Vol. 10, No. 1, 2024, pp. 829-838
DOI: https://doi.org/10.29210/1202424639

Contents lists available at Journal IICET

Jurnal EDUCATIO (Jurnal Pendidikan Indonesia)
ISSN: 2476-9886 (Print) ISSN: 2477-0302 (Electronic)

Journal homepage: https://jurnal.iicet.org/index.php/jppi

Innovative gamification strategies to improve student learning outcomes in vocational high schools

Muhammad Iqbal Faza*), Ranu Iskandar, Rizqi Fitri Naryanto
Automotive Engineering Education, Faculty of Engineering, Universitas Negeri Semarang, Semarang, Indonesia

Article Info

Article history:

Received Aug 24th, 2024
Revised Aug 27th, 2024
Accepted Aug 07th, 2024

Keyword:

Gamification
Learning outcomes
Learning media
Wheels and tires

ABSTRACT

The purpose of this research is to develop gamification-based learning media operated through the Android platform and test its effectiveness on student learning outcomes. The research method used is the ADDIE model, which involves five stages: Analysis, Design, Development, Implementation, and Evaluation. This means that researchers conduct analysis, researchers make designs for learning media so that students are not bored while learning, researchers develop media that are more interesting than previous research, researchers implement by making learning media, and evaluate to develop further research. Validation of this gamification learning media was carried out by linguists, material experts, and media experts. The trial was conducted on students of class XI TKR 1 and 2 at Mataram Semarang Vocational High School, with a total of 61 students. The data analysis of this research was conducted using a t-test. The results of this study showed that: (1) The validation results from linguists amounted to 95%, material experts amounted to 90.5%, and media experts amounted to 87.2%, meaning that the gamification learning media developed proved to be very feasible to use in learning so that students are not saturated and bored. (2) The average pre-test score was 65.44, and after learning using the gamification application, the average score was 79.56, with an increase of 14.12, and the t-test results showed a p-value of 0.00 <0.05, which means that gamification learning media has a significant impact on improving learning outcomes and increasing student interest in learning. (3) The use of gamification learning media as learning media is very good for students, as it allows students to be more independent in learning and not only rely on explanations from teachers.

Corresponding Author:

Muhammad Iqbal Faza,
Universitas Negeri Semarang
Email: 120356230280@students.unnes.ac.id

Introduction

Technological development is something that we cannot avoid in modern life, where technological advances go hand in hand with increased knowledge, which ultimately has an impact on the world of education (Glover et al. 2016). According to Petralia et al. (2017), Technological innovation is a major driver in various aspects of life, including industrial development, economic growth, and improving living standards. Technology facilitates various human activities, including in the field of education, where innovations and new ideas in learning continue to develop. Learning activities themselves are the implementation of the curriculum in an educational institution with the aim of achieving the desired results (Arifin et al., 2015). One of these educational institutions is the Vocational High School (SMK).

Vocational High School is one form of formal education institution that organizes vocational education at the education level after Junior High School (SMP) or equivalent. Vocational High School aims to prepare its graduates to be ready to face challenges in the industry, business world, and the world of work (IDUKA) (Rojaki, 2023). The education and curriculum at Vocational High School is different from that of Senior High School. The Vocational High School curriculum is designed to prepare students to enter the world of work after graduation. Therefore, Vocational High School offers various fields of study that aim to improve students' competencies so that they can directly enter the workforce or continue to a higher level of education. The spectrum of expertise includes a wide selection of programs offered by Vocational High Schools in an independent curriculum but is not limited to various majors or concentrations of expertise such as engineering, health, business, arts, and so on. (Adkha et al., 2021; Setiadi et al., 2024).

Each skill competency in the Vocational High School has three classes, and Mataram Semarang Vocational High School has a total of 19 classes. Mataram Semarang Vocational High School implements the Merdeka Curriculum, an education system that makes the teaching and learning process more enjoyable and flexible for students and teachers. The Merdeka Curriculum aims to encourage the development of more advanced and creative education in Indonesia (Merlin et al., 2022). The learning results of all 61 students in grade 11th vehicle light engineering (TKR) 1 and 2 obtained an average score of 76 from the theory score and an average score of 78 from the practical score. From the theory score data above, there are 40 students who have not reached the minimum completeness criteria (KKM), and there are 33 students who have not reached the KKM on the practical score. This indicates that student learning outcomes in wheel and tire subjects need to be improved.

There are several potentials in Mataram Semarang Vocational High School that support researchers in developing gamification learning, namely: 1) The school has Wi-Fi in every class, and teachers and students use this Wi-Fi in learning and educational administration. 2) all students have smartphones. This smartphone is Android and is based on a lollipop kernel. Students are also able to operate smartphones and the available applications. 3) All teachers have their own laptops, so they are considered digitally literate.

To overcome problems and utilize existing potential, teachers need to make innovations in learning. One of the innovations that can be applied is through the use of learning media. Currently, the trending learning media is gamification (Prabaningtyas, 2024). Learning media is important to improve student learning outcomes so that student scores are maximized, so this study aims to develop an android-based learning media called gamification, in which there is not only material and questions but also videos, quizzes, and games.

The purpose of this study is to develop gamification-based learning media on wheel and tire system material, determine the feasibility of gamification learning media used in the learning process, determine how much the improvement of student learning outcomes after using gamification learning media, and aim to determine the responses of grade 11th students regarding the use of gamification learning media. Wheel and tire learning media.

Gamification is learning by using elements in games or videos with the aim of motivating students and maximizing fun. This media can also be used to attract interest and inspire students to continue learning. Gamification uses elements of game mechanics to become a practical solution; in detail, the definition of gamification is the thought of game-based mechanics to attract people. Glover says that gamification provides greater motivation to ensure students follow lessons fully (Heni, 2016).

The principles of Gamification according to Ariani (2020), Gamification includes several important basic elements, namely: 1) Points, Indicators for learners that they have completed gamification elements; 2) Badges: Medals awarded after learners complete certain stages or challenges; 3) Level: Levels that learners must reach in the gamification process; 4) Leader board: A system that shows the rank of learners after completing challenges; 5) Avatar: A visual representation of learners in gamification. These elements support the freedom to fail, quick feedback, progress, and a storyline in the learning process.

Some studies show an increase in learning outcomes by using gamification learning media. According to Wardana (2019), the use of gamification learning media showed that students experienced an increase in learning outcomes of 27.13, and the completeness of learning outcomes increased by 70.11%, totaling 36 students. For future research, it is recommended to focus more specifically on factors that affect students, such as lack of activeness in learning, low motivation, or inability to achieve KKM.

According to research conducted by Wastari (2018), the results of this study indicate that gamification-based cooperative learning can improve student learning outcomes. The original learning outcome value of 56.96 increased to 75.53 in the first post-test and to 81.14 in the second post-test. The percentage of learning completeness in the pre-test of 10.71% increased to 42.86% in post-test I and reached 82.14% in post-test II with a total of 40 students. For further research, it is recommended that it not only focuses on cognitive learning

outcomes but also considers other aspects such as learning evaluation, student activity, motivation, and student response to the application of Gamification-based cooperative models for improvement and refinement in its implementation.

Learning media development should not be done carelessly. It should consider various aspects that become the basis of learning media assessment, such as portability, ease of process, installation, smoothness, navigation consistency, text readability, illustration quality, sound effects, and interactivity (Rati et al., 2022).

The characteristics of students in taking learning outcomes starting from elementary school or elementary school, called the children's phase, are only given a model of ABC multiple choice questions; after that, junior high school or junior high school, called the early adolescent phase which is only given a model of 4-choice multiple choice questions, then entering high school (SMA) or Vocational High School (SMK) in this adult phase students are given a model of multiple choice questions in the form of 5 choices. The more answer choices given in multiple-choice, the more students must understand the material given in order to master the material so that it is correct when choosing.

According to Agustian (2014), wheels and tires consist of two parts: rims and tires. The wheels move along the road while bearing the weight of the vehicle, while the tires function to absorb impact from the road surface and reduce shock to the vehicle body. There are two types of wheel rims, namely pressed steel wheels and rims made of cast iron alloy. The function of tires is to provide greater friction force with the road surface. Proper tire maintenance makes car tires of high quality and durable for a long time. Sporing Balancing is a way of maintaining alloy wheels by balancing the wheels so that the weight is evenly distributed so that the wheels rotate on their axis quietly without vibration.

Method

This research is a research and development (R&D) that aims to develop learning media on the material of wheel and tire system elements. The orientation of research and development is to produce learning device products in the form of gamification applications for students.

The stages of developing learning media in this study adjust from the ADDIE model (Iskandar, Rusiyanto, et al., 2023). The ADDIE model development applies five stages, namely: Analysis, Design, Development, Implementation, and Evaluation (Dewi et al., 2022). Researchers conducted an analysis by asking TKR teachers about grades that were lower than KKM and what problems were experienced in this school. Namely, there is a lack of use of existing facilities such as Wi-Fi and smartphones. Researchers wanted to develop smartphone-based learning media, and teachers also supported the research. In order to be valid, the researcher distributes questionnaires to grade 11 students to find out what grades are not good, the researcher makes a more attractive design for the learning media so that students are not bored while learning, and the researcher develops the media used to be more interesting than previous studies such as using gamification whose contents are not only material such as powerpoints, but there are also videos, quizzes, and games, the researcher implements by making the learning media as interesting as possible in order to achieve the planned goals, the researcher evaluates and asks for input from students about the learning media that has been made in order to be developed in further research.

This study uses data collection techniques, namely observation, interviews, distributing questionnaires, documentation, and tests, to find out how effective the use of multiple-choice questions is. According to Mukhlisa (2023), content validation refers to the extent of the suitability between the contents of the measuring instrument and the measuring target. For the matching process, the target content is arranged in the form of specifications, which include learning materials and learning objectives. Matching is done by assessing the specifications in detail, and if item-by-item matching is deemed insufficient, then the assessment results are considered unfavorable and will be discarded, corrected, or replaced.

Observations carried out in this study are by observing and recording information that we witness during the study; for example, we observe from grade 10 to grade 12. The interviews that researchers conducted were interviews with teachers first about what problems were experienced during learning that resulted in grades less than KKM and then interviews with students about why their grades could be less than KKM. After that, a questionnaire was distributed, namely by means of researchers making instruments and responses, then distributed to all 11th-grade students so that we know what lessons are still difficult to understand during class learning and student responses what the causes of grades that are less than KKM. Tests during the study by means of the first test, namely the pretest to find out how many scores before using gamification learning media; after the next test, the researcher gives directions to students to download the gamification application and explains all the contents in the application then gives the second test, namely the posttest so that we know how much the value increases after being given gamification

learning media. When the research takes place, don't forget to do documentation asproof that you have done the research properly and correctly.

This study chose grade 11th as a sample for gamification learning media research because in grade 11, the worst grades were less than KKM, and grade 11 also had to master the material first, after which the learning continued with practice in the workshop. If grade 11 has not mastered and understood the material provided, it will affect the next practical learning carried out in the workshop. Grade 11th must also prepare carefully because, in grade 12, students will later have internships in the industry or in workshops outside the school. If you take a sample in grade 10, the material provided is still the basics about automotive, not yet reaching the practice in the workshop, so students can still learn easily. In this study, the sample used was all 11th-grade students, totaling 61 students. 61 students were deemed sufficient to sample the data because the average of previous studies was only 35 to 40 students.

The learning media developed requires a research instrument in order to be considered feasible or valid. This questionnaire uses a Likert scale. This Likert scale consists of 5 answer options, namely strongly agree, agree, doubt, disagree, and strongly disagree. The instrument used in this research is a questionnaire given to material experts, media experts, and linguists as well as a student response questionnaire consisting of 61 students of class XI TKR 1 and XI TKR 2 of Mataram Semarang Vocational High School. Before conducting the main research, the instrument was tested and assessed by experts. The method of assessment used is by showing the gamification application to the media expert and given an instrument containing aspects of display quality, button usability and application then the expert will assess it. Meanwhile, the way the linguist assesses is in the same way by showing the gamification media, especially the quiz section and giving an instrument containing aspects of language and communicative rules, then the linguist will assess it. Likewise, the way the material expert gives a score is by showing the gamification media and giving an instrument containing aspects of material suitability, material presentation and evaluation then the material expert gives a score. Each aspect assessed from the experts is made into a percentage.

The percentage of answers to the validator assessment questionnaire scores and student responses were calculated using the formula according to (Arikunto, 2010) as follows:

$$P = \frac{\sum x}{\sum y} \text{ x } 100\%$$

Description:
P = percentage of feasibility
∑x = total number of respondents' answers
∑y = maximum number of scores

According to Auliya & Lazim (2020), decision-making categories can be seen in Table 1.

Table 1 <Percentage Validity Criteria>

Percentage (%)	**Interpretation**
81.25 - 100	Very feasible
62.5 - 81.25	Worth
43.75 - 62.5	Less feasible
25- 43.75	Not worth it

The t-test is used to compare pretest and posttest results. So that it can be known the effectiveness of using gamification learning media. The results of observations at Mataram Semarang Vocational High School many students who score less than the KKM due to the ineffectiveness of the learning media used are still traditional, causing a lack of student interest in learning such as monotonous explanations of material from teachers by explaining in front of the class using books or power points so that students are bored and bored.

The results of the Mataram Semarang Vocational High School student questionnaire that the learning process is carried out in theory in class and practice in the workshop. In the concentration of Light Vehicle Engineering expertise in the subject of light vehicle energy conversion elements, two people stated that it was difficult, one person stated that it was difficult in the process of servicing and managing light vehicle workshops, 0 people stated that it was difficult in the process of using light vehicles, 0people stated that it was difficult in periodic maintenance of light vehicles, three people stated that it was difficult in light vehicle engine systems, seven people stated that it was difficult in light vehicle power transfer systems, 24 people stated that it was difficult in light vehicle chassis systems, seven people stated that it was difficult in light vehicle electrical systems, and four people stated that it was difficult in safety systems and light vehicle electronic control systems. From the above results, it can be concluded that the most difficult level is in the light vehicle chassis system, namely 24 people.

Results and Discussions

Analysis Stage

So far, Mataram Semarang Vocational High School still uses teaching materials in the form of books and power points that look monotonous and boring. As a result, students get bored reading and learning the lesson, so learning outcomes are not maximized. For example, in the wheel and tire material lesson where this material must be understood until it is completely understood because after that it is continued with practical activities in the workshop. This knowledge is obtained from students who are lazy to search and reopen the notes recorded by students from the power point delivered.

After analyzing and observing, look for references from e-books and journals or previous theses related to the development of learning media. So a solution is obtained by developing learning media that is more attractive, accessible, flexible, and creative with an android-based.

Design Stage

The learning media used in this research can only be accessed through Android-based smartphones and can be accessed anytime and anywhere. This media can be installed on each student's smartphone and can be used without an internet connection. This learning media is equipped with pictures, videos, and games that are designed to be as interesting as possible so that students do not feel bored when learning it.

Figure 1 <Main Menu Display (a), Learning Objectives (b), Video (c), Game (d), Material (e), Questions (f)>

These learning objectives are derived from the CP and ATP. Learning objectives must be written systematically. These learning objectives are written using the ABCD model (Iskandar et al., 2020).

Assessment instruments are designed in the form of tests and non-tests to determine the feasibility and effectiveness of learning media to be used. Non-test assessment includes material, language, and media validation. The test instrument consists of questions that are used to measure student learning outcomes. In addition, this question has 5 answer choices and has been adjusted to the learning objectives (Iskandar, 2019).

The use of color in learning media greatly affects the good and bad appearance of the resulting layout. According to Purnama (2010), the use of red, yellow, and orange, or so-called warm colors, tends to be much liked and increases student enthusiasm. Meanwhile, blue, green, and purple are cold colors. Bright colors and bright color combinations are much preferred by students over parents.

Development Stage

After the gamification application is completed, the experts will assess it to find out how feasible the application that has been made is. Validation was carried out by 3 validators, namely linguists, material experts, and media experts. The linguists came from Indonesian language teachers at Mataram Semarang Vocational High School. Meanwhile, material experts and media experts come from lecturers of the Automotive Engineering Education Study Program at Semarang State University.

The linguist validation was carried out based on the rubric that had been prepared in terms of the suitability of the linguistic aspects and communicative rules, with the following results.

Tabel 2 <Results of Linguist Validation>

Aspects	Percentage %	Interpretation
Language rules	90%	Very feasible
Communicative	100%	Very feasible
Overall	95%	Very feasible

The way to assess gamification media linguists is by showing the media and providing an assessment instrument so that linguists know what aspects are assessed from the media. After this, the assessment results are calculated in Excel and then used as a percentage. The assessment results are declared feasible if the percentage is like the provisions in Table 1 above. The results of the value by the linguist stated that the gamification media was "very feasible," which was based on the results of the percentage of the language rules aspect of 90% because it received input on the use of punctuation and on questions should not use unless but replaced with the following which is not. The use of standardized language in learning and questions will make it easier for students to understand wherever students come from (Rahmawati et al., 2021). The communicative aspect is 100% because each indicator gets a score of 5, which means the best from a score range of 1-5. The overall result of aspects in terms of language is obtained at 95%.

Material expert validation is reviewed in terms of material suitability, material presentation, and evaluation with the following results.

Table 3 <Validation Results of Material Expert>

Aspects	Percentage %	Interpretation
Material suitability	95	Very feasible
Presentation of material	80	Worth
Evaluation	80	Worth
Overall	90.5	Very feasible

The method of assessment of the material expert is also like the linguist. The results of the assessment from the material expert, gamification learning media are said to be "very feasible" based on the aspect of material suitability, namely 95% because it is in accordance with the material of wheels and tires, the percentage of material presentation aspects is 80% because in the aspect of material presentation getting input to improve sentences on tire types and incomplete images, and the percentage of evaluation aspects is 80% because there are still incomplete. Evaluation aims to obtain certainty about the success of student learning outcomes and provide feedback on what is being done (Adaara, 2019). The overall percentage result in terms of material is 90.5%. Furthermore, revisions should be made to the gamification learning media.

Media expert validation was reviewed in terms of display quality, usability, and implementation with the following results on table 4. The method of assessment of media experts is also like that of the linguists above. Based on the assessment from the media aspect, the gamification media is declared "very feasible" with a percentage of 85.3% because it can be input regarding the consistency of paragraph placement, the addition of back icons, and placement that must be proportional.

Table 4 <Media Expert Validation Results>

Aspects	Percentage (%)	Interpretation
Display Quality	85.3	Very Feasible
Usability	85	Very Feasible
Applicability	100	Very Feasible
Overall	87.2	Very Feasible

A good media display must pay attention to the consistency of icon placement, paragraphs, and spaces (Hidayat et al., 2024; Setiyawan et al., 2024). From the usability aspect, this media obtained a percentage of 85% because it received input regarding the buttons on the media should be enlarged, and from the implementation aspect, it obtained a percentage of 100% because each indicator obtained a score of 5, which means the best from the score range 1-5. The overall percentage result in terms of media aspects is 87.2%. The quality of the display of learning media, such as images and sound, can stimulate students to learn and can increase student interest in learning (Alviyaturrohmah et al., 2013; Maulani et al., 2024). The three validators have stated that the gamification application to improve student learning outcomes is very feasible to use on wheel and tire material. The learning media was also assessed by students by distributing questionnaires containing aspects as in the previous experts and getting a response of 85.3%. It can be concluded that learning media is very feasible for students to use, and students feel happy using it.

Implementation and Evaluation Phase

The results of observations show that many students score less than KKM due to the ineffectiveness of the learning media used, which is still traditional, causing a lack of student interest in learning, such as monotonous explanations of material from teachers and explained in front of the class using books or power points so that students are bored and bored. The results of interviews with TKR teachers show a lack of use of existing facilities such as wifi and smartphones, which hinders the improvement of student learning outcomes. So, researchers want to make new innovations in the form of gamification learning media to improve student learning outcomes.

Gamification learning media is declared feasible for research use, and then research will be conducted at Mataram Semarang Vocational High School. First, 11th-grade TKR 1 and 2 students were given a pre-test to find out the student's scores. After the pre-test was completed, the researcher distributed the gamification learning media link to students to install on their respective Android smartphones. The researcher explained how to use gamification learning media and explained the material contained in the Gamification application. After finishing explaining, students are given time to watch videos and try quizzes and games in the gamification media. Students feel interested and want to know what is contained in the gamification media so that everything is tried.

Post-tests are conducted after students are given material using gamification learning media to find out how easy it is to understand the material using gamification learning media and to find out how much the score increases. Then not only do the tests but researchers also provide opportunities for students to provide input regarding learning media and students provide input why gamification learning media cannot be installed on the play store. After being given this input, the researcher made suggestions for further research.

Some of the factors that make student learning outcomes increase are that students feel happy after learning with the gamification learning media because the media is easy to use, does not require internet data packages to study, and is not boring because the content in the media is not only material but also students can learn by watching videos after that they can fill in the available quizzes. The attractive media display makes students feel at home to learn so as to improve student learning outcomes.

This trial was conducted on 61 students of class XI TKR 1 and XI TKR 2 of Mataram Semarang Vocational High School. The results of student responses to gamification learning media get a percentage of 85.3%. It can be concluded that gamification learning media is very feasible to use.

Table 4 <Paired Samples Statistics>

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pretest	65.4426	61	6.59172	.84398
	Posttest	79.5574	61	3.68567	.47190

Table 5 <Paired Samples Correlations>

		N	Correlation	Sig.
Pair 1	Pretest & posttest	61	.493	.000

Table 6 <Paired Samples Test>

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pretest-posttest	-14.11475	5.75065	.73629	-15.58756	-12.64194	-19.170	60	.000

Based on the figure above, the average pretest gets a score of 65.44, while after getting material and explanation through gamification learning media, the average learning outcome rises to 79.56 so that the increase in learning outcomes is 14.12 with a significance value of 0.00 <0.05, which means that the application of gamification has a significant effect on student learning outcomes on wheel and tire material. These results are in line with the opinion expressed by Septiyanto et al. (2024) that android-based learning media is very effective in automotive learning.

The increase in my research results is higher than previous research conducted by Wastari (2018), showing that gamification-based cooperative learning can improve student learning outcomes. The original learning outcome score of 56.96 increased to 75.53 in the first post-test and to 81.14 in the second post-test. The percentage of completeness of learning outcomes in the pre-test of 10.71% increased to 42.86% in post-test I and reached 82.14% in post-test II with a total of 40 students.

This gamification learning media is not only used temporarily but can also continue to be used in the long term, such as being used for the upcoming 11th grade, and other school students can also use it if they want. It's just that students from other schools must have a link to download the gamification application. It is hoped that this research can continue so that students find it easier to learn, and further research is recommended to develop this application so that it can be downloaded on the Play Store so that everyone can access it easily just by downloading the Play Store and can learn anywhere and anytime.

Conclusions

The results of this study produced a gamification application in the form of Android-based learning media that can be used as a student learning media on wheel and tire material. The increase in learning outcomes is 14.12 with a significance value of 0.00 <0.05, which means that the application of gamification has a significant effect on student learning outcomes. Media experts, material experts, and linguists stated that the learning media developed was very feasible to be tested on students. This learning media is able to improve student learning outcomes from 65.44 to 79.56. Future research should upload the learning media on the Google Play store so that it can be downloaded by anyone, anywhere, and anytime.

References

Adkha, N. F., Sudira, P., & Iskandar, R. (2021). The mindfulness aspects in the teaching of culinary art in vocational high school. *Jurnal Pendidikan Vokasi*, *11*(2), 155–170. Retrieved from https://journal.uny.ac.id/index.php/jpv/article/view/38402

Agustian, T. (2014). *Analysis front wheel alignment (FWA) pada kendaraan Daihatsu Gran Max Pick Up.* Universitas Pendidikan Indonesia. Retrieved from https://repository.upi.edu/16168/

Alviyaturrohmah, Saluky, & Muchyidin, A. (2013). Pengaruh Penggunaan Media Pembelajaran Dengan Software Prezi Terhadap Minat Belajar Matematika Siswa. *ITEj (Information Technology Engineering Journals)*, *2*(1), 11-18. Retrieved from https://www.syekhnurjati.ac.id/journal/index.php/itej/article/view/12

Ariani, & Diana. (2020). Gamifikasi untuk Pembelajaran. *Jurnal Pembelajaran Inovatif*, *3*(2), 144–149. doi: 10.21009/jpi.032.09

Arifin, A., Ramelan, & Wijaya, M. B. R. (2015). Desain Dan Penerapan Media Berbasis Adobe Flash Professional Cs5 Untuk Meningkatkan Hasil Belajar Siswa Pada Pembelajaran Kompetensi Memelihara/servis Sistem Ac. *Jurnal Pendidikan Teknik Mesin*, *15*(1), 1–5. Retrieved from https://journal.unnes.ac.id/nju/index.php/JPTM/article/view/5318

Arikunto, S. (2010). *Prosedur Penelitian Suatu Pendekatan Praktik.* Jakarta: Rineka Cipta

Auliya, L., & Lazim, N. (2020). The Development of Miss Ppl (Advanced Microsoft Power Point) Learning Media At Elementary School. *Jurnal PAJAR (Pendidikan dan Pengajaran) 4*(4), 703-714. doi: http://dx.doi.org/10.33578/pjr.v4i2.8027 703–714.

Dewi, N. R., Astuti, I., & Rahmani, F. A. (2022). Penerapan Desain Pembelajaran ADDIE E-Learning materi Bahasa Inggris pada siswa SMA. *Jurnal Ilmiah Mandala Education, 8*(4), 2774–2784. doi: 10.36312/jime.v8i4.3978.

Glover, I., Hepplestone, S., Parkin, H. J., Rodger, H., & Irwin, B. (2016). Pedagogy first: Realising technology enhanced learning by focusing on teaching practice. *British Journal of Educational Technology*, *47*(5), 993–1002. doi: 10.1111/bjet.12425

Heni, J. (2016). Penggunaan Gamifikasi dalam Proses Pembelajaran. *Jurnal TICOM*, *5*(1), 1–6. Retrieved from https://www.neliti.com/publications/92772/penggunaan-gamifikasi-dalam-proses-pembelajaran

Hidayat, H., Asri, S., Setiyawan, A., Huda, K., Roziqin, A., & Iskandar, R. (2024). The Implementation of Plasticine Wax Media to Increase the Right-Aligned Lathe Chisel Geometry Understanding for the Students of Automotive Engineering Education During Covid-19 Pandemics. *5th Vocational Education International Conference (VEIC 2023)*, 1231–1236. Retrieved from https://www.atlantis-press.com/proceedings/veic-23/125997732

Huda, K., Rusiyanto, R., Iskandar, R., & Darsono, F. B. (2024). Analyzing the Requirements for the Creation of Teaching Resources for Mechanical Engineering Practicum Courses in the Study of Mechanical Engineering Education. *5th Vocational Education International Conference (VEIC 2023)*, 1270–1275. Semarang: Atlantis Press. doi: https://doi.org/10.2991/978-2-38476-198-2_180

Idrus, L. (2019). Evaluasi Dalam Proses Pembelajaran. *Adaara, 9*(2), 920–935. Retrieved from https://jurnal.iain-bone.ac.id/index.php/adara/article/view/427/0

Iskandar, R. (2019). *Pedoman Penilaian Hasil Belajar Peserta Didik SMK Kompetensi Keahlian Teknik Kendaraan Ringan pada Mata Pelajaran Pemeliharaan Sasis Dan Pemindah Tenaga Kendaraan Ringan*. Sukabumi: CV Jejak (Jejak Publisher).

Iskandar, R., Arifin, Z., & Sudira, P. (2020). Problems of Automotive Vocational Teaching-Learning Process for Students with Mild Intellectual Disability (MID). *International Journal of Advanced Science and Technology*, *29*(7s), 417–424. Retrieved from http://sersc.org/journals/index.php/IJAST/article/view/9456

Iskandar, R., Rusiyanto, Setiadi, R., Huda, K., & Hidayat, H. (2023). Pengembangan Buku Ajar Interaktif Berbasis QR Code dan Short Link pada Mata Kuliah Praktik Kelistrikan Bodi. *Jurnal Ilmiah Wahana Pendidikan*, *9*(10), 467–477. Retrieved from http://jurnal.peneliti.net/index.php/JIWP/article/view/4482

Iskandar, R., Syafei, M. H. G., Bahatmaka, A., Hidayat, H., & Huda, K. (2023). Utilization of PowerPoint and YouTube as Digital-Based Learning Media: Literature Review. *Jurnal Ilmiah Wahana Pendidikan*, *9*(20), 936–942. Retrieved from http://jurnal.peneliti.net/index.php/JIWP/article/view/7689

Junaidi, J. (2019). Peran Media Pembelajaran Dalam Proses Belajar Mengajar. *Diklat Review : Jurnal Manajemen Pendidikan Dan Pelatihan*, *3*(1), 45–56. doi: 10.35446/diklatreview.v3i1.349

Kemendikbud. (2021). CP & ATP Fase F. Retrieved from https://guru.kemdikbud.go.id/kurikulum/referensi-penerapan/capaian-pembelajaran/smk/teknik-kendaraan-ringan/fase-f/

Marsyaelina, A., Sudiyatno, S., & Iskandar, R. (2022). Appropriate learning media for mild mentally impaired students at inclusive vocational schools: A literature review. *Jurnal Pendidikan Vokasi*, *12*(1), 93–99. doi: . https://doi.org/10.21831/jpv.v12i1.47717

Maulani, G., Wachyudi, K., Astuty, H. S., Saptadi, N. T. S., Hayati, R., Tandirerung, V. A., … Rasmita. (2024). *Komunikasi Pendidikan*. Serang: Sada Kurnia Pustaka.

Merlin, Lestari, N. D., & Yulaini, E. (2022). Analisis Implementasi Konsep Pembelajaran Akuntansi Kurikulum Merdeka Belajar Pada SMK Di Palembang. *PROSIDING SEMINAR NASIONAL PENDIDIKAN IPS*, *1*, 399–408. Palembang.

Mukhlisa, N. (2023). Validitas Tes. *JUARA SD: Jurnal Pendidikan Dan Pembelajaran Sekolah Dasar*, *2*(1), 142–147.

Petralia, S., Balland, P. A., & Morrison, A. (2017). Climbing the ladder of technological development. *Research Policy*, *46*(5), 956–969. doi: 10.1016/j.respol.2017.03.012

Prabaningtyas, A. (2024). Media Pembelajaran Gamifikasi Menarik Antusias Peserta Didik Sekolah Dasar.

Purnama, S. (2010). Elemen Warna Dalam Pengembangan Multimedia Pembelajaran Agama Islam. *Jurnal Pendidikan Agama Islam: Al-Bidayah*, *2*(1), 113–130.

Rahmawati, I., Suryana, Y., & Hidayat, S. (2021). *EDUKATIF : JURNAL ILMU PENDIDIKAN Analisis Kesesuaian Soal Penilaian Tengah Semester IPA dengan Kaidah Penyusunan Soal pada Aspek Bahasa di Sekolah Dasar*. *3*(6), 3636–3646.

Rati, F., Rohiat, S., & Elvinawati, E. (2022). Pengembangan Multimedia Pembelajaran Interaktif Berbasis Problem Based Learning (Pbl) Menggunakan Aplikasi Articulate Storyline Pada Materi Ikatan Kimia. *Alotrop*, *6*(1), 70–79. doi: 10.33369/alo.v6i1.21799

Rojaki, M. (2023). Peran IDUKA pada Pendidikan Kejuruan dalam Mempersiapkan Sumber Daya Manusia Memasuki Dunia Kerja Much Rojaki. *Jurnal Pendidikan Tambusai*, *7*(1), 1590–1598. doi https://doi.org/10.31004/jptam.v7i1.5463

Sari, D. R. (2020). SMK Mataram Semarang. Retrieved from https://semarangkota.com/03/smk-mataram/#google_vignette

Septiyanto, A., Said, I. U., Wijaya, M. B. R., Setiyawan, A., Khoiron, A. M., & Iskandar, R. (2024). Effectiveness of Implementing Android-Based Variable Valve Actuation (VVA) Media in Learning at Vocational High School. *5th Vocational Education International Conference (VEIC-5 2023)*, 369–373. Retrieved from https://www.atlantis-press.com/proceedings/veic-23/125997715

Setiadi, R., Sumbodo, W., Kriswanto, K., Bahatmaka, A., & Iskandar1, R. (2024). Skills that Support Mechatronics Vocational High School Graduates. *Advances in Social Science, Education and Humanities Research*, 137–143. doi: 10.2991/978-2-38476-198-2_18

Setiyawan, A., Sunyoto, S., Septiyanto, A., Budiman, F. A., Kriswanto Kriswanto, A. B., Sudiyono, S., … Pratiwi, I. (2024). Modeling Measuring Instrument Learning Media (MILM) in Block System Practicum for Engineering Education Students. *5th Vocational Education International Conference (VEIC-5 2023)*. Semarang. Retrieved from https://www.atlantis-press.com/proceedings/veic-23/125997731

Wardana, S., & Sagoro, E. M. (2019). Implementasi Gamifikasi Berbantu Media Kahoot Untuk Meningkatkan Aktivitas Belajar, Motivasi Belajar, Dan Hasil Belajar Jurnal Penyesuaian Siswa Kelas X Akuntansi 3 Di Smk Koperasi Yogyakarta Tahun Ajaran 2018/2019. *Jurnal Pendidikan Akuntansi Indonesia*, *17*(2), 46–57. doi: 10.21831/jpai.v17i2.28693

Wastari, Y. D. A., & Sagoro, E. M. (2018). Penerapan Model Pembelajaran Kooperatif Berbasis Gamifikasi Untuk Meningkatkan Hasil Belajar Materi Jurnal Penyesuaian Pada Siswa Kelas X Akuntansi G Smk Muhammadiyah 1 Yogyakarta Tahun Ajaran 2017/2018. *Kajian Pendidikan Akuntansi Indonesia*, *7*(1), 1–12. Retrieved from https://journal.student.uny.ac.id/index.php/kpai/article/view/14198