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Development of Android-Based Student Performance Tool (Tunersindro) to Improve Work Readiness of Vocational High School Students

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ABSTRACT

Work readiness has an effect on the unemployment rate for Vocational High School (SMK) graduates. Work readiness can be improved by improving learning patterns and tools. This study aims to develop learning aids, test the feasibility and effectiveness of the product. The research design used is the ADDIE Research Development (R&D) design with the stages of Analysis, Design, Development or Production, Implementation or Delivery and Evaluations. The research site is at SMK Muhammadiyah 2 Tempel with research subjects of 134 students, 14 teachers of Automotive Engineering Vocational School and 5 automotive industry practitioners. Data collection techniques used were questionnaires and tests with interview research instruments, media and product questionnaires and practice test sheets. Android-based student performance aids (Tunersindro) have a very high feasibility of being used in vocational learning. Not only that, with two trials, Tunersindro has a very high level of effectiveness in increasing the work readiness of SMK students

Keywords: *Improving Work Readiness, Students Performance Aid, Development Tool Tunersindro*

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INTRODUCTION

Vocational education graduates in this case vocational high schools (SMK) are prepared to become competent and ready to work human resources (McGrath & Akoojee, 2009; Choy & Yeung, 2022). The rapid development of the world of work and industry is very influential on the formation of the competence of vocational students (Thomas et al., 2019; Çinar et al., 2009; Hermanto & Sholikhah, 2019). Especially at this time, Indonesia is faced with the era of the industrial revolution 4.0, which demands the work readiness of vocational school graduates in the face of new developments and competencies in the industry. The industrial revolution 4.0 is an interesting thing and must be faced by vocational school organizers (Amiron et al., 2019; Amen & Mustaqim, 2021; Spöttl & Windelband, 2021). The industrial revolution 4.0 demands the development of technology where digitalization and automation are

an important part in increasing industrial productivity. If work readiness is not anticipated properly, the industrial revolution 4.0 will become a big problem for SMKs (Spoettl & Tütlys, 2020; Rachinger et al., 2019). This question is evidenced by the highest number of unemployed SMK graduates of 10.24% in 2022. The data identifies that the job readiness of SMK students is still low. Job readiness is a person's ability to find work. Work readiness will be maximized if the competence aspects of attitudes, knowledge and skills are owned by each individual. Digitization, automation and communication information that are connected to the demands of industrial productivity are the subject of the development of the industrial progress process so that patterns of competency formation for vocational students are needed that are aligned with the demands of work in today's industry (Baethge-Kinsky, 2020; Hirsch-Kreinsen, 2016).

The demands of the era of industrial disruption are prepared as well as possible by SMK organizers to produce SMK graduates who are ready to compete in the world of work (Sima et al., 2020; Suleiman et al., 2022; Dwivedi et al., 2021). So far, there have not been many developments and improvements in the patterns of competency formation in Vocational Schools. Improvements and developments are still limited to the steps for implementing the learning model (Serdyukov, 2017; Dziuban et al., 2018; Suwandi et al., 2022). The development of learning models is still the best solution in the formation of vocational students' competencies and is expected to be able to overcome the number of unemployed (Nagy et al., 2018). However, from the results of data collection in SMK, it is stated that the SMK learning model that is applied will not be optimal if in practice it is not supported by learning aids. Not only that, learning aids should involve industry in designing and implementing learning aids. It is hoped that the industry will remain the best partner in the formation of student competencies. Moreover, in the process of competency formation, it is adjusted to the development of digitalization, automation and informatization in the industry (Wahyuni et al., 2021)(Ali et al., 2020)(Suartini, 2019). Learning aids are expected to be able to overcome problems in SMK. But now, learning aids used in vocational schools are learning aids that are integrated with learning models (Khamdun et al., 2021; Ulseth et al., 2011). It is necessary to develop industrial-based learning aids which are expected to improve the quality of SMK graduate (Fathurahman, F. 2021: Nurtanto et al., 2019). Industry-based learning tools designed and developed with industry needs and expectations. Industry-based learning aids have not been widely applied in vocational schools. In general, learning aids that are the main control of the school and do not involve the industrial world (Ricaur & Vilorio, 2020; Sayekti & Suparman, 2020).

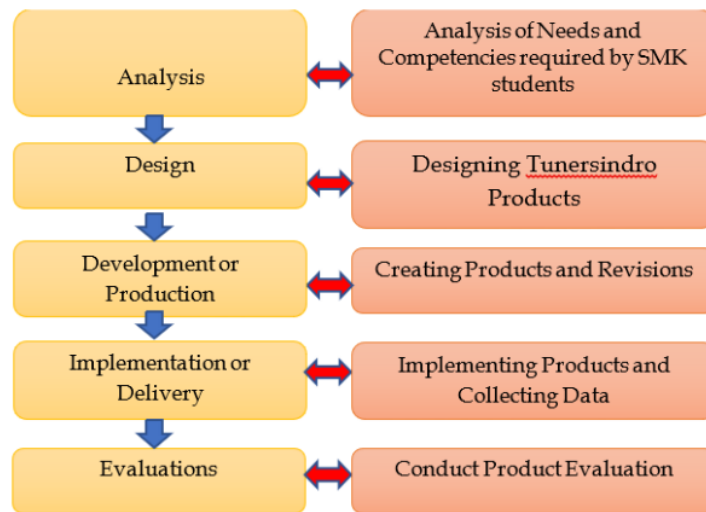
Several research results show that the application of learning models with industrial-based learning aids can improve the quality of vocational graduates. Sudjimat and Tuwoso (2021) state that the PjBL learning model with industry-based learning aids can increase group learning motivation, have high knowledge and learning outcomes are in line with industry expectations (Sudjimat & Tuwoso, 2021). Meanwhile, Khamdun (2021) states that the application of the PjBL learning model with industry-based learning aids can improve the soft skills of vocational students if implemented optimally (Khamdun et al., 2021). The learning aids developed are android-based student performance aids or Tunersindro or abbreviated as Tunersindro. Tunersindro is a learning tool that functions as a learning device and practical test for the performance of SMK students with industrial control by Android. Tunersindro is easy to use and is considered capable of aligning the needs of industry and schools because students are required to work on products, goods and services

according to industry needs (Pratitis & Jama, 2020; Simbolon & Koeswanti, 2020). Tunersindro can improve the quality of SMK graduates if it is designed according to the expectations and needs of the industrial world. Not only that, the development of Tunersindro must place the industry in the preparation, process and evaluation of learning so that the quality of graduates is in line with the expectations of the industrial world.

METHODS

This study uses an ADDIE research and development (R&D) type research design which consists of: Analysis, Design, Development or Production, Implementation or Delivery and Evaluations. This study aims to develop an android-based or Tunersindro-based student performance tool. Tunersindro was developed to support the improvement of vocational students' work readiness. The research subjects used were 34 students majoring in automotive at SMK Muhammadiyah Moyudan, teachers majoring in automotive engineering in Sleman Regency, totaling 14 teachers, and automotive industry practitioners totaling 5 practitioners. Data collection techniques used interviews in the form of focus group discussions (FGD), questionnaires and practice test sheets. (1) FGD aims to analyze the current learning needs of SMK. (2) Questionnaires are used to get input from media experts on the feasibility of android-based or Tunersindro-based student performance aids. (3) Practice test sheets are used to determine the effectiveness of Tunersindro products/tools in improving students' practical performance. Tunersindro development stages can be seen in Figure 1.

Figure 1. ADDIE Research and Development Stages



Interviews in the form of FGDs are a series of needs analysis activities that contain instruments with a number of questions that function to explore information related to the current state of vocational learning and future expectations. The FGD instrument grid can be seen in Table 1.

Table 1. FGD Instrument Grid

Grille	Question Items	Respondent
Current Conditions of Vocational Learning and Competence	1.2	Vocational Teacher, Industry
Industrial Needs for the Quality of Vocational High School Graduates	3.4	Industry
Vocational High School Needs for Industry Participation	5,6,7	SMK teacher
Learning Aids Needed by Vocational Schools and Industry	8	Vocational Teacher, Industry
Technical Design of Learning Aids	9.10	Vocational Teacher, Industry

Questionnaires, Tunersindro products and practice test sheets were validated by a content validity test. The content validity test contains consultation and simulation activities for experts/expert judgments. Media eligibility questionnaires and practice test sheets were validated by material experts from academia, while Tunersindro's eligibility was validated by media experts from the ²⁵ Indonesian Robotic School. The media eligibility questionnaire and practice test sheets can be seen in Tables 2 and 3.

Table 2. Media Validation Questionnaire Indicators

Media Validation Questionnaire Indicator	
Media Engineering	Effectiveness in Use Usability (easy to use) Product appeal
Visual Communication	Communicative (easy to understand instructions) Creative and innovative Selection of the type of manufacture The suitability of the product form that supports Theory

Table 3. Practice Test Assessment Sheet

Competency Test Indicator	
Attitude	Initiative Responsibility
Knowledge	field of work work field work
Skills	punctuality

The data analysis of this research used descriptive quantitative data analysis techniques. After getting a number on the instrument, then the research data is changed in the form of a score and then the average answer is calculated based on the score of each answer with the following formula:

$$x = \frac{\sum X}{n}$$

Note:

x= number of respondents

n = number of answer scores
 x = average score of respondents

To find out how big the feasibility and effectiveness of the Tunersindro learning aid development process, the data can be categorized in Table 4 as follows.

Table 4. Feasibility Test of Tunersindro Learning Aids

Formula	Score	Category
$X \geq x + 1.SBx$	$X \geq 3.00$	Very high
$x + SBx > x$	$3.00 > X \geq 2.50$	Tall
$x > x - 1.SBx$	$2.50 > X \geq 2.00$	Enough
$X < x - 1.SBx$	$X < 2.00$	Not enough

(Mardapi, 2008)

- x : the score achieved by students
- \bar{x} : Average overall score of students in one class
- SBx : Standard deviation of students' overall scores in one class
- $\frac{5}{2}$: (ideal maximum score - ideal minimum score)
- $\frac{1}{6}$: (ideal maximum score - ideal minimum score)
- Ideal Max Score: Item criteria x highest score
- Ideal Min Score: Item criteria x lowest score

RESULTS AND DISCUSSION

This study aims to develop and test the feasibility and effectiveness of an android-based student performance aid (Tunersindro) which is expected to improve the competence of vocational students. Tunersindro development stages use the ADDIE model (Analyze, Design, Develop, Implementation, Evaluate).

Analyze

The analysis stage is an activity that aims to analyze the learning needs in Vocational High School (SMK). This stage consists of Focus Group Discussion (FGD) activities with participants from teachers and industry practitioners. The FGD stages produced several notes and recommendations which can be seen in Table 5. Results of Needs Analysis

Table 5 Analyzing of Learning Need in Vocational High School (SMK)

Teacher	Industrial Practitioner
1. The problems experienced by SMK related to the competence of graduates are increasingly declining.	1. Vocational schools need to consult the curriculum with industry needs
2. SMK requires active participation from industry to help prepare SMK graduates	2. Industry can take part at least in the competency test
3. The learning models used will not produce maximum competence without learning aids.	3. Learning aids are very important made to support the role of industry,
4. Learning aids in design and manufacture involve industry.	4. Tools that are simple and easy to use, but have high usability.
5. The industrial world participates in the preparation, implementation and	5. Emphasis on the aspect of attitudinal competence includes the attitude of initiative and

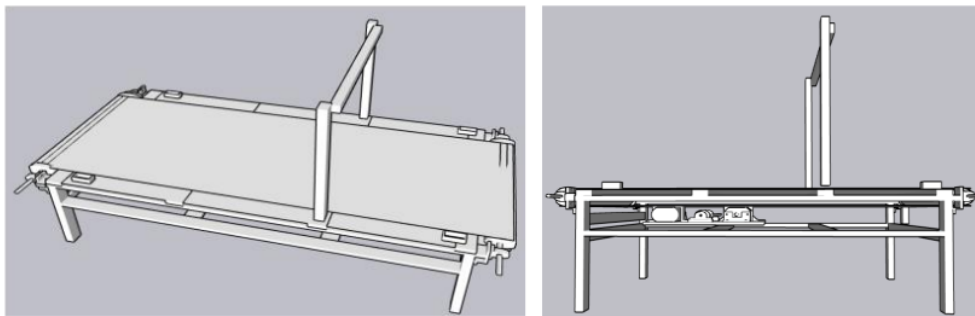
evaluation of learning.	responsibility.	Knowledge
6. Competency testing is a measurement activity that can involve industry		competence includes knowledge of the field of work. Competence skills include the execution of the field of work and punctuality.

¹² From the results of the FGD, it can be concluded that the competence of vocational students has recently decreased which has an impact on work readiness. It takes a learning model that is supported by learning aids that can facilitate industry participation.

Design

After getting the results of the needs analysis, the next step is to design the Tunersindro learning tool. Tunersindro's design ⁶ as obtained from input from industry and vocational schools. Tunersindro's design can be seen in Figure 3.

Figure 2. Design of Android-Based Student Performance Aids (Tunersindro)



Tunersindro is a learning tool that is operated with android. Tunersindro consists of several components which can be seen in Table 6.

Table 6 Tunersindro Components

Component	Amount
V Slot Aluminum Profile Extrusion Rail 2020 Clear OX CNC Frame	4
¹⁴ overlap 20pcs Elbow Connector Bracket 90 Degree T Shape L Slot Slot	2
Zinc Alloy KP08 ²³ mm Diameter Pillow Block Mounted Ball Bearing	27
BAUT L / HEX SOCKET HEAD CAP SCREW STAINLESS STEEL M5 X 20	5
nut m5 v-slot T hummer	100
Shaft 8mm Stainless Steel length 30cm 300mm SUS 201 Linear Rail	14
³ mm open timing belt GT2 rubber Aramid Fiber belt.	2
³ Stepper motor NEMA 17 1.5A Torque 0.4Nm for CNC 3D Printer AI32	2
Bracket Stepper Motor 42 NEMA 17 Black 3MM Steel Anchor stepmotor AK05	2
⁸ Allen Hex Socket Head Cap Screw M3 x 12mm (10pcs) H/T 12.9 Grade	2
GT2 Timing Pulley 16 teeth bore 5mm belt 6mm	2
GT2 Timing Pulley 20 teeth bore 8mm belt 6mm	2
L Key Set 8pcs 1.5mm~6mm / 8 In 1 Hex Key Allen Wrench Set	2
A4988 STEPPER MOTOR DRIVER MODULE WITH HEATSHINK 3D PRINTER PART	2

¹¹ [CNC] ARDUINO NANO V3 3.0 ATMEGA328P CH340 CH340G 5V BOARD +	2
³⁴ B CABLE	
Conveyor Belt - EP 100 size 50cm x 4 PLY	4
Digit 7 Segment Digital 5V LCD Display Module	4

Develop

At this stage, Tunersindro is produced according to the results of the design stage. The development and production were carried out by researchers assisted by electronics experts from the Indonesian Robotic School and the automotive industry from the Otomotif Jogjakarta Center (OJC), Gama Multi, Barokah Workshop, AnggaNewTech and RND Auto Service. The development and production of Tunersindro was carried out and produced Tunersindro according to Figure 3.

Figure 3. Android-Based Student Performance Tool (Tunersindro)



After Tunersindro works, the next step is to test the validity of the product with the help of expert judgment. The results of media validation show that Tunersindro ¹⁰ has a very high feasibility to be used as a learning aid for vocational students. The results of media validation can be shown in Table 7.

Table 7. Media Validation Results

Media	Validation Questionnaire Indicator	Score
Media Engineering	Effectiveness in Use	4
	Usability (easy to use)	3
	Product appeal	4
Visual Communication	Communicative (easy to understand instructions)	4
	Creative and innovative	4
	Selection of the type of manufacture	4
	The suitability of the product form that supports the material	3

Average Score

3.71

Implementation

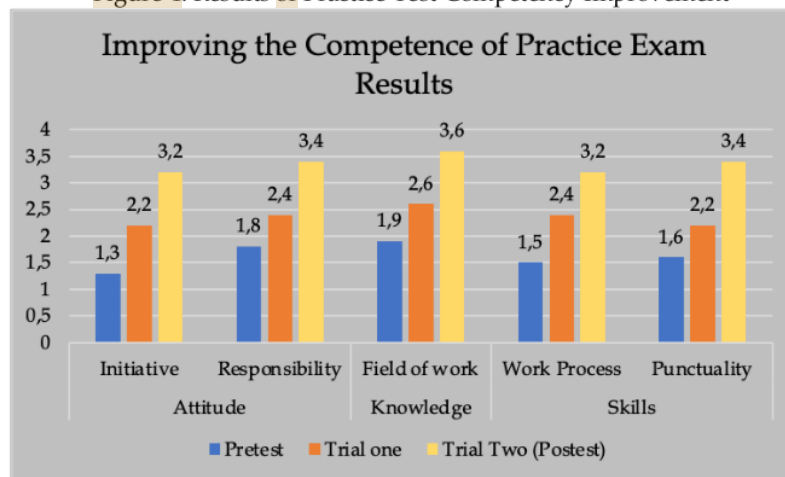
At this stage, the researcher applied Tunersindro to determine its effectiveness in increasing the work readiness of vocational students. Work readiness is determined by the achievement of aspects of attitude, knowledge and skills competencies. Tunersindro is applied to automotive learning and practical exams. The material used is the competence of diesel motor nozzle maintenance. To see the improvement in the application of Tunersindro, three times the application was carried out, namely: pretest, trial one and trial two (posttest). The results of the application of Tunersindro carried out for three times can be seen in Table 8.

Table 8. Results of Practice Test Competency Improvement

Competency Indicator		Average Score		
		PreTest	Trial One	Trial Two (PostTest)
Attitude	Initiative	1.3	2.2	3.2
	Responsibility	1.8	2.4	3.4
Knowledge	field of work	1.9	2.6	3.6
Skills	work field work	1.5	2.4	3.2
	punctuality	2.1	2.2	3.4

⁷ The results of the practical test showed that in the pretest, trial one and trial two there was an increase in aspects of attitude, knowledge and skill competencies gradually with the final result/posttest Tunersindro was very good at improving the work ⁶ readiness of vocational students. The results of increasing competence in each trial can be seen in Figure 4.

Figure 4. Results of Practice Test Competency Improvement



The application of android-based student performance aids (Tunersindro) can improve work readiness in the aspects of attitudes, knowledge and skills of Automotive Engineering SMK students. The results of the interview stage (FGD) at the stage of needs analysis and product validation resulted in the design, development and manufacture of Tunersindro in accordance with the needs of SMK and the automotive industry. This is in accordance with the results of research by Tamimi et al which stated that the application of learning aids with the internet system can help develop student competency skills and attitudes (M. Al-Tamimi & Attamimi, 2014). Arifah et al said that the application of learning through the role playing method with the help of online-based tools can improve social competence, attitude, responsibility and knowledge (Arifah Nurdin et al., 2018). The application of learning model assisted by internet-based learning tools can improve the work readiness of SMK students. This statement is in accordance with the results of research by Parjono et al, Sulistyaningrum and Novaliedry who concluded that learning models in vocational schools that are applied with learning aids will have an impact on increasing the work readiness of vocational students.(Novaliedry et al., 2020; Sulistyaningrum et al., 2020 Hasan & Pardjono, 2019).

Tunersindro has special characteristics, especially in the control system and the involvement of industrial practitioners. The control system uses an android system that can be controlled automatically/online. Meanwhile, the role of industrial practitioners lies in the process of monitoring and evaluating learning. This is different from the learning aids that have been developed so far. Muslim et al.(2020),I Gede Diva Sumarta Yana et al. (2022),Kotha Raj Kumar Reddy et al. (2021),Ranu Iskandar et al (2020) developed a tool for learning for Automotive Engineering SMK students with manual control and without involving industry. As a result, work competence achieved but not adjusted to industry needs (Muslim et al., 2020 ;Diva et al., 2022; Raj Kumar Reddy et al., 2021; Iskandar et al., 2020). Furthermore, the development of learning aids that have been developed so far does not involve industry to measure the success of the learning process and evaluation. Widjanarko et al. (2020),Ramil (2022),Marco Gadola et al. (2019) and Dwiwati et al. (2018) stated that the use of learning aids for Automotive Vocational High School students so far has been running according to school authorities. Learning will produce competence but the legality and suitability of industry-based competencies will not be optimal (Widjanarko et al., 2020; Evangelista, 2022; Gadola et al., 2019; Point Dwiwati et al., 2019).

Research on the development of android-based student performance aids (Tunersindro) will have an impact on changes in learning models and patterns. The learning model will demand a change from manual learning systems towards online and automated systems. Not only that, educational institutions will try to establish relationships with the automotive industry to jointly monitor and evaluate learning. Industry participation as a standard reference for learning success in SMK.

The development of Android-Based Student Performance Aids (Tunersindro) has a weakness that lies in the limited time of industry practitioners in monitoring and evaluating learning activities. So that further development stages are needed with a focus on a more flexible control system. Not only that, the selection of partner industries will be arranged to provide a standardized reference for competence and more

CONCLUSION

The development of an Android-Based Student Performance Tool (Tunersindro) is designed to improve the work readiness of SMK students. The application of Tunersindro for three times resulted in data that there was an increase in the competence of attitudes, knowledge and skills. Aspects of attitude consisting of initiative and responsibility, knowledge aspects of the field of work and aspects of work skills and punctuality increased from high to very high category. This shows that the application of the Tunersindro learning aid will have a positive effect on improving aspects of attitude, knowledge and skill competence.

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