled Development of Network Hardware Learning Media Based on Augmented Reality on the Android Platform, aimed to create learning media for WAN technology network hardware due to limited tools in school laboratories during practicum. The results showed that the feasibility test showed that this learning media was very practical (95.45%) and very valid (94.7%). The similarity with the research conducted was the use of the Marker Based Tracking Method in Augmented Reality technology to display three-dimensional (3D) objects on Android. The 3D objects of the network device were designed using the Blender application.

Sidik's Research (2021:14-28) Application of Augmented Reality Technology in Android-based Interactive Learning Media for Computer Network Installation Material. This research developed Android-based learning media which was equipped with Augmented Reality technology to assist the learning process. The research results showed that testing by media experts covering aspects of interface design and instructional design showed a score of 78% with a decent category. Testing by material experts covering aspects of material content and material presentation as well as feedback showed a score of 84.1% with a very feasible category. Testing by respondents (users) covering aspects of display design, navigation and presentation of material showed a score of 88.96% with a very feasible category. The relevance of this research to the research carried out was that the research method

used was the Research and Development (R&D) method with an adaptation of the ADDIE development model.

Another research by Afnan, et al (2022) with the title *Development of Android-Based SCAR (Smart Card Augmented Reality) Learning Media on Cooling System Material for TKR Students at SMK PGRI 3 Malang* which stated the results that this research created *Smart Card Augmented Reality* (*SCAR) learning media*) for the Light Vehicle Engine Maintenance (*Perawatan Mesin Kendaraan Ringan*/PMKR) subject with cooling frame material for TKR students at SMK PGRI 3 Malang. The results of the material expert test obtained by the speaker material expert were 95.54%, the instructor material master approval test was 95.73%, the media master approval test was 91.37%. Information on student learning outcomes also showed an increase of 5.18%, which indicated that the Smart Card Augmented Reality (SCAR) learning media had a great influence on the cognitive achievements of students in the Light Vehicle Engineering Department of SMK PGRI 3 Malang. The relevance of this research to the research carried out was the development of Augmented Reality media to increase students' interest in learning.

Sumbawati's research (2020:153-161) Development of Augmented Reality-Based Learning Media in Digital Systems Courses in the Informatics Engineering Department, Unesa. This research aimed to develop Augmented Reality-based learning media in digital systems courses on logic gate material, so that students were able to learn independently without being limited by space and time and to increase students' interest in learning. The results of the research that had been carried out wee: (1) Student responses after using learning media with Augmented Reality digital systems showed good results of 88.75% in the "Very Feasible" category; (2) The results of the material feasibility assessment by material experts obtained a percentage of 91.07% in the "Very Feasible" category. The feasibility assessment by media experts received a percentage of 91.4% in the "Very Feasible" category. Thus, this digital system Augmented Reality learning media could be used in learning in the "Very Feasible" category. The relevance of this research to the research carried out was the development of Augmented Reality-based learning media to increase students' interest in learning. From the results of previous research as explained above, there were similarities with the research carried out, namely the development of learning media based on Augmented Reality technology and the type of research, but none of the research was really the same as the problem studied in this study..

The novelty in this research was that the use of the SCAR application media by students at the Wongsorejo Gombong Vocational School could be categorized as very feasible, very practical, effective and significant for increasing the achievement of abstract cognitive and psychomotor competencies. Another thing was the development of the SCAR application media which was used as a companion or addition to the digital learning media for class XII Vocational School students can in the Light Vehicle Engineering Expertise Competency digitally, media in the form of electronic media that made it easy for students to learn independently, there were coherent work steps accompanied by color pictures, could be applied directly on mobile phones by students and teachers of Light Vehicle Engineering.

The way this application worked as a whole was that if the material containing the SCAR application was opened, it would open the camera on the device installed on the student's cellphone. The function of this camera was to detect markers contained in the material section, if the camera successfully tracked the marker it would display a 3D image of the ABS brake system components.

SCAR application-based learning media could be run without having to install any additional software, so it was very easy to use. The application of SCAR learning media was able to provide an interactive learning atmosphere for students because they were able to understand the learning material in more detail, thoroughly, and flexible in terms of time. The advantage of the SCAR learning media applied in the ABS brake system material was able to provide stimulation to students' mindset that learning did not always

have to be conventional but could be fun and not boring by implementing learning that could display 3D simulation-based learning. In addition, the development of SCAR technology was able to meet the need to increase students' creative skills, improve students' cognitive ability to think critically and made it easier for students to understand abstract and complex things.

CONCLUSION

Based on the discussion of the research results, it could be concluded that the SCAR learning media could be used as a learning media for ABS brake system material which was able to make it easier for students to understand the material and provide students with flexibility of time in accessing the material. The SCAR learning media could be used as a fun learning media and was able to create a new and interactive atmosphere in students' learning of Light Vehicle Engineering competency Vocational School. The student responses to the SCAR application are very high, which was able to increase student enthusiasm during the learning process. It could be said that Android-based Learning Media Development using SCAR was effective.

REFERENCES

Adam, Muhammad Imanul., Anirusilowati., Awalya. 2023. Development of An Evaluation Instrument Model for The Counseling Guidance Service Program for Student Discipline. *JRERE 12 (2) 2023 134-142. Journal of Research and Educational Research Evaluation. http://journal.unnes.ac.id/sju/index.php/jere*

Afnan, Maulid Khoirul. dkk. 2022. Pengembangan Media Pembelajaran Scar (Smart Card Augmented Reality) Berbasis Android Pada Materi Sistem Pendinginan Untuk Siswa TKR Di SMK PGRI 3 Malang. *Jurnal Teknik Otomotif: Kajian Keilmuan dan Pengajaran* Vol. 6, No. 2

Agus, Asrul. 2023. Aplikasi Model Pembelajaran Teaching Factory Untuk Meningkatkan Minat Dan Hasil Belajar Siswa Pelajaran Pre Di Smk Negeri 3 Selon. *Jurnal Inovasi Riset Akademik*. e-ISSN : 2807-1808

Aji, Nugroho Kusumo Bayu., Hadromi, Wijaya, M. Burhan Rubai. 2020. Efektivitas Penerapan Modul Elektronik Sistem Injeksi Bahan Bakar Bensin Untuk Meningkatkan Hasil Belajar Mahasiswa Dalam Mata Kuliah Teori Motor Bakar. *Journal of Mechanical Engineering Learning*

Antonioli, M., Blake, C., & Sparks, K. (2014). Augmented Reality Applications in Education. *Journal of Technology Studies*

Azuma, R. T. (1997). *A survey of augmented reality*. Presence: Teleoperators and Virtual Environments

Dwi, A.M., Hadromi, H. (2020). The Development of Interactive Learning Media Based Android Application Using Adobe Flash in Conventional Filing System. *JVCE* 5 (1), 21-28

Hermawan, L.,Hariadi, M. (2015) Pemanfaatan Augmented Reality sebagai Media Informasi Kampus Menggunakan Brosur. Seminar nasional teknologi informasi dan komunikasi: 81-88

Keshta, A. S., & Harb, I. I. 2013. "The Effectiveness of a Blended Learning Program on Developing Palestinian Tenth Graders' English Writing Skills". *Education Journal,* 2(6), 208-221.

Melati, Eka dkk. 2023. Pemanfaatan Animasi sebagai Media Pembelajaran Berbasis Teknologi untuk Meningkatkan Motivasi Belajar. *Journal on Education*, Vol. 06, No. 01, September-Desember 2023, pp. 732-741 E-ISSN: 2654-5497, P-ISSN: 2655-1365 Website: http://jonedu.org/index.php/joe

Rusnandi.2015. Implementasi Augmented Reality pada Pengembangan Media Pembelajaran Bangun Ruang 3D untuk Siswa Sekolah Dasar. *Infotech Jurnal*: 24-31

Saputra, Rujianto Eko Saputro dan Dhanar Intan Surya. (2015). Pengembangan Media Pembelajaran Mengenal Organ Pencernaan Manusia Menggunakan Teknologi Augmented Reality. *Jurnal Buana Informatika*, 6 No. 2, 153-162.

Siswanto, Edy., Samsudi., Supraptono, Eko., Sutopo, Yeri. (2022). The role of Teaching Factory (TEFA) Management onEntrepreneurship Skillof Vocational School Students: A Structural Equation Modelling Analysis. *ResMilitaris(resmilitaris.net),vol.12,no.4. 573–582.*

Siswanto, Edy., Samsudi., Supraptono, Eko., Sutopo, Yeri., Purwanto, Agus. (2023). The role of transformational leadership, work environment, motivation on job satisfaction and teachers performance of vocational schools. *AIP Conference Proceeding. Volume 2765 issue 1.* https://doi.org/10.1063/5.0155768

Sukma, Crisna Wijaya., Margunayasa, I Gede., Werang, Basilius Redan. 2023. Pengembangan Media Pembelajaran Digital Augmented Reality Berbasis Android Pada Materi Sistem Tata Surya Untuk Siswa Kelas VI Sekolah Dasar. *INNOVATIVE: Journal Of Social Science Research,* 3 (3), 4261-4275.

Sumbawati, R.H., & Meini, S. (2020). Pengembangan Media Pembelajaran Berbasis Augmented Reality Pada Mata Kuliah Sistem Digital Di Jurusan Teknik Informatika Unesa. *Jurnal IT- EDU*, 4(52), 153-161.

Wibowo,Valentina Rossi., Putri, Kharisma Eka., Mukmin, Bagus Amirul. 2022. Pengembangan Media Pembelajaran Berbasis Augmented Reality pada Materi Penggolongan Hewan Kelas V Sekolah Dasar. *Jurnal Sinar Edukasi JSE,* 3.(1). DOI: https://doi.org/10.53624/ptk.v3i1.119

Yudiono, Heri., Maulana, Sonika., Wijaya, M. Burhan Rubai., Aprianto, Rahmat., Karsan. (2021). Product-Based Learning Model Through The Alignment Of Mechanical Engineering Competencies With Industry. *Jurnal Pendidikan Teknologi dan Kejuruan,* 27(1), 74-80.