Development of Mobile Learning Based Electronic Student Worksheets to Measure Learning Motivation on Sensing Systems Materials

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Abstract. The material of the sensory system is important because in the sensory system there are several kinds of senses and the nervous system which is still abstract and the problem that occurs is a misconception about the material. Motivation is one of the factors that support success in learning, but students learning motivation is still low. This study aims to produce valid and feasible mobile learning-based electronic student worksheets and to measure students learning motivation on sensing system materials. The research subjects were students of class VIII MTsN 8 Banyuwangi. This study uses Research and Development methods and 4D models with 4 stages, namely define, design, develop, and dissemination. The instrument used was a material validation questionnaire, medial, readability, and students' learning motivation. The validation results show the average percentage of the material test is 94% and the media is 94% with very feasible criteria. The percentage of the students' readability test has an average value of 71% with a good category and the students' learning motivation is very strong with a percentage of 82%. Thus, electronic student worksheets can measure students' learning motivation. For future researchers, it is recommended to use the product in classroom learning.
Keywords: Electronic Student Worksheets, Mobile Learning, Student Learning Motivation, Sensing System

Introduction

Integrated science learning is a lesson that is discussed from various aspects of the science field, namely physics, biology, and chemistry in a related manner (Taufiq et al ., 2014). The purpose of learning science is to cultivate higher-order thinking skills such as critical thinking, reasoning, acting, and acting scientifically to solve a problem and make decisions in facing challenges in everyday life (Nugraha et al ., 2017). Science is related to everyday life events, one of which is the sensory system because the human body has five senses that are used every day. Science is always related to all the problems that exist in everyday life (Novayani et al., 2015). When students learn about science, they can build conceptual knowledge and scientific abilities that students will have because students must be able to connect concepts with problems in everyday life (Bunt & Gouws, 2020).

Understanding the material sense system is important because in the sensory system there are several kinds of senses and the nervous system which is still abstract. Students need to understand the mechanisms that occur in the sensory system. Some problem that

occurs in the sensory system material is misconceptions about the sensory system material (Farihah et al., 2016). In addition, student learning outcomes on sensory system material are still very low (Purwaningsih, 2014). Misconceptions in students occur because science material is material that is still abstract so students still have difficulty understanding it and make students feel bored (Rifqiyana et al., 2016).

Motivation is one of the factors that support success in learning. Motivation is an encouragement or interest in doing something to achieve a certain goal (Badaruddin, 2015). Motivation can be influenced by several things that cause each student to have different student learning motivations (Maryam, 2016). Several factors that can affect students' learning motivation are the condition of students, ideals, abilities, and environmental conditions such as family, friends, and society (Emda, 2018).

Several studies have been conducted to measure students' learning motivation on the sensory system material. The research in question is the use of android-based learning media to increase students' learning motivation and student learning outcomes (Indrastyawati et al., 2016). Comparison of students' learning motivation through several learning strategies (Firdiani, 2018). The effect of using animation media on students' learning motivation on the material sense system (Purwaningsih, 2014). From this research, it can be concluded that the learning motivation of students is more widely studied, but there are still few who research with mobile learning-based worksheets. So, it is necessary to have an electronic student worksheets based on mobile learning to measure students' learning motivation on the material of the sense system.

One type of electronic book that is packaged in the form of a file or application is called an E-book or electronic book (Gaol et al., 2019). By using e-books, abstract material can be visualized in concrete form or easier for students to understand because it is packaged in the form of sound, animation, and video (Mariya & Suyatna, 2015).

Mobile learning is device-based learning using mobile so that it is not limited by space and time in its use. Mobile learning is also one of electronic learning and distance learning (Surahman, 2011). The use of technology during learning will make learning active and can assess the process and learning outcomes of students and can make students motivated in learning (Watson & Watson, 2011).

The electronic student worksheets is a series of activities that students use in investigations to solve problems (Trianto, 2013). Electronic student worksheets is a student work guide so that it is easier for students to understand learning material packaged in electronic form in the form of smartphones, computers, and laptops to achieve learning goals (Purnama & Suparman, 2020). The existence of supporting images or videos can stimulate curiosity about the material presented (Putri et al., 2016).

Videos that contain material are very effective for learning and can make students motivated to be more interested in the lessons to be delivered. The use of video will create a sense of wanting to learn about the topic (Syaparuddin & Elihami, 2020). The existence of learning videos will raise enthusiasm for students in learning so that learning will be more fun. The video will help the teacher in delivering the subject matter (Sofyan et al., 2021).

Some material and questions that are packaged by utilizing technology in the form of Android-based mobile learning are expected to have a positive impact on students because the learning process is not limited by space and time its name is electronic student worksheets (Warsita, 2018). Electronic student worksheets based on mobile learning can motivate students' learning in learning (Wati et al., 2021). Student worksheets based on multimedia can motivate student learning (Muthoharoh et al., 2017). Multimedia-based student worksheets can motivate students' learning in online learning (Suharsono & Handayani, 2021).

Based on this description, the development of mobile learning-based electronic student worksheets with flipbooks is still rarely done. So it is necessary to develop mobile learning-based electronic student worksheets which aims to measure the level of learning

motivation so that learning becomes more active. This study aims to develop an electronic student worksheets based on mobile learning to measure students' learning motivation on material sense systems that are valid and suitable for use.

Methods

This type of research uses research & development (R&D) which aims to produce a product (Sugiyono, 2018) and uses a 4D model namely define, design, develop, and dissemination. The research was carried out at MTsN 8 Banyuwangi, East Java on May 11, 2022. The subjects of the study were 24 students of MTsN 8 Banyuwangi class VIII. The product results in the form of mobile learning-based electronic student worksheets to measure the effect of electronic student worksheets on students' learning motivation on the material of the sensing system. The research design with the 4D model consists of 4 stages, namely define, design, develop, and dissemination. The following are the details of the research stages with the results obtained.

Table 1. Table of Details of Research Stages

Stages	Results
Define	Literature study, guide in making electronic student worksheets and flipbook
Design	Product drafts, student learning motivation instruments, and assessment instruments for material validation questionnaires, media, and readability tests
Develop	Electronic student worksheets application, material and media validation results, test results and learning motivation, and revision results
Dissemination	Product articles and product distribution

Define stage is an activity to determine and describe the learning requirements (Trianto, 2007). The activity is to analyze the problems that occur in the sensory system material and students. As well as designing guidelines for making products.

At the Design stage, it is carried out to prepare prototypes of learning devices (Trianto, 2007). The activity is to make a product design that contains concepts, materials, and appearances. Make a questionnaire assessment instrument consisting of media and material validation sheets, and readability and learning motivation tests for students.

Develop stage is the stage in creating learning tools that have been corrected by several experts (Trianto, 2007). Activities are developing products, material validation tests, and conducting product, product trials and revising products based on suggestions from validators, and measuring students' learning motivation. Validators for media and material were 4 validators of the Master of Science Education, Universitas Negeri Yogyakarta, and 1 teacher of MTsN 8 Banyuwangi. The questionnaire produces quantitative and qualitative data. Quantitative data in the form of a Likert scale and qualitative data in the form of suggestions and responses from the validator. The readability test questionnaire and students' learning motivation, for sample are students of class VIII MTsN 8 Banyuwangi.

The dissemination stage is carried out by using learning tools that are developed more broadly. The activity was to disseminate the product to students at MTsN 8 Banyuwangi and teachers at MTsN 8 Banyuwangi as learning materials or as supporting media. Then write down the results of the research in the form of articles.

The data obtained were analyzed descriptively and result data material and media validation questionnaire filled out by 4 validators of the Master of Science Education at

Universitas Negeri Yogyakarta and 1 teacher MTsN 8 Banyuwangi as well as readability and learning motivation questionnaire by students of MTsN 8 Banyuwangi. Readability, motivation, material, and media questionnaires used a 4-level Likert scale, namely strongly agree, agree, disagree, and disagree. The levels of the Likert scale can be seen in Table 2 below. Quantitative data obtained from the results of the questionnaire were then added up to the overall score for each questionnaire then the overall score of each respondent's answer is divided by the ideal score and multiplied by one hundred percent.

Table 2. Table of Likert Scale Levels

No	Score (%)	Qualification
1	4	Strongly agree / always / very positive / very worthy / very good / very useful / very motivating
2	3	Agree/ good/ often/ positive/ appropriate/ easy/ feasible/ useful/ motivating
3	2	Disagree / almost never / negative / less good / less suitable / less interesting / less understand / less worthy / less useful / less motivating
4	1	Disagree / not good / not suitable / not interesting / do not understand / not worthy / not useful

Then conclude the data criteria (Likert, 1932; Sugiyono, 2015). The results of the average percentage score are entered into the table of eligibility criteria for the questionnaire data and the criteria for the level of learning motivation of students. The table of eligibility criteria for the questionnaire data can be seen in Table 3 (Riduwan, 2012) and the table of criteria for the learning motivation of students can be seen in Table 4 (Bernard & Sunaryo, 2020).

Table 3. Table of Eligibility Criteria for Questionnaire Data

No	Score (%)	Qualification	Information
1	81 – 100	Very good	Very feasible / very valid / does not need to be revised
2	61 – 80	Well	Eligible / valid / does not need to be revised
3	41 – 60	Pretty good	Inappropriate / less valid / need to be revised
4	21 – 40	Not good	Inappropriate / invalid / need to be revised
5	<20	Not very good	Very inappropriate/very invalid/needs to be revised

Table 4. Table of Learning Motivation Criteria

Percentage Learning Motivation	Criteria
$0 \leq NA \leq 20$	Very weak
$21 \leq NA \leq 40$	Weak
$41 \leq NA \leq 60$	Pretty weak
$61 \leq NA \leq 80$	Strong
$81 \leq NA \leq 100$	Very strong

Qualitative data in the form of suggestions from validators and students are taken into consideration in developing or improving products.

Results and Discussion

The results of the data obtained based on the research are as follows.

Table 5. Table of Material Validation Results

No	Assessment Aspect	Validity (%)					
		Validator 1	Validator 2	Validator 3	Validator 4	Validator 5	Average
1.	Content Feasibility Aspect	92	92	100	92	100	94
2.	Aspects of Feasibility of Presentation	83	92	92	100	92	92
3.	Language Eligibility Aspect	96	92	100	96	97	96
	Average	90	92	97	96	94	94
	Assessment criteria	Very Worthy	Very Worthy	Very Worthy	Very Worthy	Very Worthy	Very Worthy

Table 6. Table of Media Validation Results

No.	Assessment Aspect	Validity (%)					
		Validator 1	Validator 2	Validator 3	Validator 4	Validator 5	Average
1.	Aspects of Language Eligibility	100	100	100	100	75	100
2.	Aspects of Feasibility of Presentation	100	88	100	100	75	97
3.	Media Effects Eligibility Aspects	83	92	100	92	100	92
4.	Display Feasibility Aspect	94	94	100	100	81	97
	Average	94	94	100	98	83	96
	Assessment criteria	Very Worthy	Very Worthy	Very Worthy	Very Worthy	Very Worthy	Very Worthy

Table 7. Table of Readability Test Results

No	Rated aspect	Average Score (%)
1.	The explanation of the material on the flipbook is very complete	81
2.	Flipbook media is very easy to use	81
3.	The material does not match the material in the student's book on science	68
4.	Flipbook media cannot help in learning science material	63
5.	Flipbook media is hard to understand	67

6.	Flipbook media cannot help teachers in explaining science material	65
7.	Flipbook media is difficult to use	64
8.	Flipbook media can be quickly understood	74
9.	Flipbook media can be easy to read	78
10.	The flipbook material is by the material in the student's book	72
11.	Flipbook media can help in learning science material	79
12.	The explanation of science material in flipbook media is incomplete	64
13.	Flipbook media has an unattractive appearance	63
14.	Flipbook media can help teachers explain science material	78
15.	Flipbook media is hard to read	67
16.	Flipbook media has a very attractive appearance	79

Table 8. Table of Students Learning Motivation Results

No	Indicator	Rating Points	Score	Score max	Percentage	Assessment criteria
1	The drive to achieve something	Desire to succeed	87	96	91	Very strong
		There is encouragement in learning	81	96	84	Very strong
		There is a need for learning	89	96	93	Very strong
2	Commitment	Commitment to fulfilling school assignments	68	96	71	Strong
		It's not easy to let go of what you believe in	82	96	85	Very strong
3	Initiative	Prefer to work independently	76	96	79	Strong
		Get bored quickly on routine tasks	68	96	71	Strong
		Happy to solve problems	68	96	71	Strong
4	Optimistic	Passion for learning	85	96	89	Very strong
		Attendance at school	94	96	98	Very strong
		Tenacious in the face of adversity	68	96	71	Strong
		Overall Average			82	Very strong

The product that has been developed is an electronic student worksheets (E-LKPD) in the form of an application that can be used on *smartphones*. E-LKPD is presented in the form of electronic practicum instructions which are equipped with experimental videos. This experimental video aims to make students more motivated in learning. E-LKPD is packaged like a practicum manual and presented in electronic form in the form of an application in which there are several materials and videos related to the material. In the E-LKPD application, there are also several buttons such as page navigation, *zoom, sound, search,*

print, social share, auto flip, and *select text*. The developed E-LKPD contains a cover, introduction, table of contents, practical instructions containing objectives, tools and materials, theoretical basis, experimental steps, observations, questions, and conclusions as well as several videos related to the experiment. The cover display of the E-LKPD and the table of contents can be seen in Figures 1a and 1b.
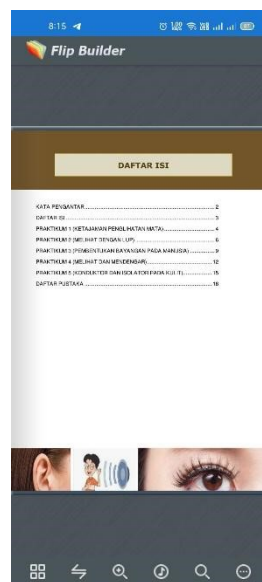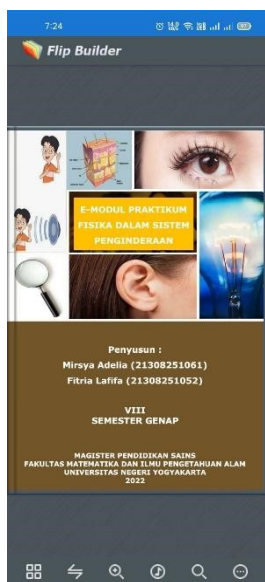

Figure 1a. Image of E-LKPD Cover Page   **Figure 1b.** Image of Contents Page of E-LKPD

In Figure 1a, you can see the initial display when opening the application, namely the E-LKPD cover. On the cover page, there is a title, the name of the product creator, and several buttons, namely page navigation, zoom, sound, search, and others. To move to the next page can be shifted directly or use the page navigation buttons.

In Figure 1b, you can see the table of contents in the form of various topics in the E-LKPD. The various topics presented in the E-LKPD include practical eye visual acuity, seeing with a lens, image formation in humans, seeing and hearing, conductors, and insulators on the skin. The practical topic contains material or physical concepts related to the sensory system in humans.

Furthermore, there are pages for each topic and also an experimental video collection page. The page for each topic can be seen in Figure 1c and the video collection page in Figure 1d.

Figure 1c can be seen for a display of the elaboration of instructions for each practicum topic. Each topic will be described starting from the purpose of the practicum, the tools, and materials used, the theoretical basis related to the concepts that are by the practicum, the steps in starting the practicum, then a table of observations to write down the results, then there are several questions as a form of evaluation of the practicum. , and finally, some conclusions are following the objectives of the practicum. In this view, the material is presented in the form of images and text that will facilitate the understanding of students in carrying out practicals.

In Figure 1d it can be seen that it contains several videos that are following each practicum topic on the Electronic student worksheets (E-LKPD). This video is to make it easier for students to understand the practical instructions that have been presented. In addition, the presence of videos can also motivate students in learning. This is in line with the theory that videos containing material are very effective for learning and can make students motivated to be more interested in the lessons to be delivered. The use of video

will create a sense of wanting to learn about the topic (Syaparuddin & Elihami, 2020). The existence of learning videos will raise enthusiasm for students in learning so that learning will be more fun. The video will help the teacher in delivering the subject matter (Sofyan et al., 2021). The existence of supporting images or videos can stimulate curiosity about the material presented (Putri et al., 2016).
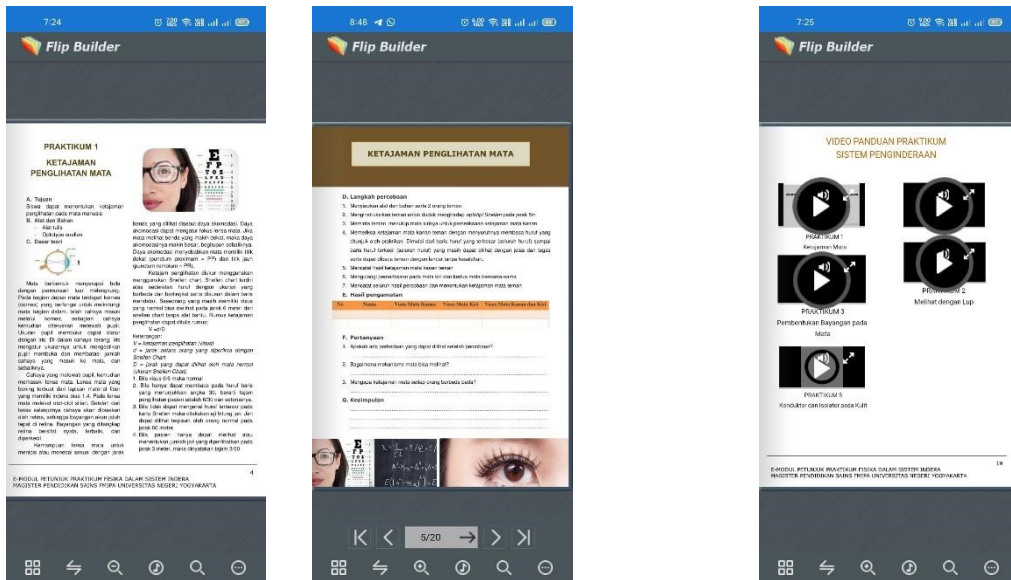

Figure 1c. Image of Topic Page in E-LKPD   **Figure 1d.** Image of E-LKPD Video Pages

On each E-LKPD display, there are several buttons. The page navigation button is used to navigate to the page you want to go to. The zoom button is used to enlarge the screen display. The sound button is used to turn on the music. The search button is used to find what you want on the E-LKPD. Then there are other buttons in the form of print which functions to print practical instructions, the share button functions to share it with someone, the auto flip button functions to automatically make the E-LKPD switch to the next page, and then select text button functions to select the desired text.

This E-LKPD has been tested for the feasibility of the material, media, and readability test. The product feasibility test consisted of media and material validation which were assessed by 4 students of the Yogyakarta State University Masters of Science Education. The average percentage gain of media and material assessment results is presented in Table 9 and Table 10.

Table 9. Table of Average Percentage of Media Rating Scores

No	Rated aspect	Average Score (%)	Assessment criteria
1	Aspects of Language Eligibility	97	Very Worthy
2	Presentation Aspect	97	Very Worthy
3	Media Effects Eligibility Aspects	94	Very Worthy
4	Display Feasibility Aspect	83	Very Worthy
	Average	94	Very Worthy

Table 10. Table of Average Percentage of Material Assessment Scores

No	Rated aspect	Average Score (%)	Assessment criteria
1	Content Feasibility Aspect	94	Very Valid
2	Aspects of Feasibility of Presentation	92	Very Valid
3	Language Eligibility Aspect	96	Very Valid
	Average	94	Very Valid

E-LKPD based on mobile learning resulted in the acquisition of the percentage of material feasibility with an average of 94% with a very valid category (Purnamasari & Rochmawati, 2015). The results of the media feasibility test resulted in an average eligibility percentage of 96% with very feasible criteria (Purnamasari & Rochmawati, 2015).

In addition, the results of the E-LKPD readability test that had been given to 24 class VIII students of MTsN 1 Blitar City produced quantitative. From the results of the readability test the percentage of feasibility obtained is 71% with good criteria. This proves that the E-LKPD product is developed and packaged attractively and supporting media such as pictures and videos can be understood clearly and easily by students so that the E-LKPD is suitable for students to use for learning. Qualitative data obtained in the form of responses, namely the application is good, can be used easily, students feel happy using this application, students are easier to understand the material, the application can motivate students to learn independently, and is very fun.

The results of measuring students' learning motivation after using the E-LKPD can be seen in Table 11.

Table 11. Table of Average Percentage of Students' Learning Motivation

No	Rated aspect	Average Score (%)
1	The drive to achieve something	89
2	Commitment	78
3	Initiative	74
4	Optimistic	86
	Average	82

From the results of the measurement of the learning motivation of students in class VIII, MTsN 8 Banyuwangi obtained 82% with very strong. The existence of students' learning motivation is supported by the presence of pictures, and videos on the E-LKPD. Based on the results of the validity and legibility test results, it is shown that the mobile learning-based E-LKPD to measure students' learning motivation on the sensing system material is very feasible to function for learning media that can affect learning motivation. This is to research that mobile learning-based E-LKPD can make students more active in learning and learning objectives can be achieved (students, 2013). This is in line with several studies that have been carried out, namely by using e-books, abstract material can be visualized in a concrete form or easier for students to understand because it is packaged in the form of sound, animation, and video (Mariya & Suyatna, 2015). E-LKPD based on mobile learning can motivate students' learning in learning (Wati et al., 2021). LKPD based on multimedia can motivate student learning (Muthoharoh et al., 2017). Multimedia-based student worksheets (LKPD) can motivate students' learning in online learning (Suharsono & Handayani, 2021). The application of E-LKPD can increase students' learning motivation (Wahyuni et al., 2021).

Conclusion

Based on the results of the product feasibility test, it can be concluded that the mobile learning-based electronic student worksheets (E-LKPD) product to measure students' learning motivation on the sensing system material is very feasible to use with an average value of 94% media and 94% material. From the results of the readability test, the product developed has an average readability test percentage of 71% with a good category. The criteria for learning motivation owned by class VIII MTsN 8 Banyuwangi students is very strong with a percentage of 82%. Therefore, mobile learning-based electronic student worksheets (E-LKPD) can be used to measure the level of students' learning motivation on sensing system material. The recommendation for future research is to be able to use the product in the classroom for learning.

Acknowledgment

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