



The development of m-LKPD project-based assisted by smart apps creator 3 to stimulate science process skills

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ABSTRACT

This research intends to develop m-LKPD (mobile *lembar kerja peserta didik*) based on a project assisted by smart apps creator 3 in the diffraction of light lesson validly and practically. m-LKPD develops to stimulate scientific processes skill as multimedia to support online learning in this Covid-19 pandemic. This research uses Design and Development Research (DDR), consisting of 4 stages: analysis, design, development, and evaluation. The instruments used in this research are interview guidelines, validation test questionnaire, practicality test questionnaire, teacher perception questionnaire, student response questionnaire, and assessment rubrics of scientific processes skill. The result of the validation test results 3,62, with a very valid category. The outcome of the practicality test is 90% as a percentage average, with a very practical as a category. The result of stimulating scientific processes skills through a small team test gets 88% as an average percentage with stimulated as a category. This shows that m-LKPD develops very valid and efficient ways to stimulate processes skills. Besides, m-LKPD creates the potential to be implemented in online learning and face-to-face learning, proven by students' responses gaining 94% with very good as a category and teachers' perceptions that achieve 96% average percentage with very good as a category. Therefore, the developed m-LKPD can be used as multimedia to support online learning in this Covid-19 pandemic.

Keywords: m-LKPD, processes science skills,

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INTRODUCTION

21st-century skills that students must have to take a role in education as supplies to enter the world of work in the future. There is 18 kind of 21st-century skills that can be divide into three that must be supplied to students: learning divided skills and innovation among them critical thinking and problem solving, communication and collaboration, creativity

and innovation. Digital literacy skills, including media literacy, technology information and communication (TIK); career and life skills: flexibility and adaptability, initiative and self-direction, social interaction and cross-culture, productivity and accountability. However, between these, Learning and Innovation Skills-4Cs aspect, critical thinking, communication, collaboration, and creativity are the most

important aspects students have to supply from primary school to junior high school (Roekel, 2002).

21st-century skills can be training by science process skills, especially for science students. (Turiman *et al.*, 2011). Observing aspect in science process skill is fundamental skills when students doing experiments. They use all Indra to collect information about objects or events in their surroundings (Monhardt and Monhardt, 2006). With live activities, like science experiments, students use their different Indra with touching, listening, smelling, and sometimes verify materials with controls; this will help students develop their thinking skills from the concrete to the more complex thinking skills.

Based on the TIMSS research in 2015, the average science achievement by Indonesian students is at 44 from 47 countries. Likewise, PISA research in 2015 shows that the result of science achievement by Indonesian students is at 69 from 78 countries; this is probably causing by science process skills that are not training. According to (Suman, 2020) science process skill is essential for practical skill development. It takes the leading role in science education, and the lives of students who pursue science education affect their achievement. It is also supported by researcher observation at Central Lampung District, South Lampung District, Bandar Lampung Municipal, and Metro Municipal at Lampung province. It shows that science process skills have not trained much. This is proving by the result of a questionnaire that has to distribute; average teachers still using the lecture method or one-way method that slightly involves students and not yet integrated practicum in learning. Science process skills will be trained consistently and in live practice (Ongowo and Indoshi, 2013). It can be said that 21st-century skills, especially communication skills, have not trained much in science process skills. Communication skill will show when science process skills, is taught (Peng, 2007).

Based on that description, practicum activity is essential in training science process skills and communication skills. Following the

essence of physics, physics is a knowledge pool, way of thinking, and experiment (Yance et al., 2013). Implementation in learning must consider effective and efficient learning models also can make students interested and motivated to learning physics. Then one of the physics learning activities that effectively train science process skills also reflect effectively and can train science process skills, also reflect the essence of physics as inquiry through practicum activity based on the project.

The Covid-19 pandemic that has hit most countries globally, including Indonesia, presents its challenges for educational institutions (Hamidah and Sadikin, 2020). The Government Ministry of Education and Culture had to forbid from kindergarten to university face-to-face learning and instruct all schools and universities to do online learning (Surat Edaran Kemendikbud Dikti No.1 2020). So teachers must to capable of showing excitement and interacting with exploit development of technology in education. One of the media that can be applying in science learning is interactive learning multimedia. Learning with multimedia can be more engaging, interactive, and meaningful to students (Leow F T and Neo M 2014; M Duh, T Bratina, and M Krasna, 2013); (., 2010). The research was done by (Turiman et al. 1, 2011) shows that using technology in learning can develop science process skills in students. It is using the technology of handphones, many benefits, especially in creating a student-centered learning climate.

Lately, research about multimedia learning has been done, like other research about the development of E-LKPD with flipbook has been done bt (Haryanto et al. 2019) and (Apriyanto et al. 2019. Moreover, the development of E-LKPD based on 3D page flip has been done by (Yelianti et al.2018).

The literature review did not find development m-LKPD with the help of Smart Apps Creator 3 to stimulate science process skills,s. Therefore, the researcher is developing learning media to produce mobile LKPD or m-LKPD based on a project to stimulate science process skills s.

RESEARCH METHODS

This research uses Design Development Research (DDR) by (Richey & Clients, 2007) consisting of analysis, design, development, and evaluation. The analysis is the first stage in development research. The activity carried out is an analysis of needs in several schools in Lampung. An analysis of needs is done by interview and filling out the questionnaire to students and 11th-grade teachers. An analysis of needs is done to know potentials and problems in schools. Obtained information based on analysis of needs becomes basic for the researcher to do further research. An analysis of needs is to dig up information about learning models used, using LKPD in learning, trained skills, availability optic kits, implementation of practicum activities, and rating the students learning outcomes in skills aspect. Afterward, obtained data in this introduction study will be analyzed and becomes basic to do further research.

The second stage in this development research is the design stage. In this stage is doing planning the structure of m-LKPD. Product is made based on analysis of needs and goals indicator in this case, is m-LKPD project-based to stimulate science process skills. The development of m-LKPD for 11th-grade science class semester 2 in the diffraction of light topic. This stage is doing planning of mobile LKPD project-based using Smart Apps Creator 3.

The development stage is developing a product suitable to design that have made in the design stage. The development stage will produce the structure of m-LKPD. The developed product will validate by validators consisting of 1 lecturer of Lampung University lecturer and two senior high school physics teachers. Validators will validate the product consisting of materials and constructs also media and product design. If it gets validation, an m-LKPD practicality test can be conducted consisting of a legibility test. Moreover, the data is taken from the teacher's perspective, and students respond. The researcher is doing this to find out students' understanding skills, knowing teachers' outlook is m-LKPD sustain

to implemented in learning while Covid-19 pandemic or direct learning later, and knowing students' respond knowing benefits after doing m-LKPD later.

The last stage is the evaluation stage. The evaluation is done every development stage m-LKPD project-based with revisions based on experts and students' suggestions or recommendations. The evaluation has done to know the success of products, so it can be said valid and practical.

The instrument used in this research are interview guidelines, analysis of needs questionnaire, validation test questionnaire, practicality test questionnaire, student response questionnaire, teacher perception questionnaire, and assessment of science processes skill. The data of validation, practicality, students' responses, and teachers' perceptions are rating by Likert scale from (Ratumanan & Laurent, 2011) and assessment of science processes skill are using rubrics of science process skill from (Nur, 2011). The interview guidelines are a question and answer activity that the researcher does with respondents to get information. The researcher interviews physics teachers and senior high school students about the diffraction of light topic and media availability as a support learning process. The analysis of the needs questionnaire is a list of questions given to respondents to get information about some problem. Filling out the questionnaire is done to know students' difficulty in the diffraction of light topic, using m-LKPD in learning, learning models used by teachers, and availability optic kit.

A validation questionnaire is used to know the validity level of the m-LKPD project-based to give valid or not information as a teacher's assistant in the learning activity. This questionnaire is given to three experts. A validation questionnaire containing media and design & material and construct. A practicality questionnaire is a students' readability questionnaire in m-LKPD project-based. A teacher perception questionnaire and student response questionnaire. A readability questionnaire to know students' convenience level in understanding m-LKPD. The teacher

perception questionnaire was used to determine the application of a product during the covid-19 pandemic and face-to-face learning. Filling out this questionnaire is to know the implementation level of the product so teachers can use it as learning media. Students' questionnaire responses were used to know students' responses after doing the m-LKPD project based on Smart Apps Creator 3.

RESULT AND DISCUSSION

This development research produces a product in mobile LKPD (*Lembar Kerja Peserta Didik*) project-based to stimulate science process skills. The first stage in this research is to analyze needs. Problem identification has been made by distributing questionnaires by online, semistructured interview. Based on an online questionnaire distributed to 17 students from 6 different schools, data obtained that only 17,7% of students have use LKPD of the diffraction of light topic, 76,5% of students using package book. Also, 64,7% of students use the lecture method, and 70,6% do not understand the diffraction of light topic. Afterward, semistructured interviews were conducted with some senior high school physics teachers in Lampung related to delivering the diffraction of light topic in school. In between, general teachers are still using the lecture method to delivering the diffraction of light topic, so that students science process skills, have not trained yet. Furthermore, in general, schools still do not have the diffraction of light kit, so practicum has not yet been conducted, so students' science process skills have not been trained yet. There has never been a practical activity in the diffraction of light topic, LKPD nor m-LKPD have not used by teachers to deliver this topic.

Overall, the analysis of needs result shows that the diffraction of light topic in some schools only using the lecture method and do not have m-LKPD. However, according to (Yildirim, Kurt, & Ayas, 2011), LKPD can make students more participate in learning activities. Moreover, some senior high schools have not done practicum of the diffraction of

light topic, so science process skills can not be trained, even though science process skills can be trained with open experiments (Aydogdu, Buldur, & Kartal, 2013). This shows that students' science process skills and 21st-century demands are not achieved yet. Problem gap and hopes that becomes basic by the researcher to develop m-LKPD project-based using Smart Apps Creator 3 to stimulate process science skills as alternative online learning media during a covid-19 pandemic.

Next is the design stage, the design of m-LKPD create based on a project consisting of some activities designing project. The making of design m-LKPD project-based is done with help from Microsoft Word and Canva to design the cover and layout. Furthermore, the m-LKPD design that has complete is arranged in Smart Apps Creator 3.

The m-LKPD project-based consists of 3 parts. The first part consists of cover, preface, table of contents, instructions for use, core competence, basic competence, indicator, and learning objectives. Next is the content section consists of 5 project planning activities. Moreover, the last part consists of evaluation and exercises.

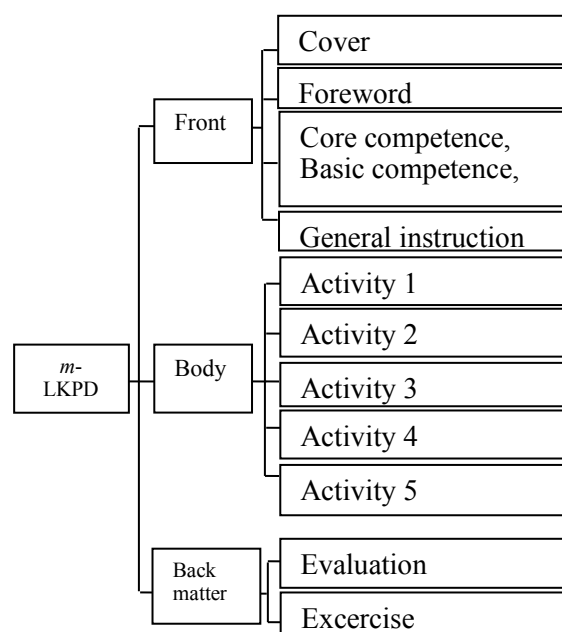


Figure 1. Product design

In the parts of m-LKPD, students' science process skills can train through some activities. In activity 2, students' science

process skills in indicator formulate the problems, create a hypothesis, and determine variable can be trained. Furthermore, in activity 4, students' science process skills can train through indicator hypothesis tests, also present data and results.

The next part is the development stage. In this stage is making validation test, practicality test m-LKPD, students' responses, and teachers' perspective also ratted the stimulate of students' science process skills. Validation test consists of material experts test & construct and media & design expert test. Furthermore, the results obtained at 3.57 from a scale of 4.00 qualitatively with very valid as a category. This shows that the quality of material, construct, media, and design develop m-LKPD are outstanding.

Table 1. The result of validation test

No.	Aspect rated	Score average	Category
1.	Material and construct	3,51	Very valid
2.	Design	3,62	Very valid
Average		3,57	Very valid

LKPD can be said good enough if it consists of six core components (title, study guide, basic competencies, or subject material, support information, task or work action, and evaluation); if one of the components, then m-LKPD is only a bunch of letter and can not be said as LKPD (Prastowo, 2011). The development m-LKPD product fulfills these six core components. This also supports the result of the validity test that the development m-LKPD declared as very good.

Next is the practicality test. The result through legibility test is 90% with very practice as a category.

Next is students' responses. The result of responses from 9 students expresses their opinion that m-LKPD their working in is helping them in understanding the diffraction of light topic cause it consisting of some phenomenon and video, also there is a tutorial to create a project and direct practicum. So it can be said that the average percentage is 100%. Furthermore, students can improve their science process skills after doing m-LKPD because they said every indicator of science process skills is in m-LKPD.

Table 2. The results of the legibility test

No.	Questions	Total question score	Maximal score	Percentage	Category
1.	LKPD structure is arranged well so I can understand	39	40	98%	Very practice
2.	Space, type, and font size in LKPD are suitable and comfortable to read.	36	40	90%	Very practice
3.	The LKPD layout is excellent and ideal so that I can read well the sequence of material.	38	40	95%	Very practice
4.	The language is easy to read and understanding.	33	40	83%	Very practice
5.	The working instructions are clear and easy to understand.	38	40	95%	Very practice
6.	The commands or questions presented in LKPD are clear and easy to understand.	33	40	83%	Very practice

7. The step-by-step in LKPD is easy to understand.	40	40	100%	Very practice
8. LKPD presentation is equipped with illustrations and links that can help me understand the topics.	37	40	93%	Very practice
9. The phenomenon in LKPD is easy to understand.	36	40	90%	Very practice
10. Pictures in LKPD can be seen clearly.	30	40	75%	Practice
11. The exercise is equipped with pictures or tables so easy to understand.	39	40	98%	Very practice
Total	360	400		
Average percentage			90%	Very practice

Therefore, the average percentage is 100% express science process skills is very stimulating. Next, additional questions in the form of a questionnaire on the Likert scale obtain an average percentage of 94% with very good as a category. The result of teachers' perspective related to the application of m-LKPD is to see the implementation of development products. Teachers' perspective is taken from five senior high school physics teachers. The perspective consists of 6 learning activities that are rated in m-LKPD; there are 26 aspects. The average percentage of teachers' perspective is 96%, with very good as a category. Based on the teachers' perspective, the development of m-LKPD can

be used in learning during a covid-19 pandemic and face-to-face learning.

Based on small-group test assessment with students doing m-LKPD, the development of m-LKPD can be said it stimulates science process skills. The result of rating stimulate science process skills shows that indicator formulate problems from percentage is 95% with very stimulating as a category, the hypothesis from the indicator is 100% with very good as a category, hypothesis indicator testing is 73% with good as a category. The indicator shows data is 88% with very good as a category, and the indicator shows the result is 75% with good as a category. This shows that development product can stimulate

Table 3. The result of teachers' perspective

Learning activities	Total score per step	Maximal score	Percentage	Category
Activity 1 (question determination)	115	120	96%	Very good
Activity 2 (project planning)	152	160	95%	Very good
Activity 3 (scheduling)	18	20	90%	Very good

Activity 4 (monitoring)	20	20	100%	
Activity 5 (test result and evaluation)	134	140	96%	Very good
Activity 6 (evaluation and reflection)	60	60	100%	Very good
Total score	499	520		
Average percentage			96%	Very good

students' science process skills.

According to Subali (2011), science process skills are performance skills that contain cognitive skills, intellectual skills backgrounding science process skills, and sensorimotor skills. Therefore, measurement of science process skills, including cognitive skills, can measure with a written test. This is also supported by learning by doing theory based on the assumption that students are better when studying personally involved in study experience. Individuals must discover knowledge so learning can be more meaningful (Smith, 1980). In this research, processing m-LKPD by students including written test, because it has indicator science process skills. This supports the result of stimulating test students' science process

skills, so the m-LKPD product can be said it stimulates science process skills very well.

The last stage in this research is the evaluation stage. In this stage, evaluation is done to see that every activity in every stage is already suitable and runs well. This evaluation is done in every stage of development procedures: analysis, design, and development. Moreover, this evaluation is generally done to develop m-LKPD product by five senior high school physics teachers.

The evaluation in the analysis stage is adding question aspect in the analysis of needs questionnaire. The Evaluation in the design stage is better using the source of the authentic references and easy for students to understand also easy to use and interactive platform so m-LKPD can be an exciting and effective

Table 4. The results of the stimulating rate of students' science process skills

No.	Science process skills indicators	Rated aspects	Total score	Maximal score	%	Average %
1.	Formulate the problems	a. Finding problems	30	30	100%	95%
		b. Making a prediction	27,5	30	92%	
		c. Formulate the problems	37,5	40	94%	
2.	Making hypothesis	Making hypothesis	40	40	100%	100%
3.	Determine variable	Determine variable	40	40	100%	100%

4. Hypothesis test	a. Make a list of tools and materials	15	30	50%	73%
	b. Planning experiment procedures	47,5	50	95%	
5. Present a Data	a. Present a result of experiment data in table	60	60	100%	88%
	b. Analysis data and discussion	37,5	50	75%	
6. Present a result	Making conclusion	27	36	75%	75%
Average percentage					88%

learning media. The Evaluation in the development stage is in m-LKPD validity test. There is an improvement of m-LKPD in validity test based on recommendations from validators.

Based on the five teachers' perspectives, the development of m-LKPD is already good and can be used in online and offline learning. Thorough evaluation and improvement, which has been done in every stage, this research is producing an m-LKPD project-based assisted by Smart Apps Creator 3 to stimulate validly and practically science process skills to use in Covid-19 pandemic and face-to-face learning.

Based on the development stage, the development of m-LKPD plays an essential role in online learning during the Covid-19 pandemic. The research by (Haryanto, Asrial, & Erawati, 2020) producing an e-LKPD. The application used is Kvisoft Flipbook Maker. Access to the e-LKPD requires a PC/laptop because the export result is not supported yet in android. This can be a problem because not every student has a PC/Laptop. Furthermore, the research by (Apriyanto, Yusnelti, & Arsial, 2019) is producing an e-LKPD with a 3D Pageflip Professional application. The access to the export of this e-LKPD can use in android but still need additional apps. Based on many types of research, the researcher is

using Smart Apps Creator 3 as a platform.

Access to m-LKPD using the Smart Apps Creator 3 platform is effortless. Students only have to download the apps that given by teachers on android. Besides, Smart Apps Creator 3 makes it easier for teachers to make online multimedia because of demands for online learning during the Covid-19 pandemic. This is because making the m-LKPD based on this apps is effortless. Teachers only have to prepare the m-LKPD file the copy it in Smart Apps Creator 3 or directly making it in Smart Apps Creator 3 platform, and then it can be edited by adding an interesting design then the result can be directly distributed to students to download it. Therefore, m-LKPD, assisted by Smart Apps Creator 3 developed by the researcher, plays a vital role in supporting online learning during the Covid-19 pandemic. Moreover, this pandemic requires students to study at home, and project making can using secondhand materials. According to (Sumarni, Wardani, & Gupitasari, 2016), practicum with limitations of laboratory devices can do alternative by making with secondhand materials.

The researcher's research procedure stage produces an m-LKPD project-based assisted by Smart Apps Creator 3 to stimulate validly and practically science process skills. It can be

used in online and offline learning.

CONCLUSION

Based on results and discussion can take the conclusion that m-LKPD project-based assisted by Smart Apps Creator 3 to stimulate science process skills can be said very valid with an average score of 3,62 based on expert judgment in material, construct, and design. Moreover, m-LKPD project-based assisted by Smart Apps Creator 3 to stimulate practically science process skills can be used in the diffraction of light topic for high school students 11th grade based on the result of lecture test is 90% with very practice as a category. The development product can be used in online and offline learning based on students' responses with an average of 94% and teachers' perspectives with an average of 96%. The m-LKPD project-based assisted by Smart Apps Creator 3 very stimulates science process skills based on the result of stimulating test by small-group test.

Any suggestions given by the researcher to the following researchers are first is to doing an effectiveness test to fulfilled the criteria of a good quality product. Second, better-using premium Smart Apps Creator, so there is no time limitation in making design product, and or using other platforms that can be used to making m-LKPD that can directly enter students' answers in apps.

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