

DEVELOPMENT OF CRITICAL THINKING VARIABLE INSTRUMENTS IN STUDENT WORKSHEET MEDIA

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Abstract: In the 21st Century, students' critical thinking abilities are needed to utilize their knowledge in problem-solving. Also, these skills are very important for students in making decisions when faced with various choices. This study aimed to see the effectiveness of students' critical thinking variables in the learning process. This study used a Research and Development (RND) method with an instrument in the form of a questionnaire consisting of 2 constructs. This study was carried out by involving seven teachers from several schools. Data collection was carried out by filling out an online questionnaire. Data were then analyzed with the help of the SPSS program. The results of this study prove that the preparation and development of the evaluation instrument of critical thinking variables in student worksheet media for students in this study were carried out by testing two research constructs, namely accuracy and effectiveness variables. Furthermore, the results of testing the validity and reliability indicate that the data validity of the evaluation instrument meets the valid criteria. Also, the results of this study indicate that the instrument developed meets the requirements for use in the development of student worksheet media.

Keywords: *Critical Thinking, Validity, Reliability*

INTRODUCTION

Critical thinking is one of the primary thinking abilities that needs to be taught in schools in the 21st Century. In this case, critical thinking is a mental process in which a person acts intentionally—repetition of patterns and stereotypes are prevented; prejudices, assumptions, and all kinds of information presented are tested, evaluated, and assessed; and different aspects, extensions, meanings, and results are discussed. [1]. Meanwhile, according to [2] and [3], critical thinking is reasonable and reflective thinking focused on deciding what to do or believe. Higher-order thinking skills, especially critical thinking skills, are needed to utilize student knowledge for problem-solving and decision-making in various aspects of life [4].

Critical thinking examines an opinion or idea, including considering or thinking based on the proposed statement. Students must be able to interpret, analyze, evaluate, explain, and conclude existing problems [5]. According to [6], critical thinkers can search for, understand, and assess relevant statements logically and rationally during problem-solving or decision-making. They also have a tendency or mindset to engage in these exploratory and reflective thinking activities. Higher-order thinking skills, especially critical thinking skills, are needed to utilize student

knowledge for problem-solving and decision-making in various aspects of life [7]. Critical thinking is fundamental for students to make decisions when faced with several choices. However, low-level thinking skills are often used in many school learning processes [8]. Students' low critical thinking skills are caused by a learning process that has yet to facilitate them to develop their critical thinking skills [9]. In addition, learning still tends to be teacher-centered; students still need to be trained to ask and answer questions and rarely conduct experiments [10].

Education is important in educating human resources, where learning outcomes can be seen as a determinant towards a better education system. Still, there is one-factor causing low student learning outcomes, which lies in the learning process [11]. Education must be encouraged as well as possible. It can be achieved through timely education to realize learning objectives, manifested in the form of a learning process, which is the application of the school curriculum through teaching activities [12]. Therefore, teachers must be more creative and innovative in teaching and learning activities and use learning media when delivering materials [13]. Besides that, it is also important to involve students in a fun learning context to increase their learning motivation or interest in learning [14]. Cognitive theory in

learning emphasizes that the combination used in learning media can improve academic performance [15].

Learning is an activity to acquire knowledge and skills, shape behavior and attitudes, and strengthen personality [16]. Learning in education must be interactive, inspiring, and challenging and must improve quality and motivation in the learning process [17]. The process of education cannot be separated from the learning process. According to [18], the learning process carried out by teachers provides knowledge that is used to equip students to solve various problems that exist in life. The process of learning can be effective if there are supporting media available. Using relevant media can optimize students' learning process [19].

Learning media is a tool that functions to explain some learning that is difficult to explain verbally and can be interpreted as a graphic, photographic, or electronic tool to capture, process, and rearrange visual or verbal information, and can help make students not bored so that they can learn more enthusiastically [20]. In line with that, according to [21], learning media can be used to convey messages from teachers to students to foster students' thoughts, feelings, attention, and even willingness so that they can encourage/support the learning process, where the learning media can be in the form of messages arranged to meet learning needs and the ability of students so that they can participate actively in the learning process. One effort to achieve learning objectives properly requires assistance that supports the learning process in overcoming student difficulties during the learning process, namely by providing Student Worksheets [22].

A student worksheet is a media that can be used in the learning process and can support the learning process; it is a learning tool that can be used in exploring the learning process to make students active [23]. There are several benefits of student worksheets, including 1) making students actively participate in the learning process; 2) assisting students in finding concepts; 3) training students in discovering and cultivating process skills; 4) being used as a guide for teachers and students to carry out the learning process; 5) accompanying students to record the material being studied; 6) helping students improve information about the concepts learned through learning activities [24].

Based on the description above, this study aimed to see whether or not critical thinking skills are used by students in the learning process [25]. This study also serves to facilitate students in dealing with various problems and being able to make decisions from several choices [26].

RESEARCH METHODS

This study used a Research and Development (RND) method [27-28]. This study involved seven teachers from several schools who were experts. In the distributed questionnaire, each statement used a Likert scale consisting of strongly disagree with a score of 1 to agree with a 5 strongly. The development of an instrument on a questionnaire with a scale of 1-5 was assessed for validity and reliability to produce a valid and quality instrument [29-30].

The model for developing an instrument of a variable was a model within a framework that is based on relevant theory and supported by empirical data [31]. The theoretical model has several stages, namely conducting a theoretical study in formulating various constructs and indicators that exist in the evaluation of variable use of student worksheet media, preparing an outline of the instrument, preparing the items on the instrument, conducting trials, revising, analyzing, and formulating the outcome instrument of the study [32]. The questionnaire used to measure the development of an instrument of critical thinking variables has two constructs: variable accuracy with as many as four questions and variable effectiveness with as many as three questions. Data were taken by conducting a trial first and then using a questionnaire, which was filled out via Google Forms by seven expert teachers from several schools who were selected purposively according to their abilities and expertise that have been certified. This study was conducted within two months, from September to November. After obtaining the data, they were analyzed using the SPSS Version 29 program.

RESULT AND DISCUSSION

Non-Test Instrument Validity

The preparation and method for developing an evaluation instrument for using critical thinking variables in the development of LKPD media in this study were carried out using a theoretical development model [33]. This study was conducted by conducting academic research to formulate an evaluation construct on using critical thinking variables on student worksheet media. Based on studies of various theories about using critical thinking variables, there are two variable evaluation constructs for using student worksheet media, namely 1) variable accuracy and 2) variable effectiveness. The following is Table 1 of the outline of the variable instrument for the use of student worksheets.

Based on Table 1, the number of statement items was seven items spread over two constructs. After the researchers prepared the instrument outline for each construct, the researchers then prepared the statement items. After the instrument was prepared, it was submitted to the validator team for validation; the validators were teachers. A

validity test is used to determine whether a measuring instrument is valid [34] [35]. Each statement item in an instrument is said to be valid if the value on the calculated coefficient (r-count) is greater than (r-table) [36]. The results of the instrument validity test for each research data are shown in Table 2.

Based on Table 2, $r\text{-count} > r\text{-table}$, all items in the instrument can measure the evaluation of the use of Scientific Approach-based LKPD media.

Table 1. Outline of the variable instrument for the use of student worksheet

NO	Construct	Number of Statements (Questions)
1	Variable Accuracy	1,2,3,4
2	Variable Effectiveness	5,6,7

Table 2. Outline of the variable instrument for the use of student worksheet

Construct	Items	Corrected item-total correlation	Cronbach's Alpha Item Deleted
Variable Accuracy	Critical thinking variables are suitable for use in the structure and function of plant tissues.	0.436	0.683
	Critical thinking variables are suitable for student worksheets based on the Scientific Approach	0.467	0.661
	These variables are appropriate for studies related to product development.	0.254	0.718
	These variables are appropriate for studies related to students.	0.494	0.636
	The variables used can improve students' 21st-century skills.	0.736	0.836
Variable Effectiveness	The variables used are interesting enough to be used in studies.	0.917	0.808
	These variables have a relationship with the Scientific Approach model	0.917	0.808

Non-Test Instrument Reliability

Each item is assessed in developing the evaluation instrument of critical thinking variables in student worksheet media. It is used to measure the extent to which items in the scale measure the same construct as other items on the same scale [37]. Table 3 shows the reliability scale using Cronbach's Alpha coefficient for the questionnaire based on the variable validation instrument for students' use of student worksheet media.

Table 3. Cronbach Alpha Reliability Index for Each Construct

Construct	Overall Cronbach's Alpha Value
Variable Accuracy	0.675
Variable Effectiveness	0.817

Based on the results of Table 3, the Cronbach Alpha Reliability Index values were obtained for each construct in this study, and the overall alpha values for components 1) variable accuracy and 2) variable effectiveness, each had an alpha value of 0.675 and 0.817. An item is reliable if the alpha value is between $0.6 < X < 1$ [38].

Thus, the two constructs owned in the study have fulfilled the reliable requirements to be used for further research.

Based on the results of the validity and reliability test of the evaluation questionnaire on critical thinking variables in the use of student worksheet media, a valid and reliable instrument was obtained. The results of this study are reinforced by a previous study stating that an evaluation instrument that can be used is an instrument that meets the criteria, namely valid [39]. In addition to meeting valid criteria, the instrument must have highly valid criteria. An appropriate instrument is used in studies if it meets several requirements, namely validity and reliability [40]. The existing opinion strengthens the results of this study so that the instrument in the evaluation variable for the use of student worksheet media for students is declared valid and suitable for further research needs relating to the evaluation instrument of critical thinking variables in student worksheet media for students.

It is reinforced by a study stating that to ensure quality in research results, the instruments that can be used are derived from selecting valid and reliable tools [41]. Furthermore, using a variable evaluation instrument must meet valid and

appropriate criteria for use. An evaluation instrument for evaluating/assessing the use of variables for students can prevent speculative actions from students in making an evaluation, especially in determining the final grade after a study on evaluation achievement using critical thinking variables to develop student worksheet media for students.

Based on the analysis, the questionnaire that can be developed based on a variable evaluation instrument for students has good construct validity and high reliability so that it can be used in studies, namely the development of student worksheet media. Therefore, the instrument in this study measuring the evaluation of the use of critical thinking variables in the development of student worksheet media has been tested and is considered feasible to use and can be trusted for use in studies measuring the evaluation of the use of critical thinking variables for students.

CONCLUSION

The results of this study allow a conclusion that 1) the preparation and development of the evaluation instrument of critical thinking variables in student worksheet media for students aim to test two research constructs, namely, 1) variable accuracy and 2) variable effectiveness. The results of testing the construct validity and reliability show that the validity of the evaluation variable instrument for the use of student worksheet media for students has met the criteria of validity and the reliability of the evaluation variable instrument for the benefit of student worksheet media for students prepared and developed in this study has completed the category declared reliable.

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