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The Development of Interactive Physics E-Book in Rigid Body Equilibrium and Rotational Dynamics

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Abstract:*Book one of teaching resources is commonly used in the learning process. The development of Information and Technology, presents the book as an e-book. This research Aimed to produce an interactive e-book of physics. Based on the assessment of characteristics of Senior High School physics lesson and related references of rigid body equilibrium and dynamics of rotation, had been found requiring additional visualization concepts several Compared to common pictures. Moreover, the e-book's pictures display accompanied by relevant definitions did not make the students understand the concepteasily. The multimedia integration, for instance, audio, video and animation can be applied to create more apparent object visualization accentuating the e-book's interactive view. This study is research and development with Borg and Gall models are limited to the stage to 4. The result of validity test run by media and material experts and practitioners, described decently that the product is applied as teaching material in physics. The test was also conducted on 18 students who give good criteria against e-book developed interactive physics.*

Keywords:*Interactive, E-Book of Physics, Rigid Body Equilibrium and Rotational Dynamics.*

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I. Introduction

Along with the development of Computer Information Technology (ICT) for the visualization of concepts in physics subject matter has been done with the addition of a picture such as we find in textbooks or by moving objects (animation) displayed on the computer. The use of computers not only helps to show the animation but also used as a medium serving of teaching materials such as books, known as e-book (electronic book). Prefix e- electronics implicit meaning is interpreted based on the digital electronics technology [1]. Understanding e-book literally been widely defined, namely e-books as part of a print book that can be displayed on the desktop computer, laptop, smartphone, tablet or e-book reader [2]. The Ministry of Education has provided an e-book with the name of Electronic School Books (BSE) for each subject can be downloaded / download on the Internet or in print can be obtained at a very affordable price. E-books are downloaded are available in PDF (Portable Document Format) and this type is the most widely used by teachers and learners as teaching materials.

Ease obtained from the e-book in this format does not make it so optimal when applied in learning. The design is identical to the printed book ordinary coupled with the format of electronic cause learners to experience eyestrain significantly [3], dry eye, discomfort ocular, headaches and other visual symptoms [4] so that users tend to read quickly or just looking for points certain -points. This situation resulted in the learning message be passed or are learning concepts that are not delivered in full. The solution to this problem can be overcome by developing an e-book. Their fundamental errors on the final result about the completion of the rotational dynamics mastery of the material concept [5]. Misconceptions level students on the material the rotational dynamics of 58.7% [6].

Later this e-book has been made more interactive by adding some features such as audio, video, slideshows and photo gallery [9]. Interaction in computer media can be raised with the presentation of practices and drills, game tutorials, simulations, discovery, and problem solving [7]. Interactive format contains audio, image, and video as well as the availability of multimedia links that can be used manually by the user [8]. Some of the variables contained in the interactive electronic book as a variety of images, diagrams, symbol, sign, shape and videos as well as the equipment support thinking skills [9].

Components in textbooks as the title, the basic competence or subject matter, information support, training and assessment contained in the e-book is interactive. Further steps e-book compilation interactive physics namely: (1) The title is derived from the basic competence or subject matter in accordance with the size of the material; (2) Directive clearly written learning so that learners easy to use; (3) Supporting information is explained in clear, concise, and engaging in written form or still images and moving images; (4) The tasks

written in the interactive program; (5) can be carried on the work of the task that is granted at the end of learning, which can be viewed by learners via computer; and (6) Using a variety of learning resources that enrich the material, such as books, magazines, the Internet,

The development of e-book with multimedia integration shows that e-book effectively to improve learning outcomes learners physics [10]; [11]. There are significant differences in learning outcomes between the groups learn to use e-book and group learning with traditional print book [12]. In addition, there are benefits to readers using an e-book which can increase the motivation to read for new readers [13] and increase understanding and interest in reading in children [14]. The use of technology in e-book reads like this also makes it easy for parents and teachers to provide a learning experience that is efficient and pleasant [15].

II. Method

The collection of information is done through the study of literature andused related observation of teaching materials that show that the teaching materials in schools is still dominated by Physics Lesson Package Books, School Books Electronics (BSE) that are downloaded from the internet and also the availability of learning facilities such as LCD projectors and computer labs are rarely functioned. Planning is based on studies related literature required hardware (hardware) that is PC / Laptop and software (software) that Adobe Professional CS 5. This device is needed to design interactive e-book physics because electronic books are digital versions of traditional print books to read on a personal computer or on an e-book reader is software for use on a standard-sized computers [16].

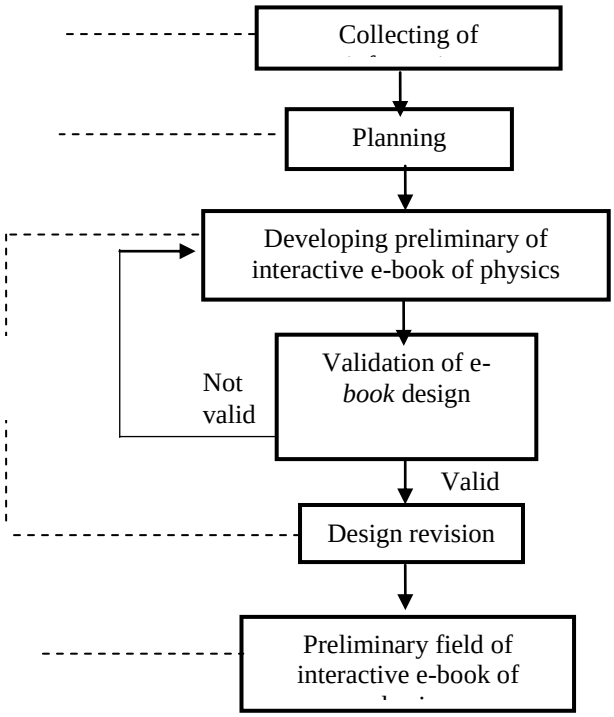

Fig.1: Research Procedure

The next stage of designing products through the determination of the flow of teaching materials, design of flow charts, Story Writing Board, Collection of graphic material, material collection and Programming animations using professional flash CS 5 with action script 3. After programming the application so through further resistant design validation by circulating a questionnaire on a team of experts (4 experts media, 4 subject matter experts) and 2 practitioners who are competent in the field of physics education and learning multimedia. Based on the results of this validation is done on the advice of the design revision obtained. The products have been revised subsequently entered a stage of initial field trials at 18 learners by providing a questionnaire response to the product.

III. Result and Discussion

The results of product design development can be seen in Table 1. Products e-book interactive physics design results are then validated by a team of experts and practitioners. Assessment scores in subsequent validation questionnaire was percentage to obtain final assessment criteria for each expert. The results of the validation test can be seen in Table Results Validation.

TABLE 1: Product Profile Interactive e-book of physics

No.	Type Design	Result
1.	Product Name	*E-book* Interactive physics
2.	*Extensions*	*.exe*
3.	Material Content	Equilibrium of rigid bodies and rotational dynamics
4.	Media Content	Videos, animations, audio
5.	Learning Activity	Finding the facts, make provisional estimates, looking for information to learn, create answers to the problems, exercises

AM-1 to AM-4 is the code for the validator matter experts who provide an assessment of the quality aspect is, methods of presentation and language in e-book interactive physics. The average percentage of matter expert assessment by 78% with both criteria. Likewise with media experts (code validator AD-1 to AD-4) assessment of media design that consists of a language, illustrations, completeness, display and audio-visual software. Values obtained for all validator were presented so that the average percentage to 77% with both criteria. In addition to a team of experts, validation is also done by practitioners that high school physics teacher. Practitioners amount to twice the code validator PT-1 and PT-2) provide an assessment of the quality aspect / contents, methods, language, illustrations, completeness, and display.

TABLE 2: Results of Validation

code Validator	The total score per aspect								Total	%	% Average	Criteria
	Contents	Method	Language	Illustration	Completeness	Display	Software	Audio Visual				
AM-1	64	17	21						102	85%	78%	Good
AM-2	61	15	19						95	79%		
AM-3	61	15	20						96	80%		
AM-4	53	13	17						83	69%		
AD-1			22	9	9	9	17	18	84	88%	77%	Good
AD-2			20	7	8	8	16	14	73	77%		
AD-3			19	7	7	7	15	17	72	76%		
AD-4			19	6	7	6	14	13	65	68%		
PT-1	27	16	17	8	10	8			86	86%	82%	Good
PT-2	25	18	16	5	6	7			77	77%		

The average percentage of media experts (Figure 2) show good criteria, this is because the addition of interactive side with their visualization in the form of text, images, audio, video and animation is easier to remember and captured by the learners and learning message delivered will be felt real because it service that by naked eye and stimulate the senses that exist in the human body [17]. In addition, excess addition of interactive features such as animation in e-book can make child what the author would expect in more detail [18].

The validation results show that the design of interactive e-book physics fit for use as a teaching material in the material balance of learning physics and dynamics of rigid body rotation. Advice given validator be material to repair the product (design revision phase).Products e-book interactive physics that has been through the validation and subsequent revision through the stages of initial field testing / trials are limited. Students of XI MS 1 class in SMAN 1 Kediri is the subject in this trial. Students learn the material balance and dynamics of rigid body rotation by using interactive e-book physics as the main teaching materials. After learning students were given a questionnaire to determine their response to the e-book interactive physics. The results of this trial can be seen in the Table 3.

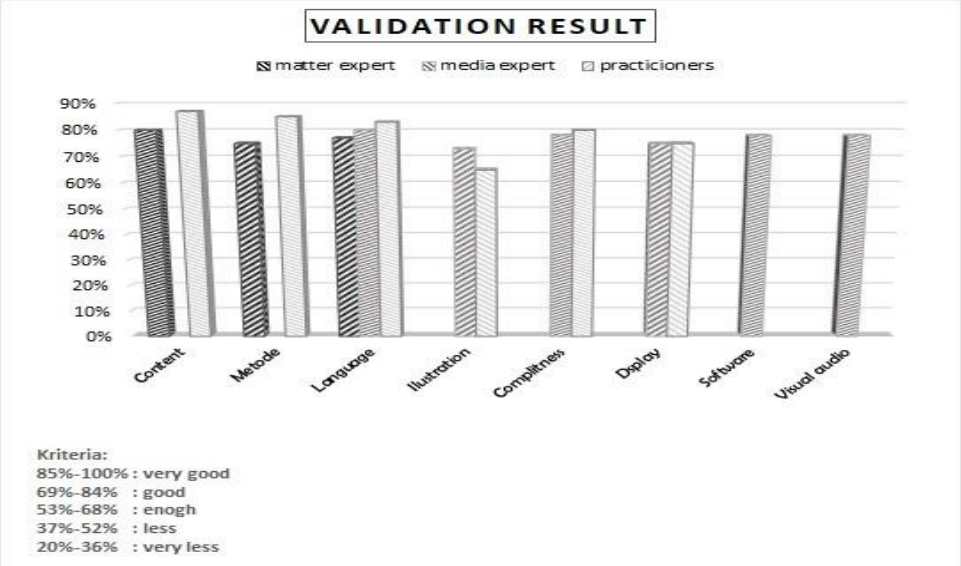

Fig 2: The Result of Validation

TABLE 3: The Results of The Initial Field Trials

No.	Statement	type Statement	answer		Total
			Yes	No	
1	Installation instructions and usage guidelines physics program interactive e-book is clear and easy to understand	Positive	17	1	17
2	I find it difficult to operate the e-book interactive physics	Negative	3	15	15
3	The navigation key is easy to use and consistent location	Positive	15	3	15
4	I could clearly read the text / article contained in the e-book interactive physics	Positive	18	0	18
5	The language used in interactive digital book is easy to understand	Positive	16	2	16
6	Quality image display in an interactive digital book interesting and clear	Positive	16	2	16
7	The animation was presented clear and easy to administer.	Positive	16	2	16
8	Packaging exercises contained in the e-book interactive physics boring	Negative	6	13	13
9	Back sound / music used disturb my concentration while reading material	Negative	2	16	16
10	Overall view interactive digital book still has some shortcomings that need to be refined	Negative	14	4	4
Total score					146
Average		14.6			
Percentage		81%			
Criteria		Very good			

Score 1 is given to answer yes and 0 for no answer at a positive statement. While the negative statement is assigned a score of 0 for answers yes and 1 for an answer. The average percentage of 81% is obtained with very good criteria. These results indicate that the e-book worthy of being interactive physics teaching material in the material balance and dynamics of rigid body rotation. This feasibility given students for e-book designed interactive reduce the level of saturation in the use of teaching materials. This result is supported by the finding that the interactive system is proven to facilitate deep learning for actively involve students in the learning process [19].

IV. Conclusion

Based on the result and discussion, the result of validity test run by media and material experts and practitioners, described decently that the interactive e-book of physics is applied as teaching material in physics. The test was also conducted students give very good criteria against e-book developed interactive physics.

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