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RESEARCH ARTICLE

VALIDITY OF BASIC PHYSICS MODULE OF CAC MODEL TO IMPROVE HIGHER ORDER THINKING SKILLS OF COLLEGE STUDENTS.

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Abstract

This study aims to produce models Basic Physics module CAC (contextual, analytical and conceptual) to train students Higher-Order Thinking Skills are valid. This module was developed with an emphasis on understanding the Basic Physics contextually, analytically and conceptually. The structure of the module material in the form of images depicting the contextual events, basic Physics analysis which can be the analysis of images, graphs and mathematics, and other material module structure is the concept of Basic Physics. This research is a model of development with Borg and Gall. In this research, carried out studies in the literature that the material is composed of a module. The module is validated by expert validator and user lecturer. Module validation results by expert validators and user lecturers can be concluded that the module is valid for improving students' higher order thinking skills with a total of 327 logical validation scores and a total of 322 empirical validation scores.

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Introduction:-

Education plays an important role in the development of the progress of a nation, because it can improve the quality of human resources (HR) of the nation. With the increase of human resources, the nation's productivity will increase, which will lead to an increase in the progress of a nation. One of the efforts made by the government to improve the quality of education in Indonesia is by doing development in the education curriculum. The government has made some curriculum changes. Recent curriculum changes is a change of the Education Unit Level Curriculum 2006 (KTSP 2006) into the Curriculum, 2013. Based on the survey results of PISA 2012 and PISA 2015 survey results, we can determine the picture quality of education in Indonesia that must be corrected immediately as a whole both in knowledge, Attitudes and skills in order to compete with other developing countries, especially countries that follow the PISA program. The government needs to improve the quality of education as an effort to realize the mandate of the opening of the 1945 Constitution, namely "to educate the life of the nation", and development in all fields can be done immediately.

Basic theory:-

The process of education can not be separated from the learning activities. Learning activities in Higher Education are determined by the cooperation between lecturers and students. Lecturers are required to be able to present the lecture material with the optimum. Therefore, new creativity and ideas are needed to develop ways of presenting lecture material. Creativity in question is the ability of a lecturer in choosing the right method, approach, and media

in the presentation of lecture materials. Constraints faced by students in learning is the lack of learning media that can be used in the lecture process, so that learning is done to be not optimal. The books available to students in bookstores as well as in the library are generally difficult to understand as they are translations from foreign languages to Indonesian. One of the media that can be used in lecturing process is module. In Basic Physics lecturing process can be used Basic Physics Module is a Basic Physics learning package that contains a concept unit, sample problems and discussion, practice questions, Summary, Formative test, follow-up and feedback and key formative test answers, as one of the efforts The organization of individual learning that allows students to master the lecture materials independently. Module Basic Physics Model CAC (contextual, analytical and conceptual) to lecture Physics is based on understanding the concept of Physics presented contextually and train students to be able to do an analysis of the problems of physics contained in the module, and is also expected to analyze and provide Solution to the everyday phenomena of physics.

Contextual Learning:-

Contextual Teaching and Learning is the concept of learning in which the teacher presents the real world into the classroom and encourages students to make connections between their knowledge and application in their daily lives, while students gain knowledge and skills from a finite context Little, and from the process of constructing itself, as a provision to solve problems in his life as a member of society (Nurhadi, 2003). Contextual learning can be said to be a learning approach that shows the natural state of knowledge. Through relationships within and outside of the classroom, a contextual learning approach makes the experience more relevant and meaningful for students in building the knowledge they will apply in lifelong learning. Many of the benefits students can take in contextual learning are the creation of classrooms in which students will become active participants rather than just passive observers, and students will be more responsible with what they learn. Learning will become more meaningful and fun. Students will work hard to achieve learning objectives, students using prior experience and knowledge to build new knowledge. (Faridah, 2012).

Thought Analysis (Analytical Thinking):-

Analytical thinking is one approach that is often used to solve problems in the organization. This method looks at the problem picture in detail. This process analyzes the data in detail and sees the logical relationship between one and the other. Analytical thinking is the thought process that drives us to make better decisions. First we use the creative thinking process to gain a variety of solution options for the problems we face, then we need to use the analytical thinking process to choose some of the best alternative solutions. Analytical thinking skills include problem solving skills and decision making abilities. The basic rule of analytical thinking is forcing our minds to spread by thinking of many alternatives, then make it narrower by choosing the best alternative. One systematic approach and scientist in analytical thinking is the framework using the Problem-Hypotheses-Facts-Analysis-Solution model (Subagya, 2013).

Concept Learning:-

According Sapriya (2012) concept is an abstract notion that connects people with groups of objects, events, or thoughts. The birth of the concept because of the consciousness of the class attribute shown by the symbol. In addition, according to B. Othanel Smith and Robert H Ennis (in Wahab, 2012) the concept is a collection of abstract notions related to the symbol for the class of an object, event or idea. According to Robert S. Slavin (in Rosalia, 2013) students' skills in understanding the material is necessary because it affects the student learning outcomes and mastery of existing concepts in students. Based on the above opinion can be concluded that by improving the mastery of the concept is expected students or students can easily understand the basic concepts of physics that can be applied by students or students in everyday life. This will also make the Basic Physics subject to attract students because the study of Basic Physics is not only a memorization of the book, but students work together in groups directly to solve the social problems that are facing in their environment. (Nugroho, 2013)

Learning Media:-

According Widodo (2007) media learning is a tool of learning systems that have been developed in education, ranging from elementary school to college. Learning media is used as a means to facilitate learners to absorb the subject matter. With the learning media, it is expected that the teaching and learning process will take place with better and efficient, so as to improve student achievement. In principle the purpose of learning is that students successfully master the subject matter in accordance with predetermined indicators. Because in each class of students gathered with different abilities (intelligence, talent and speed of learning) it is necessary to organize the material, so that all students can achieve and master the subject matter as specified in the time provided, for example

one semester. The form of implementing such a way of teaching is to divide learning materials into learning units, each of which includes one or several subjects. The parts of the learning materials are called modules. Module is a way of organizing lesson material that pay attention to education function. The strategy of organizing learning materials contains squigging which refers to the making of the sequence of presentation of the subject matter, and synthesizing that refers to the effort to show the students that there is a correlation between the facts, concepts, procedures and principles contained in the learning materials.

Higher Order Thinking Skills:-

High-level thinking is defined as the wider use of the mind to discover new challenges. This high-level thinking capability requires one to apply new information or prior knowledge and manipulate information to reach possible answers in new situations (Heong, 2011). High-level thinking is thinking at a higher level than simply memorizing facts or saying something to someone exactly as something is delivered to us. Wardana (2010) argues that high-order thinking is a process of thinking involving mental activity in an effort to explore complex, conscious and creative, conscious experiences to achieve the goal of acquiring knowledge that includes the level of analytical, synthesis, and evaluative thinking. In general, there are several aspects that show the ability of high-level thinking that is owned by someone that is critical thinking skills, creative thinking, and solve problems. Johnson (2007) argues that critical thinking is an organized process that allows students to evaluate the evidence, assumptions, logic, and language that underlies the thinking of others. The creative thinking abilities of Thomas, Thorne and Small of the Center for Development and Learning (2000) suggest that creative thinking involves creation, discovering, imagining, guessing, designing, proposing alternatives, creating and producing. Creating a creative idea means coming up with something unusual, new, or raising a solution to a problem. A person's ability to think creatively can be demonstrated through several indicators, such as being able to suggest new ideas, ask questions, dare to experiment and plan strategies.

Method:-

This study uses research methods development (development research). The model used is a model development Bogh and Gall. This development model consists of 10 stages, but from the 10 stages used in this research until the seventh stage, this is done due to limited time and research resources.

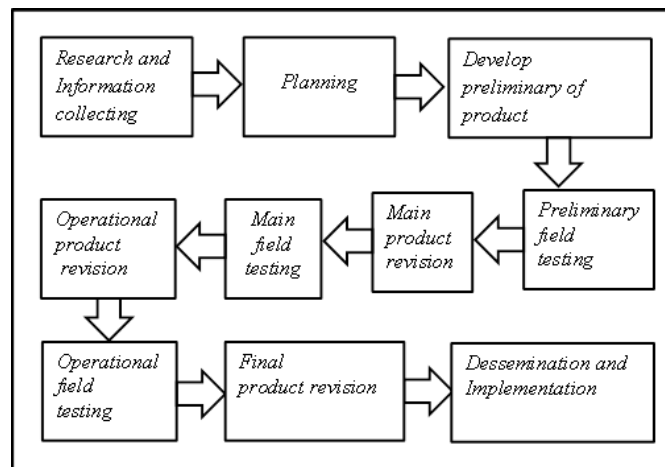


Figure 3.1:- Steps Borg and Gall development

Design test module product used is the design of the One-group pretest-posttest design, as presented in Table 1 with the research subjects are Physical Education S1 students who take the course Physics II

Tabel 3.1:- One-Grup Pretest-Posttest Design

Kelas	Pretest	Perlakuan	Posttest
Eksperimen	O ₁	X	O ₂

(Sugiyono, 2008) :

Information:

X = Module CAC

O 1 = pretest (initial capability test)

O 2 = Postes (final proficiency test)

Student learning outcomes data were analyzed to determine the effectiveness of the modules using a normalized gain score (N-gain) for the value of pretest - posttest class field trials. The calculation of the gain score is normalized according to Meltzer (2002) is:

$$N - gain = \frac{Postest\ Score - Pretest\ Score}{Maksimum\ Possible\ Score - Pretest\ Score}$$

Basic Physics module is said to effectively improve the CAC model of higher order thinking skills if the results of the N-gain score pretest-posttest showed moderate category or tinggi. Classification N-gain normalized by Richard R. Hake can be seen in the table below (Hake, 1998):Tabel 3.2 :

Table 3.2:- Categories N-gain

No	Gain Score (g)	Kategori
1	$g \geq 0,7$	High
2	$0,3 \leq g < 0,7$	Medium
3	$g < 0,3$	Low

Results And Discussion:-

In the study of this development, resulting CAC models Basic Physics module (Contextual, Analytical and Conceptual) is valid, effective and practical

validity Module Basic Physics Model CAC:-

Basic Physics module design model of CAC (Contextual, Analytical and Conceptual) before tested on a small group trial (limited) and a large group trial (field) must be validated in advance by experts and validator validator to valid users. A product is said to be valid if the total score of the assessment results by the expert validators and the validator pengguna at least reached the category is quite valid. If the module has been valid then got the initial product module ready to be tested, but if not yet valid then it must be revised until valid. This validation stage is based on logical validation and empirical validation. In this research, logical validation is performed by 2 expert validators consisting of Physics subject matter experts and Physics learning media experts. Validator validate physics learning material experts feasibility aspects of content, presentation feasibility aspects, language assessment and aspects of CAC models Basic Physics module, while the medium of learning physics expert validator validates the feasibility aspect kegrafikaan. Empirical validation performed by the user lecturer who is a lecturer Physics, validation aims to determine the feasibility of Basic Physics module CAC models in the lecture Physics 2. If found feasible then the module can be applied in the lecture, if declared unfit then the module must Revised, so otherwise eligible. Some repair material vibration and mechanical waves in Basic Physics module CAC models after being validated logical and empirical presented in Table 4.1, while the result of logical and empirical validation form a total score of assessing the feasibility of the model Basic Physics module CAC and validity module category are presented in Table 4.2

Table 4.1:- Validation Result of Basic physics Module of CAC Model

Before Validation	After Validation

Table 4.2:- Total Score Feasibility Assessment Basic Physics Module of CAC Model

Aspect of Assessment		Assessment	
		Logical	Empirical
Appropriateness Content	Total Score	83	75
	Category	Valid	Valid
Presentation	Total Score	61	57
	Category	Valid	Valid
Language	Total Score	51	50
	Category	Valid	Valid
Graph	Total Score	112	120
	Category	Valid	Valid
Basic Physics Module Model CAC	Total Score	20	20
	Category	Valid	Valid
AMOUNT	Total Score	327	322
	Category	Valid	Valid

Conclusion:-

Module Physics model of CAC (Contextual, Analytical and Conceptual) is a module Physics arranged in contextual analysis and conceptual, based on understanding the concept of Physics thus increasing keterampilan students in

conducting an analysis of the problems of physics contained in the module, and can Analyze and provide solutions to Physical phenomena that occur every day. This module has been validated by the expert that is the lecturer of physics lecturer, lecturer of Physics learning media and user lecturer who is the lecturer of Basic Physics lecturer. The results of the validation by experts and professors user indicates that the module Physics CAC valid models to improve the level of mastery of the material and high-level thinking skills of students if applied in learning Physics with a total score was 327 and the validator expert lecturers user total score is 322.

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