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Physical module based on Higher Order Thinking Skill (HOTS) using 3D pageflip professional

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Abstract. This study aims to develop a HOTS-based physics module using a professional 3D pageflip, knowing the opinions of experts on the feasibility of HOTS-based modules by using 3D pageflip professionals and to find out the responses of educators and students to HOTS physics modules. The results of this study are: HOTS-based physics modules using professional 3D pageflip that have been developed can be used at the SMA/MA level as teaching material. The final product that has been produced in the development of HOTS-based physics modules using 3D pageflip professionals has met very good criteria. Product exploration in HOTS-based physics modules uses for students in small group trials and field trials with very interesting criteria. With product trial response to educators against HOTS-based physics modules using 3D pageflip professionals with very good criteria. Based on these results, it can be obtained that teaching materials in the form of HOTS based physics modules are good and interesting to be used as physics teaching materials.

I. Introduction

The development of science and technology (science and technology) on the process of learning activities bully the development of learning resources and learning media [1]. Lately there has been the latest trend regarding Information Technology-based teaching materials, so physics learning also took part in the development.[2]. This is because technology-based teaching materials are able to help the learning process of physics become more effective and can improve understanding for students. [3]. Students in the present era have been carried away by increasingly advanced technology, thus for the teaching and learning process the use of technology is needed as a support for learning by educators and students[4].

One interesting teaching material that can be used by students is the module. Modules can be divided into two groups: modules in the form of print and modules in the form of digital. Modules in the form of digital have the advantage of being able to explain the material with the medium of an interactive learning process [5].

Life skills are used in dealing with problems in the 21st century era which are very complete so that they can find a solution to the problem. Skills in solving these problems are related to students' thinking skills, namely high-level thinking skills or higher order thinking skills (HOTS) [6]. Higher Order Thinking Skill (HOTS) is to familiarize students in the analysis, evaluation, and creation based on educational needs by always adhering to the existing content standards and competency standards of graduates [7]. Based on the pre-research results with educators in the three high school / MA schools in the south of Natar, it shows that educators have not used teaching materials by emphasizing the HOTS context and adequate facilities have not been used optimally for independent learning or



class. So based on the results of the pre-study it can be seen that the learning process and available teaching materials are still lacking in developing HOTS abilities of students.

Based on the pre-research results by distributing questionnaires in the form of HOTS test instruments to students in three schools, namely Natar 1 High School, Swadhipa Natar High School and Yadika Natar High School at the SMA / MA level showed that students had very low HOTS abilities with a percentage of 70, 97%, 83.87% and 73.09%.

Therefore, educators are required to be able to present an interesting material so that they can motivate students in learning. One application of the use of information and communication technology in the learning process is a digital module because this module has an attractive design so students can easily understand and be easy to use[14]. The digital module itself is a teaching material that can be combined into a single unit between printed technology teaching materials and computer technology and developed with interesting offerings that can increase the learning spirit of students [8].

Multimedia is one of the supporting factors for effectiveness and efficiency in learning. The digital modules developed are designed attractively by combining images, videos, and animations that aim to foster students' learning motivation, and the material and questions contained in digital modules can train students' high-level thinking skills which include analyzing, evaluating, and create. The application used to develop this high-thinking digital-based module is 3D Pageflip Professional [9].

Professional 3D Pageflip is a software that is used to create teaching materials with 3D effects and has complete navigation, so that the effects of reversing modules and digital e-books will feel more real. This is because there are various features including images, animations, videos, flash. Audio, and the display of three-dimensional books presented are able to arouse students' enthusiasm, making it easy to practice high-level thinking skills of students [10]. Learning to use multimedia is at least unique and flexible for the location and time for students who use it.

Referring to the previous research that Pageflip Professional 3D-based learning media with product results with very good categories and the results of the response with very good categories [11]. The difference between this research is using physics modules compiled based on HOTS for high school / MA level.

2. Research Method

The purpose of this study is to develop HOTS-based modules by using 3D Pageflip Professional, Knowing the opinions of experts on the feasibility of HOTS-based modules by using 3D Pageflip Professional, Knowing the response of educators and learners to HOTS-based modules using 3D Pageflip Professional. The design of this development uses a design and approach Research and Development (R&D). This study uses a 4-D research and development model developed by S.Thagarajan, Dorothy S Semmel, and Melvyn I Semmel which consists of four main stages, namely: define, design, development, and dissemination [12]. This study is only limited to the stage of develop (validation and revision of the module) because in this study it does not aim to determine the effectiveness of the product being developed. The first stage is define, at this stage, the front end analysis is carried out to find out the existing problems and the needs of students, analysis of students to know the students' initial knowledge through questionnaire test instruments, task analysis to formulate the material to be developed, concept analysis to identify the main concepts will be developed based on KI and KD and analysis of learning objectives based on the 2013 Curriculum syllabus. The second stage is design, after conducting preliminary research, the next activity is to design a physics module based on Higher Order Thinking Skill (HOTS) using 3D Professional Pageflip on Business and Energy material. At the design stage, it is by choosing the format and design that will be the initial product at this stage of development. The last stage is develop, during the development stage, product validation was carried out to material experts, media experts and religious experts. After being validated, the next step is to revise the product according to the suggestion given. Furthermore, after being revised, test the product to educators and students using an instrument questioner. Research data is accumulated using expert validation sheets, educator response sheets, and

student response sheets and analyzed with a likert scale[13]. Validation of material experts, media experts, religious experts using validation sheets and responses to modules using questionnaires to educators. The questionnaire in this study was analyzed using a likert scale, is presented in table form[14].

Table 1. Rules for Granting Scores

Category	Score
Very Good	5
Good	4
Deficient	3
Not Good	2
Very Not Good	1

To interpret the percentage of feasibility scale criteria as a result of the validation of media experts, material experts and religious experts, the assessment criteria used are presented in table form.

Table 2. Scale eligibility criteria

Eligibility Scores (%)	Assessment Criteria
$0 \leq x \leq 20$	Very not Good
$21 \leq x \leq 40$	Not Good
$41 \leq x \leq 60$	Deficient
$61 \leq x \leq 80$	Good
$81 \leq x \leq 100$	Very Good

To interpret the percentage of students' responses, the assessment criteria are presented in table form.

Table 3. Scale satisfaction criteria

Satisfaction Scores (%)	Assessment criteria
$0 \leq x \leq 20$	Very dissatisfied
$21 \leq x \leq 40$	Not satisfied
$41 \leq x \leq 60$	Less satisfied
$61 \leq x \leq 80$	Satisfied
$81 \leq x \leq 100$	Very satisfied

3. Results and Discussion

Based on a series of development steps that have been carried out, the product of research and development is produced in the form of a HOTS-based physics module using 3D Pageflip Professional. The results and discussion of this product research are as follows:

3.1 Define

The initial activity before developing a physics module based on Higher Order Thinking Skill (HOTS) using 3D Pageflip Professionals is a define, there are several main steps to conducting preliminary research, as follows :Front end analysis, Based on the results of interviews conducted in three schools, educators stated that students have less interest in the physics learning process because the presentation of material uses only teaching materials that are too thick like printed books and have not used the media to the maximum that makes students have less interest in the process of learning physics and have not emphasized the Higher Order Thinking Skill (HOTS) in the learning process so that it can cause learning processes that are less than optimal in training HOTS. Analysis study, based on questionnaires in the form of HOTS ability test instruments for students, it was found that students had very low HOTS abilities. This underlies the need for the development of modules based on HOTS as teaching materials and by using a 3d Pageflip Professional to inspire students to learn so that it is easy to train HOTS students. The analysis of the tasks carried out is analyzing Basic Competence (KD) and then describing the Indicators of Competency Achievement. Task analysis must be easily understood by students so that students can achieve minimal competence. based on the description of the results of the analysis of the tasks needed in the learning process based on Basic Competence. The analysis of the concepts that have been carried out is to recognize the important and main components that will be studied is done is to identify the important and first parts to be studied and then arranged in a systematic and relevant manner in the module based on front end analysis, namely usage instructions, prerequisites, Competencies Basic, Core Competence and success criteria for physics learning modules designed and designed to train HOTS. Analysis of learning objectives is summarizing the results of task analysis and concept analysis to find out the physics learning objectives.

3.2 Design

After the next preliminary stage, namely the design stage. There are several kinds of stages that are carried out in the design stage in developing this module. Media selection is done by mapping material according to the right media based on components graphic, text, sound, video and animation. The next step is to select the format and determine the format or type of media being developed is learning multimedia. In addition, a description of the initial multimedia learning design was carried out.

3.3 Develop

After carrying out the preliminary research stage then the design stage has been carried out and the researcher is carrying out the development stage. At the development stage the researcher conducted a media feasibility test by means of validation.

3.3.1 Description of Media Expert Validation

After the product has been designed, the next step is validated. product validation is done after making the initial product. Validation was carried out by experts, consisting of media experts, material experts, and religious expert. HOTS-based module product validation uses a professional 3d pageflip with 4 assessment indicators.to find out the feasibility of HOTS-based modules using the professional 3d pageflip developed are present in table form

Table 4. Description of Media Expert Validation

Assessment Indicator	Percentage (%)	Category
Module Cover Design	92,5	Very Good
Module Content Design	86,67	Very Good
module software design	95,00	Very Good
ease of use	100	Very Good
Average	92,29	Very Good

According to the table above actually shows that the overall assesment indicators of media expert validation are categorized as very good criteria.

3.3.2 Results of Material Expert Validation

Validation of HOTS-based module products uses a professional 3d pageflip with 5 assessment indicators, namely quality of content, provision of coverage, language feasibility, Implementation, and HOTS contained in the module. The purpose of this material validation is to determine the feasibility of the material developed in HOTS-based physics modules using a 3D pageflip professional are present in table form.

Table 5. Description of Material Expert Validation

Assessment Indicator	Percentage (%)	Category
Content Quality	98,33	Very Good
Provision of coverage	100	Very Good
language feasibility	100	Very Good
Implementation	100	Very Good
HOTS	100	Very Good
Average	99,67	Very Good

According to the table shows that the overall assessment indicators are categorized as very good criteria.

3.3.3 Results of Validation of Religious Experts

Religious validation in HOTS-based modules uses a professional 3d pageflip with 2 assessment indicators, namely the quality of Islam and the scope of coverage contained in the module. The purpose of this religious validation is to find out the feasibility of verses associated with business material and energy in HOTS-based physics modules using a 1 3d pageflip professional.

Table 6. Description of Religious Experts Validation

Assessment Indicator	Percentage (%)	Category
Quality of Islam	100	Very Good
Coverage determination	95	Very Good
Average	97,5	Very Good

The results of religius expert validation that the number of percentages of religious validation on the assessment indicators for coverage of 95% with very good criteria.

3.3.4 Product Trial

Products that have gone through the stages of validation of media experts, material experts, and religious experts and have been revised according to suggestions by validators of media experts, material experts and religious experts, the next step is for researchers to test students and educators who aim to test the effectiveness of products that have been developed. Field trials were conducted with 86 students from all three classes, namely 1 Natar Public High School, Yadika Natar High School, and Swadhipa Natar High School, in this trial each student was given a questionnaire consisting of several assessment indicators, namely interest, material and language. This trial aims to be a benchmark to find out more about the response of students.

Table 7. Description of Students Responses

Assessment Indicator	Percentage (%)	Category
Interesting	86	Very satisfactory
Material	85	Very satisfactory
Language	86	Very satisfactory
Average	86	Very satisfactory

After conducting trials on small groups and field trials, the next step is educator trials conducted on 3 class educators from the three schools, in this trial the educators were each given a questionnaire consisting of several assessment indicators, namely the quality of the content, language, module contents, HOTS with material and display modules. This educator trial was conducted to strengthen data and to know product attractiveness widely.

Table 8. Description of Educators responses

Assessment Indicators	Percentage (%)	Category
Content Quality	80	Very Good
Linguistics	90	Very Good
Fill in the Module	85	Very Good
HOTS with Material	92	Very Good
Display in Modules	92	Very Good
Average	88	Very Good

Presentation of the results of this development to answer the problem statement. The data presented are based on the development process, the results of validation and the results of product trials. module development through the validation stage of media experts, material experts and religious experts. Assessment of media experts in the table, from the data from the validation of media experts each assessment indicator gets very good criteria. This can be seen from the assessment of each assessment indicator obtaining a percentage above 80%, namely by percentage an average of 92.29%. So that the HOTS-based physics module using professional 3d pageflip is stated to be very good.

Excellent criteria are seen from the module cover design assessment indicators that are in accordance with the module layout, the suitability of the contents with the module display, the color of the contract module title with the background, proportional font size of the module title. Design assessment indicators for module contents that are in accordance with the illustrations of module content, consistent in the layout of the module contents, typography of module contents, and complete layout elements. Assessment indicators for module software design, compatibility of material presentation in 3D interactive learning multimedia Professional Pageflip based on Higher Order

Thinking Skill (HOTS) and ease of use according to the presentation of modules using 3D Pageflip Professional easy to use.

Evaluation of material experts on the table, from the data from the material expert validation, each assessment indicator gets very good criteria, with an average percentage of 99.67%. So that the HOTS-based physics module using professional 3d pageflip is stated to be very good. Criticism is very good seen from the indicators of content quality assessment that are appropriate to the concepts presented with core competencies and basic competencies. Indicators for assessing the scope of coverage include conformity with cognitive, affective, and psychomotor learners on business material and energy. Indicator of language feasibility assessment, the language used is communicative. Indicator evaluates the implementation seen from the presentation of drawing material, animations, videos, interesting learning simulations so that it can train HOTS.

Assessment of religious experts in the table, from data from the results of the validation of religious experts with an average percentage of 97.5%. So that the HOTS-based physics module using professional 3d pageflip is stated to be very good. The criteria are very good seen from the indicators of the quality of content that are able to in still Islamic values to students. Indicators of assessment of coverage that include integration between verses of the Koran and the material in the module.

Assessment of educator responses in the table, from the results of the educator's response data which is an average percentage of 88%. So that the HOTS-based physics module using professional 3d pageflip is stated to be very good. Very good criteria can be seen from the indicators of assessing the quality of content, including the material being developed interesting to learn because it is in accordance with Basic Competencies and Core Competencies. Communicative linguistic indicators make it easier for students to understand the contents of the module. Indicators for assessing the contents of the module, can teach students to learn independently. HOTS assessment indicators with material that presents material by analyzing, evaluating, and creating can form high-level thinking skills of students. Indicator assessment display module presents physics learning modules using 3D Pageflip Professional can attract the attention of readers. Assessment of students' responses in the table, from student response data, with an average percentage of 86% for students' trials. So that the HOTS-based physics module using professional 3d pageflip is stated to be very good. Very good criteria can be seen from the indicators of the appraisal of interest in the physics module using 3D Pageflip Professional can improve the learning spirit of students in physics learning. Attractive indicators of material delivery that make it easier for students to understand the lesson. Indicators of language assessment to make it easier for students to understand the meaning contained in the material.

4. Conclusions

The opinions of media experts regarding the final product developed resulted in an average rating with very good criteria, the opinion of the material experts regarding the final product developed was that the average rating with very good criteria and the opinions of religious experts regarding the final product developed resulted in an average rating with very good criteria. The HOTS-based physics module using the Professional 3D Pageflip developed has tested students' responses and the educator's response test. In the test of the response of students to the final product developed, the small group trials produced an average rating with very interesting criteria and the field trials produced an average rating of 86% with very interesting criteria. in the test of the educator's response to the final product developed the average rating with very good criteria.

The results of the research and development of HOTS-based physics modules using a Professional 3D Pageflip then put forward some suggestions from researchers for further researchers, that are continuing to the deployment stage, so that HOTS-based physics modules using professional 3d pageflip can be applied perfectly in the learning process. The second is to develop HOTS-based physics modules using professional 3d pageflip with undeveloped material.

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