

Developing Subject Specific Pedagogy (Ssp) Of Local Wisdom “Meriam Bambu” Physics Learning Media Assisted With Smartphones To Improved Self Regulated Learning In Senior High School

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Abstract: The purpose of this study was to describe: (1) Produces a medium of learning physics meriam bambu assisted local wisdom smartphone for the material sound waves that meet the eligibility criteria, (2) untuk instructional media portray the real object using local bamboo wisdom meriam, (3) the values of local wisdom in meriam bambu. This study is a research and development (R & D), which refers to the model 4-D model of development. Feasibility media validated by subject matter experts, media experts and practitioners. Media developed loaded onto the smartphone. Data obtained in the form of qualitative data and kauntitatif, Qualitative data referred to in order to get suggestions and comments for further improvements while quantitative data in the form of scores were used to assess the feasibility according to the criteria. Quantitative data analysis was performed using kriteria quality raw scale. Based on the analysis concluded: media expert validation earned an average of 4.20 aspect display with good category of software engineering aspects of 4.25 with very good category. Meanwhile, for the assessment of media usage aspects of the media get a mean score of 4.25 with the criteria aspect very well, and 4.24 with the criteria of the language very well.

Index Terms: .physics learning media, meriam bambu, local wisdom, Malay culture, physics material learner, smartphone, self-regulated learning

1. INTRODUCTION

Educational experience as well as the development of science and technology. in the 21 century, education is an important factor to make learners have the skills to learn and innovate, skills using the media and information technology, as well as to work together, and participate in proficiency in life (lifeskill). 21st century education has three concepts that have been adapted by the Ministry of Education and culture of the Republic of Indonesia. Three 21th century concept is the skill , scientific approach and authentic assessment[1]. The third concept is adapted to be able to Indonesia develop creative education towards the 21st Century Skills 2045 (1) learning and innovation skills, (2) Information media and technology skills, and (3) life and career skills[2]. Three such skills often called with rainbow-knowledge skills of the 21st century. It is also described in the National Education System Law No. 20 2003 Article 1 that "education is a conscious and deliberate effort to create an atmosphere of learning and the learning process so that learners actively develop her potential, people can cope with any changes that occur in life and living". One science have an important role in the face of the 21st century, and science and technology education is science. Physics is part of the science that underlies the development of Science and technology. Physics is the science which deals with the symptoms and a natural phenomenon found in everyday life to be able to using information technology in solving problems related to events encountered in life. Development science and technology in tandem with developments in science. According to [2] Material Science should be in accordance with the nature of science. Katerakteristik include science as a way of investigating (science as a way to investigate) and Science as a body of knowledge (science as collection of knowledge). Both of these characteristics according to [3] quotes Alan J. McCormack and Robert E. Yager including Taxonomy of Educational Science. 9 facts, concepts, theories, and laws, including information studied by the students and are grouped in the domain of knowing and understanding. While the science process skills, in Taxonomy Science Education included in the domain of exploring and discovering.

The teacher is a special skill that cannot be done by just anyone who does not have special competence known as the teacher's professional. A teacher is said to be a professional in his field is carrying out his task to provide opportunities so that students can learn well, thus the factors that make it possible to improve the quality of physics learning is to strengthen the teacher's pedagogy content knowledge (PCK). According to [4] defines PCK as a combination of pedagogical knowledge and content knowledge that develops over time from experience. The PCK was then implemented in the form of a subject-specific pedagogy (SSP). Shulman in [5] introduced PCK compiled not only based on knowledge of the contents of the material, but also included knowledge about teaching the material. Whereas at California State University interpret CNS is a form of knowledge and part of the thinking process of a teacher. Therefore, SSP is a dynamic product that can change according to the level of mastery of a teacher of a subject. Teachers can use technology to overcome the problems of practical activities that cannot be done with conventional laboratories and increase learning independence. Based on the results of the interview also obtained information about the causes of difficulties of students in learning physics. Based on the results of the physics teacher interviews at a number of SMA N Solok Selatan and Padang, information was obtained about the physics learning process in the classroom and some of the causes of difficulties experienced by students when learning physics. The results of observations in the field found almost every student has a smartphone. These observations are supported by the statements of [6] and [7] that the use of Android reaches approximately 2 million people. The use of smartphones in learning physics explained can provide various facilities for students in learning physics. The facilities provided, among others, enable students to have flexibility to access learning, build understanding through simulation and evaluation activities that can be done independently independently, displaying experimental activities that are virtual, so it does not require experimental activities in the laboratory [8]. Self-regulated learning skills help students achieve academic success using learning strategies. Current

developments in the education system require teachers to go beyond the classical transfer of knowledge from teacher to student and find new methods for building knowledge through learning independence [9]. Research has shown that teachers can gain the ability to implement teaching strategies and skills to promote self-regulated learning in class [9]. In line with this, states that students who have high learning independence are students with self-motivation who can use learning resources to solve problems in learning tasks [10]. With the rapid development of technology that uses mobile applications with the theme and function are combined in the form of an element of entertainment and the lifestyle of modern society with all conveniences provided. The rapid development of these applications make us forget the environment around, the interaction between an individual with the other decreases. Related with mobile applications is very often used by learners when this form of multiplayer gaming applications arena. And if you remember back before rapid smartphone use in society, children are more preoccupied with game activities containing elements of local culture contains elements of history. One example of local cultures is a game made of meriam bambu. Meriam bambu Indonesia historically in times of war Dutch struggle against the forces. The cannon used by the Dutch used to destroy Indonesia that use only soldier stakes at the time. Because the force of the struggle is not cannon as the Dutch troops, then they imitate cannon Dutch but with the use of bamboo is cut and then fired with the aid of fire. Authors interested in developing applications based smartphone that contains elements of education at the same load of local wisdom in the form of meriam bambu games and reviewing physical events that occur when a cannon detonated. This application contains physics formulas and event simulation.

2 MATERIALS AND METHODS

2.1 Local Wisdom Meriam Bambu

Indonesian Education is a national education, so that in the process of education must meet the criteria as well as cultured educated men. The criteria to be met in the national education [12] is a) national education practitioners must develop the intellectual potential of human beings; b) National Education was instrumental in developing the specific potential of individuals in accordance with the potential of his personality; c) National education should develop politeness in society; d) Develop human moral Indonesia in behavior, which is sourced from the national culture as well as faith and piety; e) Practical education in all types and levels of education need to develop a sense of Indonesian nationhood, a sense of Indonesian nationality. Various types of local wisdom that has been described above is the potential development of local wisdom-based education. Therefore, the education necessary to design, and determine the most suitable development model for dissemination of local knowledge [13]. Education based on local wisdom will teach students to always attached to a concrete situation they are facing. Such situations are associated with cultures that exist in the region [14], so the problem will happen next future (waning culture) will be resolved. One type of local wisdom that can be applied in relation to the physics of material is meriam bambu game. The game itself is played when a meriam bambu welcome holidays like Eid, Eid al-Adha, the Prophet's birthday, and etc. Meriam bambu formerly used by soldiers This independence fighters Indonesia as a tool to scare the invaders because the sound

of a very loud meriam bambu as well as a cannon made gunpowder. Aspects studied physics at meriam bambu namely temperature and heat. The process of meriam bambu explosion comes from the evaporation of petroleum that is in the meriam bambu mixed with oxygen and refined by fire, after an explosion it will be a lot of smoke inside the cannon formed thereby reducing the volume of oil. Meriam bambu contain values - noble values in the realm of Malay culture which is very useful for the community. Some noble values contained in meriam bambu games, among others; (1) Meaning the big day. Meriam bambu game is done as a way to welcome the big days, such as Ramadan, holidays, religious holidays, or custom big day, (3) The realization of gratitude and joy. As an expression of gratitude and expressions of joy on the struggles and successes obtained, for example, as an expression of gratitude have been successful fasting during Ramadan. (4) Preserving tradition. Meriam bambu game is one of many owned by the rich tradition of Malay society so desperately need to be preserved from extinction eroded by the times. (5) Train creativity. Meriam bambu is not a game that can be bought easily as most modern games that exist today. To be able to play a meriam bambu had to make his own. The process of making meriam bambu that is the person's creative process. (5) Train courage. Playing a meriam bambu does contain the risk of harm, but if it remains cautious and always be vigilant in play, it can train one's courage. [15], [16] generally defines culture as part of the knowledge, skills, experience, attitudes and beliefs such as artifacts goods produced by humans and transmission from one generation to the next. Culture is the human intellectual, social, technological, political, economic, moral, beliefs and aesthetic appreciation. [17] culture is an expression of human life. Culture can be considered in terms of the traditional humanities and social sciences. The local culture as local wisdom. Local culture is obtained based on the experience in life. Pengalalam in the form of knowledge [18]. Local knowledge can be found in various archipelago [19]. Local wisdom as a way of life and knowledge and strategies of life in the form of activities with local communities as actors in responding to various problems for their Kebutuhan invention. Local knowledge as a natural resource in the form of the creation of art, culture, human resources which is characteristic of an area [20]. [21], [22], [23] argue local knowledge is hereditary in the oldest indigenous people of the next generation.

2.2 Learning media meriam bambu physics-based smartphone

The workings of meriam bambu 1) At the time of kerosene in the cannon gets hot then the oil will be volatile; 2) When the kerosene vapor mixes with oxygen will cause an explosion if ignited a fire; 3) After the explosion it will be a lot of smoke inside the cannon formed thereby reducing the volume of the oil vapor can be formed. Therefore the trigger must have blown a hole to remove smoke from the cannon so much space available for occupancy kerosene vapor, Explosion on meriam bambu emit vibrations in meriam bambu tube. Sound waves are one example of wave mechanics. Namely mechanical waves propagating waves require an intermediary agent (intermediary medium). Sound waves are mechanical waves in the form of longitudinal waves, the waves that rambatannya direction parallel to the direction of vibration. The human ear is very sensitive to sound waves to within the limits

of a certain intensity. A sound wave can be received by the human ear depends on the frequency, amplitude and waveform. Android is a mobile operating system is open source which is supported by the Google Corporation; engines [24], and based on linux kernel that provides an open platform to create their own applications for development [25]. The platform supports a number of interface technologies including GSM / EDGE, CDMA, EV-DO, UMTS, Bluetooth, and Wi-Fi (Herman, 2011: 1-2). Features available on android among others, are as follows [26]. a) Dalvik virtual machine: optimized virtual car devices; .b) Supporting media: audio, video, and various image formats (MPEG4, H.264, MP3, AAC, AMR, JPG, PNG, GIF); c) Cameras, Global Position System (GPS), compass, and accelerometer (hardware dependent); d) Framework application: allows users danpemindahan of the available components; e) SQLite: for data storage; f) a rich development environment, including emulator, debugging tools, and a plugin for the Eclipse IDE; g) Graphics: 2D and 3D graphics based on the OpenGL library; h) GSM, Bluetooth, EDGE, 3G, and WiFi (hardware dependent). Smartphone has advantages in software section by just using a simple computer code can be distributed directly open or open source. It makes users have the freedom to be able to build their own applications. Smartphone is also based on the native Google applications in which the integrated applications like Google Calendar, push email, Google Play, Gmail, and Google Maps. Smartphone berbantuan learning media is media that can ddigunakan with mobile devices (smartphones / tablets) with the android operating system that can be used in mobile. This allows the operating system to do independent learning outside of schools [27], or in other words supporting the learning process of students without being tied to a place and time [28]. With the smartphone's media assisted learning outside of school learning is done well. With the android-based learning media can improve the utilization of the mobile device or tablet as a medium of learning for learners [29]. Excess smartphone as a learning medium than can be used whenever and wherever without being bound to time and space, the operating system in the smartphone also is open source, meaning developers are free to create a new application in it besides the developed applications can also be distributed via Google Play which is the market official android.

2.3 Method

This research into the types of Research and Development, and the model of development of the 4-D. 4-D model of the development consists of four stages, ie define, design, develop and disseminate (Thiagaraja, Semmel, and Semmei, 1974: 6-9). Research and development is the process of development and validation of educational products [30]. Several research stages, namely a preliminary investigation to determine the problems being faced in the world of education, gathering information to find solutions to existing problems, product design, product validation is done by media experts, subject matter experts, and peers. Simply put, the cronology flow diagram of the development phase of WEAK can be in figure 1.

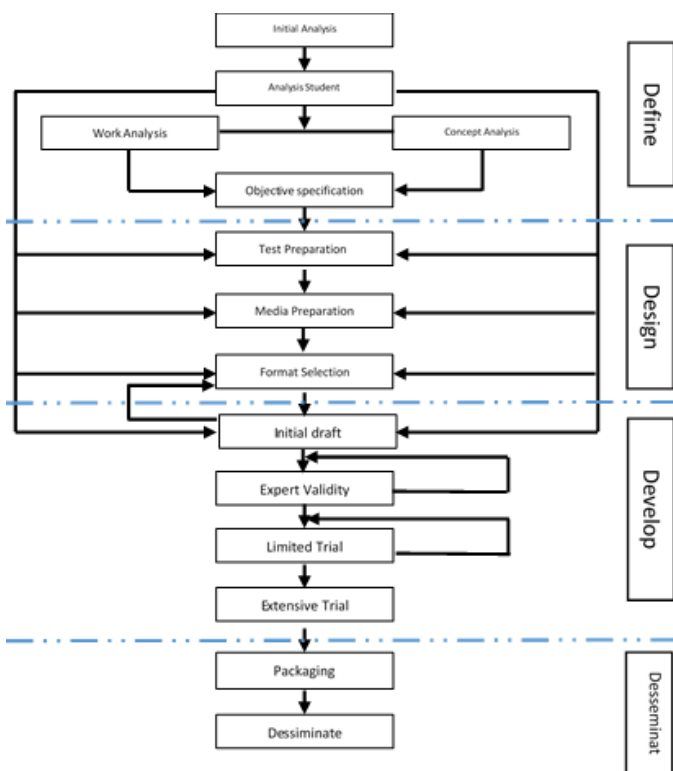


Figure 1. Diagram of procedure Develop Model

Product trials in this study consisted of limited trials and extensive trials. The aim is to find out the product readability, the feasibility and effectiveness of the products that have been developed in increasing students' independence and students' problem solving abilities. Extensive testing was carried out at class XI SMAN 3 Solok Selatan using 3 classes. In extensive trials, the product developed was tested using the Quasy experimental method, with the Pre-test Post-test Control Group Design. The research design is shown in Table 1.

Table 1. Research Design

No	Treatment	Y ₁	
		Pre-test	Post-test
1	X ₁	O ₁	O ₂
2	X ₂	O ₁	O ₂
3	X ₃	O ₁	O ₂

Trial is limited to the user, then the revision of products according to suggestions and ideas from the experts. Instrument data collection using questionnaires were analyzed using a Likert scale of 1-5.

The data that will be generated from testing the feasibility of this form of quantitative data with a score of 0 and 1. Before performing analysis using the equation Aiken's, the data obtained should be analyzed first. The steps are as follows:

- a. Averaging the scores of each item items for all aspects of product assessment that the overall total score divided by the total votes aspect of the assessment carried out, using the following equation:

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

\bar{X} : The average score

$\sum X$: Total score

n : Total Assessor

- b. Comparing the value of the average score of quality criteria listed in Table 2 below:

Table 2. Conversion Interval Average Quality Criteria Questionnaire

No.	Score Range (i)	Category Quality	Index
1	$\bar{X} \geq X_i + 1,8 S_{bi}$	Very good	5
2	$X_i + 0,6S_{bi} < \bar{X} \leq X_i + 1,8S_{bi}$	Well	4
3	$X_i - 0,6S_{bi} < \bar{X} \leq X_i + 0,6S_{bi}$	Pretty good	3
4	$X_i - 1,8S_{bi} < \bar{X} \leq X_i - 0,6S_{bi}$	Less	2
5	$\bar{X} \leq X_i - 1,8 S_{bi}$	Very less	1

Information :

\bar{X} : Average score

X_i : Average score of the ideal

$X_i = \frac{1}{2} (skor\ tertinggi + skor\ terendah)$

S_{bi} : ideal standard deviation score

3 RESULT

Feasibility assessment questionnaire given to subject matter experts and practitioners and peers. Data obtained in the form of quantitative and qualitative data. Qualitative data referred to in order to get suggestions and comments for further improvements while quantitative data in the form of a score that is used to look at the feasibility in accordance with established criteria. Assessment conducted by subject matter experts, practitioners and peer based learning and material aspects. Ratings were analyzed in accordance with the lattice material expert validation questionnaire which can be seen in Table 3.

Table 3. Lattice matter expert validation questionnaire

No.	Aspect	sub Aspects	Indicator
1.	Theory	the suitability of the material	The material in accordance with KI
			The material in accordance with KD
			The material according to the indicators of learning
			Principle / law of physics contained in the material is
		completeness of the materials	The material is presented using the appropriate facts
			Facts presented contextually
		Examples of appropriate material	

		The use of equations, symbols and units	matter
			Clarity summary of the material
			Writing the equation is true
			Writing unit correctly
			Use of the correct symbol
2.	Language	Compliance with the rules of Indonesian	Use of the correct unit
			Using the standard
			Use the correct sentence structure
			Using sentences that are easy to understand
			Using a phrase that does not cause a double meaning
3.	presentation material	Systematic presentation	Concepts are presented in a coherent
			The illustrations are presented in accordance with the material
			The material is presented in an interactive
			The material is presented in the form of multimedia

Results matter experts feasibility aspects of the media get a lot of revision. In general the comments of experts, namely less material touches the side of the meriam bambu which should be the main topics according to the title. For more details can be found in the appendix. Based on a review conducted several revisions of the three assessment of the material can be seen as follows: (1) Adjust the placement of the material with KD and learning objectives, (2) adding a summary of the material, (3) Fix the mistake of writing units and symbols. (3) Fix the illustration material.

Analysis of results of votes on media android media pembelajaran local wisdom meriam bambu can be presented in Table 4 in detail in the Appendix.

Table 4. Conversion Assessment Score Media by Media Experts

Aspect	The score	Category
Display		
identity media	4.19	Well
Text	4.18	Well
layout	4.26	Very good
Images, animation, and video	4.18	Well
Software Engineering		
Installation and performance	4.32	Very good
Creativity and innovation	4.19	Well
keseluruhan	4.20	Well

Based on Table 4 it can be seen that the layout and installation aspects of performance with excellent category and is rerato highest score. This is because in terms of icons used easy to understand, attract, and the composition of the colors used in accordance with the background. Learning media is easy to operate and does not use a large memory and ram for mengoprasikannya. Aspects of text and images, animation and video 4.18 with either category have an average low score because there are suggestions and improvements. The advice obtained are too small typeface is too small and required image zoom menu Based on the assessment of media experts, practitioners and peers it can be said that the application MerBam fit for use with minimal revision. Media that has been revised in accordance with the advice and

comments ready for use in the test phase.

4. DISCUSSIONS

Media smartphone is one of the final product development results are used to improve independent learning and problem solving ability of students. This product has gone through several stages of assessment one of which is a product feasibility assessment by experts, practitioners and peers, the assessment results indicate that the medium unfit for use. Media smartphones based on local wisdom bamboo merima the teaching materials created in the application form which is multimedia. The main menu contains a developer profile, guidance, competence and material. On the menu guide contains a description of each button that is used. Menu competence contains KI, KD and indicators of achievement used. The menu contains sub-sub material that is introductory material on meriam bambu, rapid propagation material, the material properties of sound waves, the frequency and amplitude of the material, the material sound intensity, Doppler effects and encapsulation materials. In each sub material contains material that is integrated with a meriam bambu, animations, simulations and video. In the summary section contains a summary of the material sound waves. As demonstrated in this document, the numbering for sections upper case Arabic numerals, then upper case Arabic numerals, separated by periods. Initial paragraphs after the section title are not indented. Only the initial, introductory paragraph has a drop cap.

5. CONCLUSIONS

Media smartphone is one of the final product development results are used to improve independent learning and problem solving ability of students. This product has gone through several stages of assessment one of which is a product feasibility assessment by experts, practitioners and peers, the assessment results indicate that the medium unfit for use. Media smartphones based on local wisdom bamboo merima the teaching materials created in the application form which is multimedia. The main menu contains a developer profile, guidance, competence and material. On the menu guide contains a description of each button that is used. Menu competence contains KI, KD and indicators of achievement used. The menu contains sub-sub material that is introductory material on meriam bambu, rapid propagation material, the material properties of sound waves, the frequency and amplitude of the material, the material sound intensity, Doppler effects and encapsulation materials. In each sub material contains material that is integrated with a meriam bambu, animations, simulations and video. In the summary section contains a summary of the material sound waves.

- a. Results of the assessment by the media of material aspects dipeoleh average of 4.25 which are in both categories in accordance with all aspects assessed.
- b. Results of the assessment by the media from the media aspect dipeoleh average of 4.34 which are in both categories in accordance with all aspects assessed.

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