Develop E-Balean Maning

by Suryo Hartanto

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THE DESIGN OF ANDROID-BASED INTERACTIVE LEAN MANUFACTURING APPLICATION TO INCREASE STUDENTS' WORK SKILL IN VOCATIONAL HIGH SCHOOL: THE DEVELOPMENT AND VALIDITY

Suryo Hartanto[1], Asrul Huda[2]*, Rizky Ema Wulansari[3], Akrimullah Mubai[4], Firdaus[5], Shalehoddin[6]
[1,6] Universitas Riau Kepulauan, Batam, Indonesia
[2,3,4,5] Universitas Negeri Padang, Padang, Indonesia

Coresponden Author: asrulhuda@gmail.com

Abstract

Vocational education graduates should have expertise competencies according to their fields so that it is easy to fill the job market, but this condition is not in line with expectations. BPS data as of February 2020 still shows the open unemployment rate, which is dominated by SMK graduates, at 8.49%, meaning that it is the highest-ranking contributor to open unemployment. One indication of this high percentage is the lack of work skills for vocational school graduates in the world of work. This lack of work competence is indicated because the learning process is not integrated with the real world of work. Therefore, improvement steps are sought through a learning process that integrates school learning with the real world of work by developing media that support learning activities with the real world of work. Therefore, the purpose of this research is to design an Android-based interactive lean manufacturing application to improve the work skills of vocational students. This study uses the 4D development method (four-Ds) for the development of android-based interactive lean manufacturing applications and uses a survey method for validity and this AR application will be validated by 3 experts. The results of this study indicate that the validation test of android-based interactive lean manufacturing applications is included in the valid category. So, it can be concluded that the Android-based interactive lean manufacturing application technology has been valid to be used in the learning process. This study uses the 4D development method (four-Ds) for the development of android-based interactive lean manufacturing applications and uses a survey method for validity and this AR application will be validated by 3 experts. The results of this study indicate that the validation test of android-based interactive lean manufacturing applications is included in the valid category. So, it can be concluded that the Android-based interactive lean manufacturing application technology has been valid to be used in the learning process. This study uses the 4D development method (four-Ds) for the development of android-based interactive lean manufacturing applications and uses a survey method for validity and this AR application will be validated by 3 experts. The results of this study indicate that the validation test of android-based interactive lean manufacturing applications is included in the valid category. So, it can be concluded that the Android-based interactive lean manufacturing application technology has been valid to be used in the learning process. The results of this study indicate that the validation test of android-based interactive lean manufacturing applications is included in the valid category. So, it can be concluded that the Android-based interactive lean manufacturing application technology has been valid to be used in the learning process. The results of this study indicate that the validation test of android-based interactive lean manufacturing applications is included in the valid category. So, it can be concluded that the Android-based interactive lean manufacturing application technology has been valid to be used in the learning process.

Keywords: lean manufacturing; interactive; android; validity

I. INTRODUCTION

The low competency achievement of Vocational High School graduates has an impact on the absorption of graduates in the world of work, as a result, educated unemployment is increasing. Statistics data In February 2020 the open unemployment rate (TPT) was still dominated by Vocational High School graduates, a total of 8.49%, followed by Senior High School 6.77% and Diploma III 6.76% (BPS, 2020). Referring to these data, a solution is urgently needed to reduce unemployment which is indicated by a lack of work skills. Effective and efficient work competence is determined by two

inseparable aspects, namely hard skills and soft skills. Soft skills play an important role in career and social life (Hartanto et al., 2020; Majid, Liming et al., 2012). Soft skills also affect hard skills so that they will be more flexible and positive in meeting the expectations of the world of work (Hartanto et al., 2020; Sausa, 2011). Soft skills and hard skills are part of work skills, it has to manage maximally in the school.

Vocational education needs to strive for integrated learning with the world of work in order to provide benefits in vocational competence proficiency (Gall & Gall, 2003; Sausa, 2011). Vocational learning will be meaningful if students learn directly in the world of work through experts directly (Hartanto et al., 2020; Lubis, 2020). There is a working method in the industrial world, namely Lean manufacturing. This method has been adopted in the world of learning under the name of a lean manufacturing-based learning model (Hartanto et al., 2020). This learning model has been declared valid, effective and practical in the testing process, has met the eligibility criteria for a learning model (Hartanto et al., 2020; Hartanto, 2020). It has Syntax: (1) Stimulus, (2) Identification, (3) Reflective Observation, (4) Monitoring, (5) Evidence, (6) Assessment and Reflection (Hartanto, 2020). Lean manufacturing based learning model is implemented in an integrated manner with industry through the application of work shadowing. There are three targets in achieving work skills competence, namely: vocational students, industrial instructors and teachers. The results of the evaluation of the limited trial of the lean manufacturing learning model still found obstacles, namely: 1). Industry instructor. The material taught to students in shadowing in the industry requires media that is not just a guide/hand out, it is very necessary so as not to interfere with the work process in the industry. 2). Students need structured guides that are easy to access and study to suit industry work. 3). Online learning during the Covid-19 pandemic, most students cannot learn directly in the industry, then we need media that is easy to learn without having to come to the industry. This module is structured as an answer to the problems mentioned above, which was carried out in accordance with the Special Objectives in Year One (2021). Produced learning steps using interactive lean manufacturing learning modules that are valid, effective and practical, second year (2022). An android-based interactive lean manufacturing learning module is produced that is valid, effective and practical. Third year (2023): Produced an industrial integrated learning policy script with lean manufacturing-based learning to improve the work skills of vocational students that are valid, effective and practical. Produced learning steps using interactive lean manufacturing learning modules that are valid, effective and practical, second year (2022). An android-based interactive lean manufacturing learning module is produced that is valid, effective and practical. Third year (2023): Produced an industrial integrated learning policy script with lean manufacturing-based learning to improve the work skills of vocational students that are valid, effective and practical. Produced learning steps using interactive lean manufacturing learning modules that are valid, effective and practical, second year (2022). An android-based interactive lean manufacturing learning module is produced that is valid, effective and practical. Third year (2023): Produced an industrial integrated learning policy script with lean manufacturing-based learning to improve the work skills of vocational students that are valid, effective and practical.

The urgency of research is that the low competence of Vocational High School graduates contributes to the highest unemployment rate, supported by the lack of effective integration of learning with the world of work, further deepening the gap between skills competence and work needs. In an effort to fulfill the revitalization of vocational schools, urgent and targeted solutions are needed. The solution to integrate school learning with the world of work is the development of an Android-based interactive lean manufacturing learning application to improve the work skills of Vocational High School students in response to Presidential Instruction No. 9 of 2016 in aligning the educational curriculum in accordance with the competency needs of the world of work.

II. METHOD

a. Research methods and procedures

This type of research is research and development (Research and Development). This research is used to produce a product that is measurable and tested on validity and practicality. According to (Gall & Gall, 2003), development research is the process used to develop and validate products. The research procedure carried out is as follows:

The initial stage is observation, where the results of the observation show that it is necessary to take steps to integrate the world of work and education through supporting tools consisting of process

steps for applying lean manufacturing-based learning to achieve the required vocational work skills. The preparation is carried out through the analysis stage by considering the characteristics of the industry, and students in the implementation. At this stage carry out steps in the form of problem identification, media analysis in lean learning for students and instructors, then design includes animation content, coloring, examples of actions, supporting facilities and infrastructure.

Furthermore, the development of the android-based interactive lean manufacturing application was carried out, then product validation was carried out through FGDs to measure the accuracy of content, graphic design, grammar, coloring, etc. This is done as a process of testing product validation. Validation activities are carried out by expert judgment/content validation of the product. Then a medium-scale test was conducted to measure the product at the practical strata. This practicality is carried out to see the usability of this android-based interactive lean manufacturing application product.

b. Research Sample

This Android-based interactive lean manufacturing application was validated by 3 experts, where the experts assessed the android-based interactive lean manufacturing application that had been developed through the survey questionnaire provided. These 3 experts were chosen based on their scientific fields, those who were chosen were those who had scientific fields or experts in the field of informatics and computers. While the respondents used in filling out the practical analysis questionnaire were students and lecturers of Informatics Engineering Education, Padang State University.

c. Research Instruments

In this study, there are 2 instruments used, the first is a practical instrument used to see the usability of the android-based interactive lean manufacturing application, in the needs analysis instrument there are 30 questions regarding the android-based interactive lean manufacturing application. And the second is a validity instrument, there are 30 statements related to the android-based interactive lean manufacturing application. In this study, the instrument used has been validated using an expert judgment strategy.

III. RESULTS AND DISCUSSIONS

In this study, the design of an android-based interactive lean manufacturing application uses Unified Modeling Language (UML) and Data Flow Diagrams (DFD) modeling. UML is a method in visual modeling that is used as a means of designing object-oriented systems. The purpose of UML modeling in this research is to be able to easily understand, analyze and, facilitate the creation of a program. While DFD is a description of the flow of information that is processed from input to a certain output. DFD focuses on the flow of information, the origin and destination of data, to how the data is stored. DFD in this study aims to explain or analyze an information system. In addition, this diagram can also be used in the software development process.

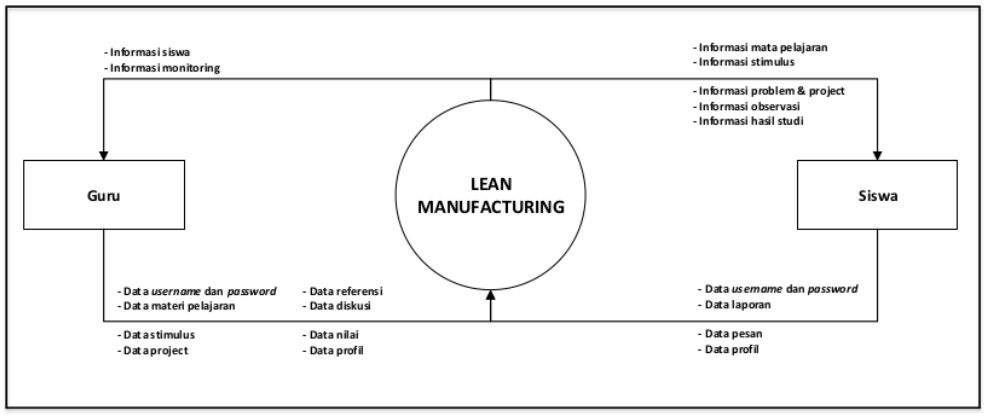


Figure 1. Data Flow Diagram of android-based interactive lean manufacturing application

The first thing to do when designing an android-based interactive lean manufacturing application is to create a DFD (see figure 1), where the DFD is to create an overview of a system, then proceed with coding based on the analyst's directions contained in the DFD.

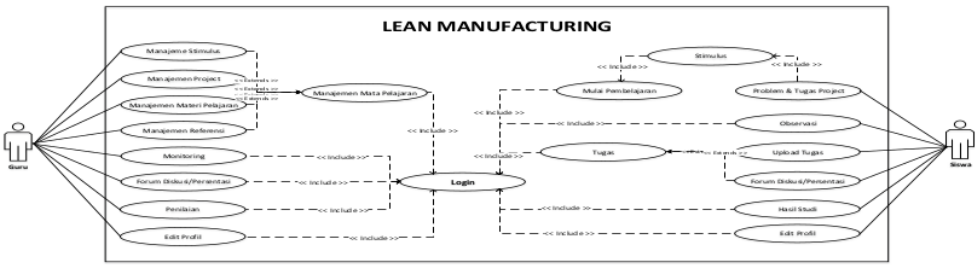
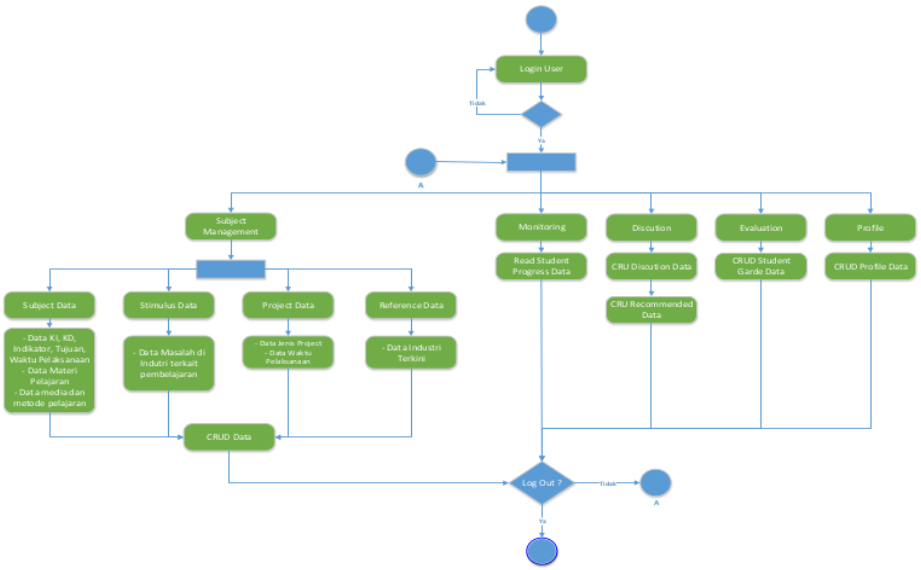
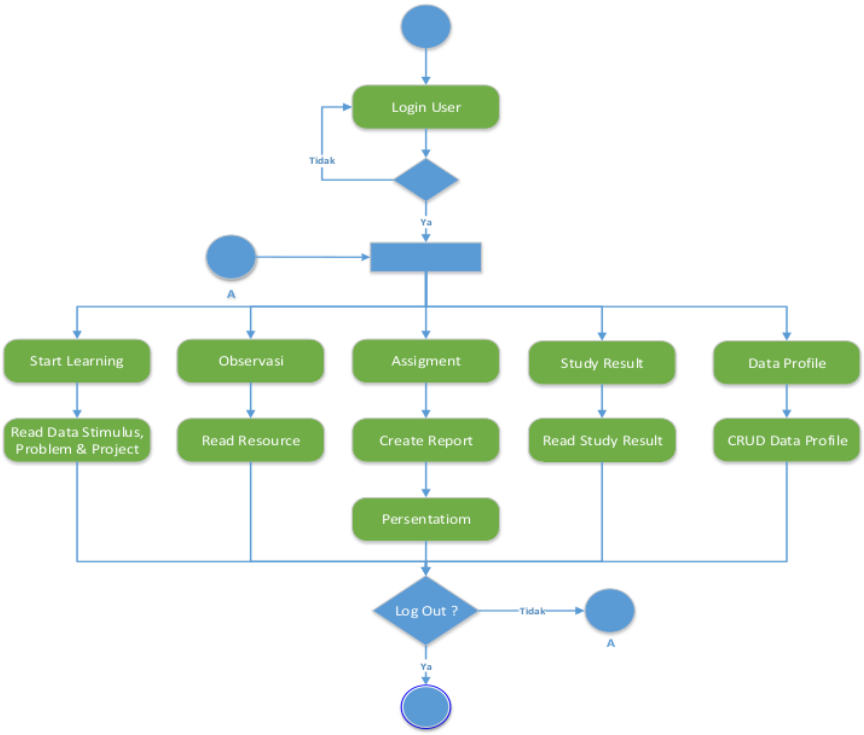


Figure 2. Usecase Diagram of android-based interactive lean manufacturing application

The use case diagram in Figure 2 serves to show the process of activities sequentially in the android-based interactive lean manufacturing application system, describes the process of android-based interactive lean manufacturing application, displays the sequence of activities in the android-based interactive lean manufacturing application and as a bridge between the manufacturers. with consumers in describing an android-based interactive lean manufacturing application.



(a)



(b)

Figure 3. Activity Diagram of android-based interactive lean manufacturing application for teacher (a) and students (b)

The activity diagram in Figure 3 serves to explain the sequence of activities from the android-based interactive lean manufacturing application for teachers and students, shows the sequence in the android-based interactive lean manufacturing application for teachers and students, it is easy to understand the whole android-based interactive lean manufacturing application process. and knowing the activities of actors/users based on the use cases/diagrams made earlier.

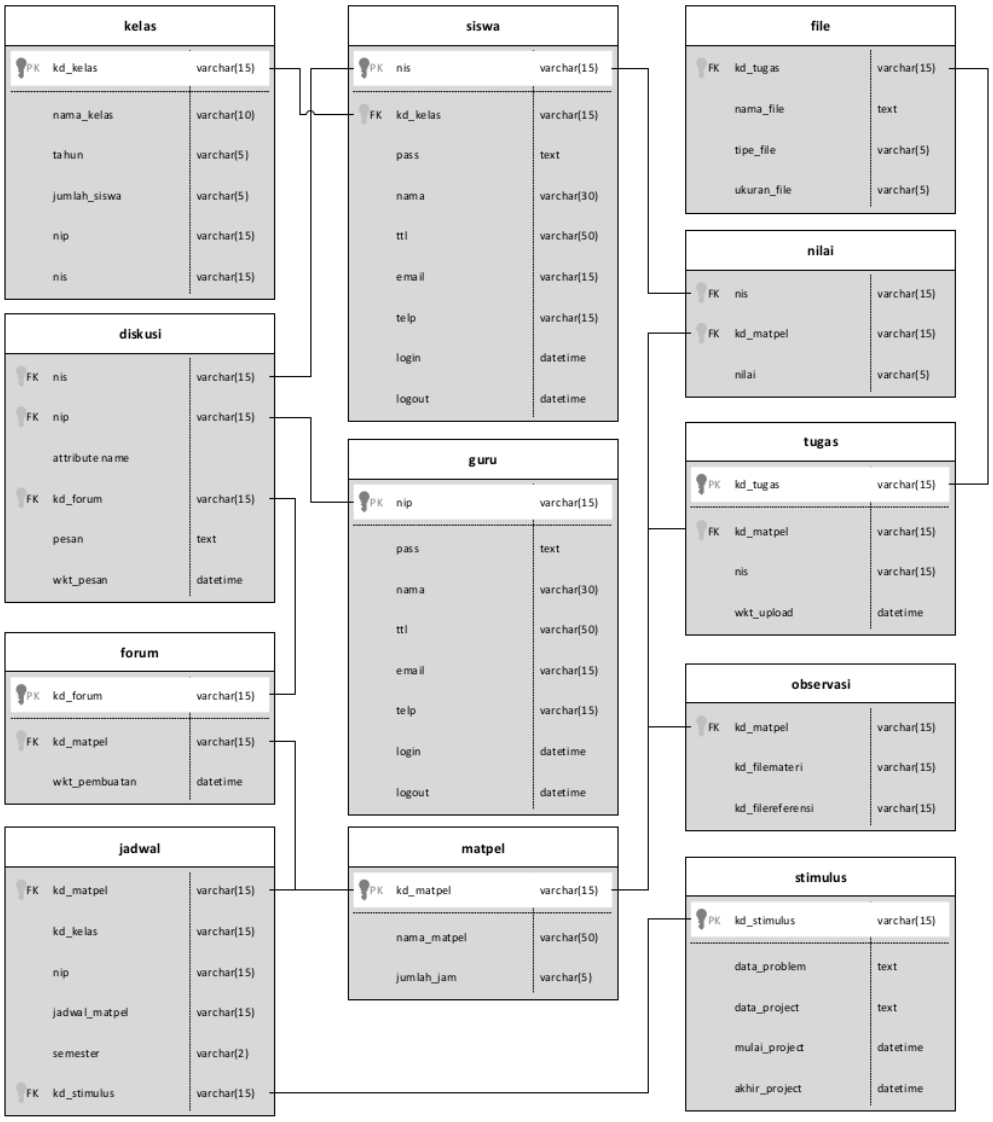


Figure 4. Database of android-based interactive lean manufacturing application

The database in Figure 4 functions to classify data and information, prevent duplicate data and data inconsistencies, simplify the process of storing, accessing, updating, and deleting data, maintaining the quality of data and information accessed as inputted, assisting the process of storing large data and can also help improve the performance of android-based interactive lean manufacturing applications that require data storage.

After designing the android-based interactive lean manufacturing application, the android-based interactive lean manufacturing application was developed. After the design (prototype) was carried out, the android-based interactive lean manufacturing application followed the existing design.

Then a validity test is carried out to validate or assess the feasibility of the product, in this activity validation will be carried out by an expert or validator. The validation process obtained input from the validator which was used to revise the developed android-based interactive lean manufacturing application. Input from the validator is used as a guide in making improvements and revisions to the

products made. Revision activities include improvements and adjustments with suggestions from expert validators and practitioners in accordance with their field of study. The results of the assessment (validation) of the Android-Based Interactive Lean Manufacturing Application can be seen in table 1. The results of the validity test of the Android-Based Interactive Lean Manufacturing Application are described in detail as follows:

Table 1. Validation Results of Android-Based Interactive Lean Manufacturing Applications

No	Assessment Aspect	Rating result		
		Average	TCR	Category
1	Material Substance	4.25	85.00	Well
2	Learning Design	4.55	91.00	Very good
3	Visual Communication Display	4.75	95.00	Very good
4	Software Utilization	4.91	98,20	Very good
	Final Average	4.62	92.30	Very good

Based on the table above, the results of the validity test of the Android-Based Interactive Lean Manufacturing Application are categorized as good. The final average value obtained is 4.62 with an achievement level of 92.30%. These results were obtained after being assessed by 3 (three) validators. If viewed based on the assessment aspect, it was found that 1 (one) aspect of the assessment was in a good category, namely the use of material substance. For the learning design aspect, the visual communication display and the use of software are in the very good category.

Furthermore, a field test was conducted to see the practicality of the android-based interactive lean manufacturing application. Android-based interactive lean manufacturing application is said to have high practicality if it is practical and easy to use. The practicality test data was obtained from filling out the practicality questionnaire of android-based interactive lean manufacturing application. The results of filling out practicality test questionnaires filled out by students regarding the practicality of Android-Based Interactive Lean Manufacturing Application Media can be seen in table 2 below.

Table 2. Results of the Practicality Assessment of Android-Based Interactive Lean Manufacturing Applications

No	Assessment Aspect	Rating result		
		Average	TCR	Category
1	Effective	4.13	82.60	Well
2	Creative	4.25	85.00	Well
3	Efficient	4.58	91.60	Very good
4	Interactive	4.72	94.40	Very good
5	Interesting	4.57	91.40	Very good
	Average	4.45	89.00	Well

Based on table 2 above, it can be concluded that the average Practicality Assessment of Android-Based Interactive Lean Manufacturing Application Media is 4.45 with an achievement rate of 89.00% and is in good (practical) criteria. This means that the practicality of Android-Based Interactive Lean Manufacturing Application Media can be applied.

Android-based interactive lean manufacturing application is one of the latest technology-based media solutions that can be used by teachers in both online and offline learning processes that can improve students' work skills (Hartanto et al., 2017). Android-based interactive lean manufacturing application provides learning materials where students can be actively involved in learning, so the android-based interactive lean manufacturing application is one of the computer-based interactive learning media solutions that can improve students' work skills (Huda & Hartanto, 2020).

This is in line with research Woo (2009) which states that android-based interactive media is a smart platform that can provide more feedback quickly, so this can increase student active participation. Furthermore, the selection of modeling in the development of android-based interactive lean manufacturing application is intended to design or system, and presentation of learning materials in the system. The model chosen by UML consists of data flow diagrams, use case diagrams and activity diagrams.

This is done so that no errors occur when building an android-based interactive lean manufacturing application (Lonnie, 2010). UML is widely used in building applications because it simplifies the understanding process so that work becomes more productive and one way to better understand the relationship between objects in a program is to use UML (Bower, Cathie Howe, Nerida McCredie, Austin Robinson & David Grover, 2014). As well as the development of augmented reality media carried out by Huda et al. (2021) which is built based on the design of UML.

Based on suggestions and assessments from the validator both in terms of material and design, the android-based interactive lean manufacturing application developed is declared valid, this is because the media presentation has included all components which include systematic consistency of presentation, concept coherence, suitability of illustrations with material, presentation of text , tables, figures, and lists of references, motivational learning generators, summaries, assessments, feedback and follow-up (Muslich, 2010). So this android-based interactive lean manufacturing application deserves to be tested.

After the android-based interactive lean manufacturing application was declared valid, a trial was carried out on the android-based interactive lean manufacturing application to see the practicality of the android-based interactive lean manufacturing application. The practicality data of this android-based interactive lean manufacturing application was taken through trials conducted on students. Based on the practical results, it is found that this android-based interactive lean manufacturing application is included in the practical category.

This can be explained because this android-based interactive lean manufacturing application is presented in full so that students can get information about the subject matter. Based on this indicator, this android-based interactive lean manufacturing application belongs to the practical category. This is in accordance with the opinion Hawkins (2016) which states that one of the practical benefits of using instructional media in the teaching and learning process is that the media can clarify the presentation of messages and information so as to facilitate and improve the process, competence and learning outcomes of students.

IV. CONCLUSION

Less effective integration of learning with the world of work, further deepening the gap between skills competency and work needs, the solution to integrate school learning with the world of work is the development of Android-based interactive lean manufacturing learning applications to improve the work skills of vocational students. The validation test shows that the augmented reality application technology is in the valid and practical category. Research from the development of the android-based interactive lean manufacturing application has several contributions, namely: adding references to the treasures of knowledge about technology applications for learning and increasing variations in the use of media in learning that can involve students actively in learning.

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