Model Of Assessment For Learning Based On Higher Order Thinking Skills For Computer Network Learning For Students Of Vocational School

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Abstract. Vocational High School (SMK) as one of the vocational schools plays a strategic role in fulfilling the workforce. One of the competencies that must be possessed by vocational graduates is the ability of HOTS. Many SMK graduates are not absorbed into the industry because they don't have HOTS ability. This study aims to develop AFL model based on HOTS that can be applied to the learning of computer network for vocational high school students. This research is a development research using the HC-ADDIE modification model, which is collaboration and modification of Hopkins and Clark's research, development and diffusion model of the ISD ADDIE and classroom action research (CAR) models. The development stage involves the activities of the design prototype model, validating models, readability testing, training teachers/observers, and conducting limited and expanded trials. The results showed that AFL model based on HOTS of computer network learning for students of vocational high school were successfully developed through the HC-ADDIE modification model.

Keywords: AFL, HOTS, computer network learning, students of vocational high school.

1 Introduction

Vocational High School (SMK) is a formal education that aims to prepare students to enter the workforce, prepare students to master the knowledge, skills, attitudes and values needed by the workforce [1]. SMK graduates are required to be able to work independently, have a professional attitude in the area of expertise they are interested in and have competence in accordance with the chosen expertise program.

The fact is that SMK graduates have not been able to answer the labor problems needed by the workforce (Alimudin et al., 2018). Moreover, if we look at BPS data as of 2018, South Sulawesi Province ranks the 6th highest SMK Open Unemployment Rate which is 12.48% even above the national average of 11.24%. For example, the number of alumni especially in the Department of Computer and Network Engineering produced by a number of favorite SMKs in South Sulawesi also shows a sad phenomenon, namely those who work in accordance with the background of expertise taken at SMK not more than 5% of the average graduate . Even though this subject of expertise is a very favorite major in SMK. Can we predict how the conditions of other schools. On a national scale, the majors of computer engineering and informatics occupy the third position of contributors to unemployment alumni in 2018, amounting to 228,554 people.

One obstacle of acceptance of vocational graduates in the world of work is the ability to think at a high level. This is consistent with the opinion of Delise, Rose and Nichole that the

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ability to think and work at a high level is one of the competency requirements that must be possessed in the world of work [2], [3]. The ability to think at a high level is now known as Higher Order Thinking Skills (HOTS).

Higher Order Thinking Skills

At present, the design of learning in vocational schools has been directed to HOTS. One reason is that the construction of National Examination questions continues to be improved so as to measure students' abilities in the higher cognitive domain ... "[4]. On the other hand, many vocational teachers still use low-level thinking skills (LOTS) assessments , which only facilitates students in short-term memory [5] .This phenomenon is not only a local problem, but also a global problem.There are international concerns about the dominant practice of LOTS assessment which only encourages students to focus on learning that emphasizes rote learning [6]. As a result, graduates are less skilled and lack high-level thinking skills to solve problems in their lives [7] (Yee et. Al., 2015).

Vocational schools must also be able to prepare graduates to be able to enter the workforce according to specified requirements. Cotton [8] and Robinson [9] state that in order to enter the workforce, prospective workers must have the readiness, abilities, and skills required by the workforce (employability skills), one of which is HOTS. According to Robinson (2000: 3), by having HOTS, a person will be able to learn, provide reasoning, think creatively, make decisions, and solve problems (problem solving).

Some of the capabilities mentioned above can be achieved if someone is able to apply knowledge, analyze problems, evaluate problems, and arrange alternative designs of problem solving based on the knowledge and understanding they have. Some indicators of this ability are summarized in HOTS, so this HOTS must be owned by all students including computer and network engineering students. Therefore, the development of HOTS has become a very important matter in the educational curriculum for computer and network engineering students.

Assessment For Learning

At present, the design of learning in vocational high schools has been directed to HOTS, so the development of HOTS assessments is a priority. Assessment is a process that is carried out as a step to evaluate the performance of the whole system, analyze the effectiveness of teaching, and obtain information within the decision making framework of students aimed at improving the quality of learning [10].

The assessment process in Vocational High Schools must be carried out on all aspects of student ability so that the results of the assessment have meaningfulness for students, both to enter the workforce and to continue their education to a higher level. This is in accordance with Indonesia Minister of Education and Culture Regulation No. 66 of 2013 concerning Educational Assessment Standards, stating that the scope of assessment of student learning outcomes includes attitudes, knowledge and skills competencies that are carried out in a balanced manner so that they can be used to determine the relative position of each student to the standards that have been set. This was agreed by Brookhart [11] that by conducting regular HOTS assessments, there would be positive developments in their students, namely thinking skills and performance would increase overall.

Learning in Computer and Network Engineering In general, vocational students' thinking skills are still low. When doing exercises, students can do a good job based on teacher demonstrations and worksheets. But when they find an error, they have not been able to analyze the cause of the error (the C4 analysis level), evaluate the error steps (the C5 evaluation level) and make a solution to manage the error (the C6 creation level). The biggest problem faced by

students is the difficulty in generating ideas [12]. This pattern is the same as research which states that the highest learning styles in vocational students are perpetrators and the lowest are thinkers [12]. Therefore, it is necessary to think about how the HOTS development strategy of computer and network engineering students is.

Assessment with these characteristics has advantages such as being able to detect weaknesses and strengths of students, being able to detect positions of students' abilities in learning based on criteria not compared to other students, involving teachers and students in the implementation process, and can assist teachers and students in achieving learning goals which are expected. In addition, assessment can foster motivation, responsibility, self confidence, independence, honesty, and student achievement in learning [13]. It was agreed by Yusuf that the function of assessment is as a provider of information and quality control of education, which includes all components of education starting from the implementation process to the educational product [14].

The development of HOTS computer and network engineering students is a demand that must be done immediately, bearing in mind the characteristics of work in computer and network engineering is to produce or produce products related to the world of networks that require critical and creative thinking skills. This is because in general the installation and configuration process requires a long problem-solving process and that is: (1) compiling network concepts; (2) designing a network that includes making topology and making network design; (3) selection of materials (raw materials); (4) determination of the technology used; (5) installation and configuration process; and (6) testing; Therefore, students as computer and network engineering must be ready and able to master well in accordance with the demands of the global world.

Based on the description above, it can be said that an increase in assessment of student learning outcomes can be done by developing a HOTS-based assessment model. Therefore, this research was conducted to develop a HOTS-based assessment model For Learning (AFL) for learning Computer Engineering in Vocational Schools (SMK). Media assessment For Learning (AFL) in question is an application developed based on the management of student learning assessments.

2 Method

Step 1 : Research

The stages of research in this study include the following activities: (a) problem analysis; and (b) needs analysis based on the results of a preliminary study of HOTS, learning motivation, positive attitudes and behavior of students, curriculum (syllabus, lesson plans, learning materials, and assessment systems) and theoretical and empirical studies of related theories and research results with HOTS, assessment systems, AFL, vocational education, & the demands of the global work world (employability skills).

Step 2 : Development

Based on the results of the research stage, the next stage of development is carried out. This stage of development was carried out to produce a model and set of HOTS-based AFL model instruments for learning computer and network engineering for students, which included designing prototype models, model validation activities, model readability tests, teacher training / observers (lectures and observers) training), and model trials both limited and

extended trials using a classroom action research (CAR) approach so as to produce a HOTS-based AFL model that is good, fit, and feasible to use.

Step 3 : Diffusion

The diffusion stage is the final stage of this research which includes the dissemination of development models that are intended to disseminate the results of this research either through socialization in the form of publication of research results in the form of research seminars, national and international seminars, and journals.

3 Results

Step 1 : Research

Results of the Preliminary Study Review

HOTS vocational education students in the field of computer networks which include the ability to apply, analyze, evaluate, and create in general are still quite low so it needs to be improved and developed. This is indicated by the low ability of students in terms of applying theories to solve problems, thinking critically, giving reasons and logical arguments, solving problems, making decisions, and arranging concepts and designs / designs in the process of creating new products when students complete assignments given by the teacher. Most students also experience difficulties when writing or compiling scientific papers. This was apparently due to the lack of time to read and was not accustomed to using the ability of HOTS during the learning process and in the process of completing assignments / questions

Results of Theoretical and Empirical Studies

The development of HOTS, learning motivation, positive attitude and student motivation in the field of computer networking are very important. Therefore, learning strategies and teaching models in the field of computer networks in SMKs must be able to develop HOTS, learning motivation, positive attitudes and student motivation, in order to produce pious, intelligent, and independent learning outcomes and be able to bring increasingly complex global challenges. HOTS development, learning motivation, positive attitude and student motivation can be done by applying HOTS-based AFL in the process of learning computer networks in the classroom as an effort to prepare the workforce needed in the 21st century.

Results of Problem Analysis and Needs Analysis

The results of the problem analysis show that: (1) vocational students in the field of computer networks still have HOTS which is quite low, even though students should already have HOTS high enough to be able to face the challenges of an increasingly complex global world; (2) students also still have low motivation to learn, positive attitudes and behaviors, even though this aspect is very important to support the success of student learning; (3) learning strategies and assessment systems that have been applied so far have not been able to develop HOTS, learning motivation, positive attitudes and positive student behavior even though they should have been developed both through the learning strategy and the assessment system; (4) in the learning process in the field of computer networks have not yet integrated the assessment model that is as an assessment for learning (AFL) for the purpose of developing HOTS, learning motivation, positive attitudes and behavior of students while actually being developed through the application of AFL in classroom learning; (5) most of the questions / assignments given by the teacher still measure students 'cognitive abilities at a low level (low order thinking skills, LOTS), whereas at the student level the questions / assignments should have measured and developed students' cognitive abilities at the level higher (higher order thinking skills,

HOTS); and (6) HOTS-based AFL models for computer network learning for SMKini students do not yet exist, so it is necessary to develop a HOTS-based AFL model for computer learning so that they can be immediately applied in classroom learning as an effort to develop HOTS, learning motivation, attitudes and behavior positive students and improve and improve the quality of learning in the computer field in college.

Step 2 : Development
Results of HOTS-Based AFL Model Development

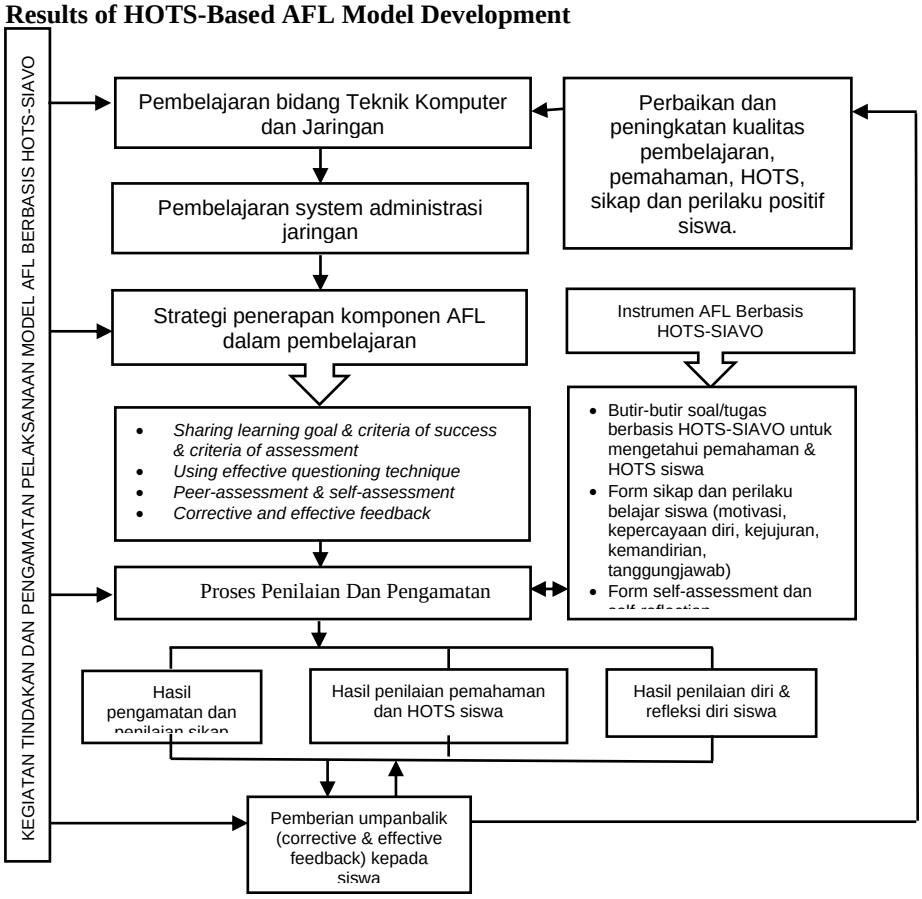

Fig. 1. HOTS-based AFL models in learning computer networks

Fig. 1. Results of Observation of the Application and Implementation of the HOTS-Based AFL Model

Siklus	Jumlah Skor dan Rata-rata (%) Keterlaksanaan Model												Rata-rata		Ket
	UT						UP								
	Rater 1		Rater 2		Rater 3		Rater 1		Rater 2		Rater 3		Skor	%	
1	22	79	24	86	24	86	26	93	26	93	26	93	24,7	88,3	DTDB
2	24	86	25	89	25	89	26	93	26	93	26	93	25,3	90,5	DTDB
3	28	100	28	100	28	100	28	100	28	100	28	100	28	100	DTDB
Rata-rata	24,7	88,3	26	92	26	92	27	95,3	27	95,3	27	95,3	26	92	DTDB

Keterangan: DTDB = dapat terlaksana dengan baik
UT = Ujicoba Terbatas; UP = Ujicoba Diperluas

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