



Development Of Android-Based Interactive Jobsheet On Electrical Measuring Equipment Materials In Vocational School

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Abstract

This study aims to 1) the feasibility of the developed android-based interactive jobsheet, 2) the effectiveness of the developed android-based interactive jobsheet. 3) Student responses to the developed android-based interactive worksheets. This study uses the ADDIE development model. The experimental design in this study used the One-Group Pretest-Posttest Design. The research sample was class X students majoring in Light Vehicle Engineering (TKR). Data analysis used normality test, homogeneity test, product feasibility test and student response analysis. The results of the analysis can be obtained that the android-based interactive jobsheet development results are stated 1) feasible both from the results of the material test and media test with an average score of 80.6% and 81.25%. 2) Effectively used in learning as evidenced by the acquisition of an N-gain of 0.52 and is categorized as a moderate increase in learning outcomes. 3) Student responses to the android-based interactive worksheets that have been developed meet the "interesting" criteria. It is proven that the average percentage of student responses is 73.43%. The researcher suggests that before doing learning, teachers and students are expected to install an Android-based interactive worksheet on a handphone or laptop.

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INTRODUCTION

Rapid technological advances have an impact on the increasing development of knowledge which will affect the use of smartphones in Indonesian society. According to Kominfo survey results in 2017, more than half of Indonesians or 66.36% already own a smartphone. When viewed based on work 70.98% of students or college students have a smartphone. But this very large number is not followed by the use of smartphones for studying, 13.97% when not connected to the internet and 27.51% when connected to the internet, only used for communication or entertainment. The results of the author's survey at SMK Negeri 10 Semarang, related to smartphone ownership at the Department of Light Vehicle Engineering (TKR) showed that of 35 students all using the Android operating system. Student ownership of this cell phone will be better if it can be used as a learning tool and media. This is emphasized by Suprpta et al (2018: 2) the use of learning media in the world of education provides more new breakthroughs in increasing efficiency and effectiveness in the learning process.

Learning outcomes are changes that occur in students, both regarding cognitive, affective, and psychomotor aspects as a result of learning activities (Susanto, 2016: 7). According to Hadromi in Jamal (2020) states that the ability of teachers to manage learning both in planning, implementing and implementing the learning process and applying effective learning media affects the level of student learning success. In this study, the material for electronic measuring instruments includes multimeter, dwell tester, timing light, battery tester, battery charger. Multimeter or Avometer is an electrical measuring instrument used to measure electrical quantities and resistance. (Sasongko, 2016: 69). The Dwell tester is used to measure the dwell angle so that it is adjusted according to the manufacturer's specifications. (Sasongko, 2016: 111). Timing light is a tool used to check and adjust the ignition timing according to the crankshaft rotation angle (Sasongko, 2016: 112). The battery tester is used to determine the condition of the

battery charge. A battery charger is a device for charging electric current into a battery. In the learning process, this material usually uses the lecture method to deliver the material and then is given practical assignments with existing jobsheet guidelines.

Agus Sulistiyanto in Cahyani (2019: 145) jobsheets are printed tools (types of printed teaching aids) that are used to support an instructor in teaching who wants to fulfill competencies, especially in the workplace, which contains guidelines and pictures on how to create or complete profession. According to Daryanto (2016: 69-70) Interactive multimedia is multimedia that is equipped with a controller that can be operated by the user, so that the user can choose what is expected for the next process. Examples of interactive multimedia are interactive learning, game applications, and others.

The experience and observations of the researchers when carrying out Field Experience Practice (PPL) activities at State Vocational High School 10 (SMK N 10) Semarang assessed that there were still many students who had difficulty using an electric measuring instrument. The results of an interview with Mr. Slamet, as a teacher at SMK N 10 Semarang on May 5, 2019 at 18.00 WIB, said that there were still many students who did not understand and could not use electrical measuring instruments according to procedures, of 34 students only 35% were able to do so. electrical measuring instruments properly, while 65% of students are still not able to use electrical measuring instruments properly plus the existing jobsheets still have shortcomings (not according to jobsheet standards) such as no competence to be achieved, processing time, and assessment. This factual evidence occurs due to several factors, namely: Learning is still conventional when students often play cellphones during the learning process and the absence of learning media motivates students to study independently, and the jobsheets are not clear and detailed. There is no jobsheet development carried out by the teacher. This causes students to be less enthusiastic about the material of electrical measuring instruments which

results in the implementation of the practice.

Looking at the large number of students, according to Triyono et al (2013: 1) and Priyanda (108) in a class whose number of participants tend to be better at using interactive media in the form of animation in the learning process so that it is more efficient because demonstrating measuring instruments can be visualized using an LCD so that all students in the class can pay attention and see. The use of appropriate and varied media can increase learning motivation, allowing for more real interactions between students and the environment, also guides students to learn independently according to their abilities and interests (Wati et al., 2020; Hadromi et al., 2021). Where the learning process using interactive multimedia (MMI) can generate learning motivation in improving learning outcomes.

Mobile phones that use an Android-based system are very familiar with SMK 10 students, according to Putra in Taufiq (2016: 292) Android provides an open platform for developers to create new applications. Researchers used Adobe animate cc to develop existing jobsheets. Adobe Animate is an application that can be used to design and create interactive learning media, this application is a development of Adobe Flash Professional CC with several additions to its features. (Prastyo and Hartono, 2020: 34)

The research subjects taken in this study were students of class X Automotive Light Vehicle Engineering (TKRO) at SMK N 10 Semarang with the consideration of low student learning outcomes in the material of electric measuring instruments because students did not pay attention to the material presented by the teacher or still low motivation to learn independently at school. there are still shortcomings (not according to the standard jobsheet) such as the absence of competencies to be achieved, processing time, and assessment accompanied by the use of students' android phones which are less useful during the learning process. Based on this, researchers are interested in developing an Android-based interactive worksheet in the hope that it can be a solution because it is more practical. the use of smartphones

can be useful in learning activities and students can be more independent in practicing, especially during the COVID-19 pandemic which makes it impossible to conduct face-to-face learning. This research is in line with the opinion expressed by Makunti (2019), according to him, diagnostics using an electronic-based Jobsheet is one of the corrective actions for practical learning. This electronic work sheet or Jobsheet based on Information and Communication Technology (ICT) has enormous potential as a medium or tool to develop these skills in the learning process. This refers to the e-books, e-modules or m-learning that are currently developing.

The purpose of this study is to evaluate 1) the feasibility of the developed android-based interactive jobsheet. 2) The effectiveness of the developed android-based interactive jobsheet. 3) Student responses to the developed android-based interactive worksheets.

METHODS

The research method used in this study is a research and development method with ADDIE development. (Sugiyono: 2015) The choice of this model is because ADDIE focuses on development for learning purposes, one of which is learning media and also this model can describe a systematic approach to instructional development (Suryani: 2018).

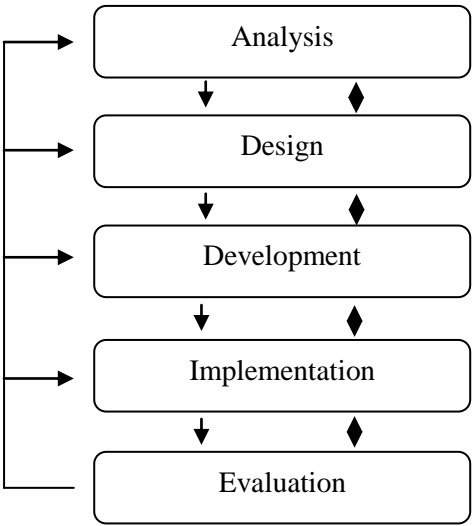


Figure 1. ADDIE Model Development Stage

According to Branch in Marji et al (2020) this model was chosen because it has several advantages: 1) interdependence, each component of the ADDIE model is interrelated; 2) synergistic, every part of ADDIE influences each other; 3) dynamic, each process/step can change according to input from the previous process; 4) cybernetic, every process/step in the ADDIE model is to organize, guide, automate, replicate, and prevent the failure of the entire process; 5) systematic, ADDIE model development, all designs have been completely planned for each process/step.

The experimental design in this study used the One-Group Pretest-Posttest Design. The research subjects were divided into two; 1) the subject of validation is a lecturer in the mechanical engineering department and a TKRO teacher as a material expert and media expert. 2) The subject of implementation is the students of class X TKRO SMK N 10 Semarang, totaling 35 people.

The methods used in data collection are as follows: 1) Interview, interview technique is used as a data collection technique by researchers to find problems that must be studied. Interviews were also conducted to find out specific things that require in-depth answers from the respondents, in this case the teacher of class X majoring in Light Vehicle Engineering at SMK N 10 Semarang. The specific thing that is meant is about the learning media used by teachers and students during previous learning. 2) Questionnaires are used to determine the validity and practicality of the developed media. The questionnaire used in this study was a validation questionnaire and a questionnaire to determine the response. Validation questionnaires are used to obtain a validity assessment from a team of experts regarding the materials and media that have been made. The feasibility test of media experts and material experts is carried out to determine whether the resulting product can be said to be feasible or not (Vembriliya, et al, 2019; Shofwanthoni, 2019). Then the student response questionnaire was used to determine the practicality of the developed media.

3) Test, the measurement of student learning outcomes is measured using multiple choice objective tests consisting of 40 multiple choice questions. The forms of the tests carried out are pretest and posttest.

Before being used for the pretest and posttest, the instrument test was previously carried out, intended to test whether the instrument questions met the specified requirements, so there was a need for an analysis of the instrument. Instrument testing includes: validity test with formula (Arikunto, 2013):

$$r_{pbis} = \frac{M_p - M_t}{S_t} \sqrt{\frac{p}{q}}$$

And test the reliability with the formula (Arikunto, 2013):

$$r_{11} = \left(\frac{k}{k-1}\right) \left(\frac{V_t - \sum pq}{V_t}\right)$$

After that look for the level of difficulty and power difference. The question is said to be valid if the value of sig < 0.05 while the item with a value of sig > 0.05 states that the item is invalid. Based on the results of the validity analysis using the SPSS 16 software, 10 items were found that were not valid, namely points 8, 9, 25, 37, 38, 42, 43, 45, 47, and 50 with sig values > 0.05. While the other 40 items are valid, so they can be used for research.

Good reliability is if the index is equal to or higher than 0.70 (Litwin in Khumaedi, 2012: 29).

Table 1. Reliability Test

Reliability Statistics		
Cronbach's Alpha Based on Standardized Items		
Alpha	Items	N of Items
.911	.915	50

In this case, the results of the reliability test using the Cronbach's Alpha formula obtained a reliability value of 0.911, meaning that the item has a very high reliability value or has a high constancy value.

The level of difficulty is used to indicate how difficult or easy the items used are. Good questions are questions that have varying levels of difficulty ranging from easy, medium, and difficult.

The results of the analysis of the level of difficulty using SPSS. 16 there are 18 items in the "easy" category, 24 questions in the "medium" category, and 8 questions in the "difficult" category.

The discriminatory power of questions is used to determine whether the questions used can differentiate between high-ability students and low-ability students. Based on the analysis of the discriminatory power of the triangle questions, the test questions can be identified that there are 30 questions in the "good" category, 17 questions in the "enough" category, 2 in the "bad" category, and 1 in the very bad category.

Then to determine the effectiveness of the product, a T test was used using the SPSS 16 application or with the following formula (Prana Ugiana Gio and Elly Rosmaini, 2016):

$$t = \frac{\bar{d} - \mu_D}{sd/\sqrt{n}}$$

N-Gain test using the following formula (Sundayana, 2014):

$$Gain\ Ternomalisasi\ (g) = \frac{(score\ posttest)-(score\ pretest)}{(score\ ideal)-(score\ pretest)}$$

RESULT AND DISCUSSION

Jobsheet Eligibility

The feasibility test for the interactive jobsheet material was carried

out by experts in the field of automotive measuring instruments from SMK N 10 Semarang and State University of Semarang with an average score of 80.6% and was included in the "appropriate" category. Meanwhile, the media feasibility test was carried out by two media experts from the State University of Semarang, with an average score of 81.25% and was in the "appropriate" category.

The material expert assessment criteria are as follows; 1) title and KD are 90%, 2) learning objectives are 70%, 3) material suitability is 82.9% and 4) material quality is 76.7%. The average score is 80.6% in the “decent” category.

Then the criteria for the assessment of media experts can be seen in table 3, namely as follows; 1) software by 90%, 2) visual design by 79.2% and 3) usability by 85%. The average score is 81.25% in the “decent” category.

Product revisions are carried out after a feasibility test by material experts and media experts, the results of both material and expert feasibility tests show that the products made are included in the appropriate category, both material experts and media experts provide suggestions so that the product

Developed the better, after being revised the new product can be used in research, the following suggestions are given and also the follow-up carried out.

Table 2. Material Expert Test Results

No	Assessment criteria	Score	
		Material Expert 1	Material Expert 2
1.	Title	5	4
2.	Basic competencies	4	5
3.	Learning objectives	4	3
4.	Material Compatibility	31	27
5.	Material Quality	25	21
Total score		69	60
Total Score		129	
Maximum Score		160	
Eligibility Percentage		80.6	
Criteria		appropriate	

Table 3. Media Expert Test Results

No	Assessment criteria	Score Media Epert 1	Media Epert 2
1	Software	8	10
2	Desain visual	40	55
3	Manfaat	7	10
Total score		55	75
Total Score		130	
Maximum Score		160	
Eligibility Percentage		81.25	
Criteria		appropriate	

Table 4. Expert Validator Suggestions

Subject	Suggestions	Follow-up
Material Expert 1	Improvements to some symbols and language usage according to EYD	Fixed malfunctioning or unnecessary symbols.
Material Expert 2	Fixed some images that were not appropriate or unclear. Numbering in the sequence of work steps	Improved use of language according to EYD
Media Expert 1	Examples of measurement results for each tool in the material menu and simulation should be included	Replace unclear images.
Media Expert 2	Note the writing, the layout of the images and writing is adjusted to the available space, the addition of audio to the application	Numbering in the order of each work step.

Evaluation of Student Learning Outcomes

The use trial in the form of pretest and posttest was carried out to class X students majoring in TKRO SMK N 10 Semarang and got an average pretest score of 48.826 and an average posttest value of 75.843.

Then the prerequisite test was carried out, namely normality test and homogeneity test. The results of the

normality test can be seen in table 5, with a confidence level of = 0.05, a significant value (sig) on Kolmogorov-Smirnov is 0.136 with a value greater than 0.05. This means that the data is normally distributed. In addition, when viewed from the normal output, the Q-Q plot shows that the data is normally distributed, because the diagram is not far from the normal diagonal line.

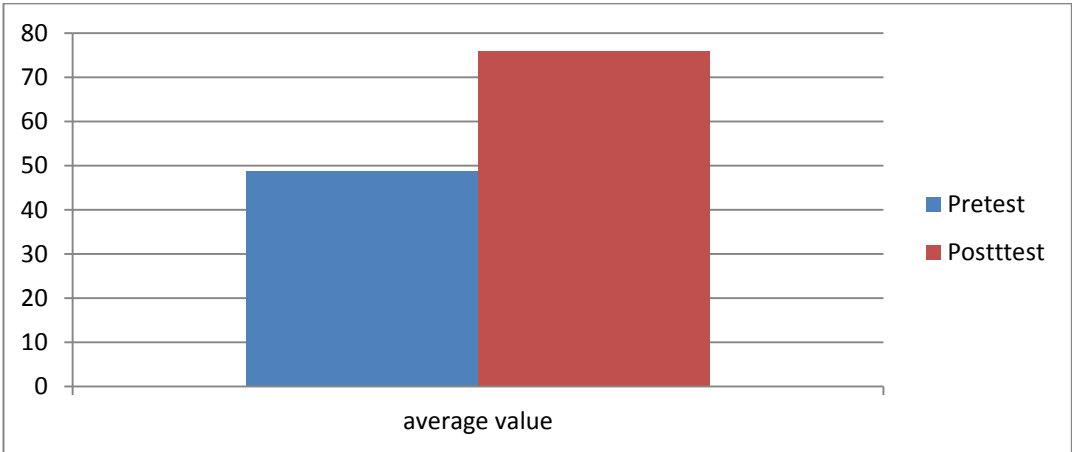


Figure 2. Usage Trial Results

Table 5. Normality Test Results

	Kolmogorov-Smirnov ^a		
	Statistic	Df	Sig.
hasil_belajar	.131	35	.136

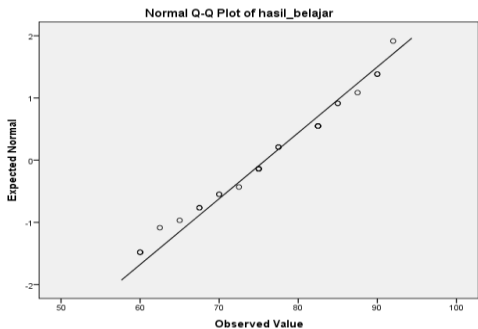


Figure 3. Q-Q Plot Chart

Table 6. Homogeneity Test

N	Valid	35
	Missing	0
Mean		75.843
Std. Error of Mean		1.5964
Std. Deviation		9.4447
Variance		89.203
Kurtosis		-.869
Std. Error of Kurtosis		.778
Minimum		60.0
Maximum		92.0
Percentiles	25	67.500
	50	75.000
	75	82.500

To determine the homogeneity of the data, it can be seen in the kurtosis value, which is -0.869. The negative value is small enough to approach normal, so it can be assumed that the data is almost

homogeneous. Furthermore, if you look at the box plot diagram, the box plot normality output tends to be in the middle and there are no outliers. So, based on this information, it can be assumed that the homogeneity of student learning outcomes is met.

Differences and improvement of learning Outcomes

The effectiveness of the interactive jobsheet can be known after conducting the t test (to determine the difference in learning outcomes) and the N-Gain test (to determine the increase in learning outcomes). The procedure for interpreting the t-test must first be determined: 1) The value of (0.5). 2) dk = N-1. 3) Comparing t-count with the value of t-table. With the provision that t-table < t-hitung < t-table, then H0 is accepted, there is no significant difference, and if t-hitung < t-table, then H0 is rejected, there is a significant difference.

Based on table 7. we can know the value of dk = 35 – 1 = 34, we get the data t-table = -2,728. t-count = -18,082. The value of t-count < t-table, then H0 is rejected, it can be concluded that there is a difference between before using an android-based interactive jobsheet and after using an android-based interactive worksheet.

Then for the N-gain test from the data source, the pretest and posttest scores got a score of 0.52, indicating that there was an interpretation of an increase in the "moderate" category of students.

Table 7. T-Test

	Paired Differences					T	Df	Sig. (2-tailed)
						95% Confidence Interval of the Difference		
						Lower	Upper	
	Mean	Std. Deviation	Std. Error	Lower	Upper			
Pair 1 pretes – postes	-27.5571	9.0161	1.5240	-30.6543	-24.4600	-18.082 34	.000	

Student Response to Interactive Jobsheet

Then an analysis of student responses to the developed interactive worksheet was carried out by obtaining an average score of 73.43%, based on the criteria, it was included in the "interesting" category.

Finding analysis

The results of the descriptive analysis showed that the results of the pretest and posttest had increased from the average in the pretest of 48.286 to 75.843 at the average value of the posttest and the N-Gain test got a value of 0.52 indicating a "medium" increase interpretation. From this we can know that android-based interactive worksheets can improve student learning outcomes. This increase is possible because of the advantages that exist in the developed interactive worksheet.

The advantage of developing this interactive jobsheet is to reduce the lecture method carried out by a teacher, because the materials and procedures for using the tool already exist in writing or in the form of animation or video. the ease of use of this interactive worksheet can motivate students to learn according to the needs of practice that is carried out independently, with an attractive appearance this interactive worksheet can increase student interest in learning that can be read or studied anywhere. Likewise for teachers, this worksheet has the advantage of making it easier for teachers to deliver material because it can be installed on a laptop so that it can be displayed on a projector screen for a large number of students. In addition, another advantage of using interactive jobsheets is that there is no need to print jobs or procedures for using tools through print media that require sheets of paper.

Another similar study conducted by Fredyana (2016) researchers carried out the development of android-based learning in Basic Automotive Technology (TDO) subjects for class X at SMK N 3 Buduran Sidoarjo concluded that 1) android-based learning media was declared very feasible, with a

feasibility percentage of 91,89%; 2) the application of the media received a positive response from students and was categorized as very good with a response percentage of 86.64%; 3) student learning outcomes were declared to be increasing and categorized as very complete with the highest percentage of learning outcomes 86.6% based on the post-test1 and post-test2 scores.

Another study conducted by Amri and Jatmoko (2019), researchers developed motorcycle overhoul learning media using a job sheet on student learning outcomes of Automotive Technology Vocational Education students, University of Muhammadiyah Purworerojo, researchers got the results 1) Media experts showed an average score of 80.35 %. Material expert validation shows an average score of 78%. 2) Student learning outcomes in the experimental class and control class with the average value of the experimental class 77.29% and the average value of the control class 73.33 %. Based on these results, the motorcycle overhoul learning media can improve student learning outcomes.

Another study was also conducted by Devi et al. (2017) who developed a performance assessment-based jobsheet to improve the competence of conventional engine tune up at SMK BISMA Kersana. After collecting data and analyzing it, the researcher concludes that the feasibility of a performance assessment-based job sheet is very feasible to use. Seen in the average result of the validator jobsheet of 95.51% in the appropriate category and students' practical skills based on the percentage from 33.33% to 80.56% and based on the N-gain arithmetic test it increased by 0.37 which was included in the medium category.

Other studies have previously been carried out similarly by Noktavianda and Aryadi (2011: 68). The research achieved good results. Based on the results of the study, it can be concluded that there is an increase in student learning outcomes in the competence of the car lighting system that applies the jobsheet as a visual aid. From the calculation

analysis, the experimental group learning outcomes increased by 13.88, with an average pre-test score of 58.19, which experienced a significant increase in the post-test average to 72.07. While the control group experienced an increase of 12.44, with an average pre-test score of 58.86 which increased to 71.30 in the post-test average.

Research conducted by Mindarta (2018: 65) suggests that jobsheets are tools in practice that function as school aids and are used by students. While the e-jobsheet is a guide for practicing electronically. This research was conducted to help improve the performance of vocational students, especially to improve the system on the engine with the Engine Control Module (ECM). Using the e-jobsheet as a 21st Century Student Learning Resource, it is hoped that students will more easily understand the substance and learning outcomes so that the e-jobsheet is effectively applied. This study used a pre-experimental design with one pretest-posttest group. The population in this study were all program students diploma 3 vocational education in automotive machinery, State University of Malang. Sampling was carried out by purposive sampling technique for 4th semester students. Data collection techniques in this study were carried out through tests. The data analysis technique in this study uses the "t" test for two small samples that are related to each other. Observation results show $t_{count} = 7.14 > 1.83 = t_{table}$. Thus H_a is accepted and H_0 is rejected, which means that there are differences in student learning outcomes before and after the application of the e-jobsheet, and the value is significant. So it can be concluded that the use of e-jobsheets in practical learning in the practice of machine control systems has been effective.

Based on this description, it can be concluded that the use of an interactive jobsheet using an electric measuring instrument developed has been proven effective and relevant to the studies that have been carried out in the form of developing interactive media or developing a jobsheet so that it is suitable for use for learning, namely

the material using an electric measuring instrument in accordance with the SOP.

CONSLUSION

Conclusion

Based on the results of the research and discussion, it can be concluded that 1) the interactive jobsheet that has been developed meets the "feasible" criteria. It is proven that the average percentage of material expert test results is 80.6% and the average percentage of media expert test results is 81.25%. 2) The effectiveness of the jobsheet is proven from the average score of the pretest without the interactive jobsheet is 48.283 and the average score of the posttest is 75.843. Based on the t-test, the results can be drawn from $t_{count} = -18.28$ and $t_{table} = -2.728$. Because the value of $t_{count} < t_{table}$, it can be concluded that there is a significant difference between the control class and the experimental class. Based on the gain test results obtained a value of 0.52 which indicates that the increase in learning outcomes using interactive worksheets is in the medium category. 3) Student responses to the android-based interactive worksheets that have been developed meet the "interesting" criteria. It is proven that the average percentage of student response results is 73.43%.

Suggestion

Based on the conclusions above, the recommended suggestions are 1) Before carrying out learning, teachers and students are expected to install an Android-based interactive jobsheet on a cellphone or laptop that will be used to convey material on the use of electrical measuring instruments. 2) Schools are expected to use this android-based interactive Jobsheet as input and study material for schools in improving learning effectiveness. 3) Other researchers are expected to use the results of this study as a reference for developing android-based job sheets.

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