Validity of a Kahoot!-Based Cognitive Test Instrument on Corona Pandemic Theme

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Abstract

This study aimed to determine the level of expert validation of a developed Kahoot!-based cognitive test instrument on corona pandemic theme in the Integrated Science course. The research used the Research and Development (R&D) 3D model. The assessment instrument was developed on a web basis using the Kahoot! platform. The data were analyzed by quantitative and qualitative descriptive analysis based on the validity of the questions obtained through expert validation tests. The results showed that the cognitive test instrument developed obtained an average score of 4.57 with a very valid category referring to the distribution of the three aspects of the assessment, where the construction and material aspects are in the very valid category, and the language aspect is included in the valid category. It can be concluded that the instrument made are in accordance with the standards and assessment criteria. So, developed Kahoot!-based cognitive test instrument can be used to assess cognitive aspect of pre-service science teacher on Corona Pandemic Theme.

Keywords: Kahoot!-Based Cognitive Test Instrument, Kahoot!, Integrated Science Course, Corona Pandemic Theme

INTRODUCTION

Currently the online learning systems have been widely used by various educational institutions so that the learning is not limited by time and space and can be conducted anytime and anywhere. According to Moore et al (2010), e-leaning is a learning pattern that utilizes web-based technology by loading content and learning methods delivered via the internet. E-learning also allows education to take place in a flexible, student-oriented manner by utilizing information and communication technology (Azeiteiro et al, 2014). One of the components that determines the success of a learning process is evaluation. Evaluation is an activity carried out in a structured manner to monitor the quality of learning (Suryani, 2017).

The evaluation process will involve assessment and measurement activities. Evaluation, assessment, measurement are hierarchical activities that are interconnected and cannot be separated from one another, and their implementation is carried out sequentially. According to Kizlik (2012), assessment is a process of gathering information to monitor student progress where the information is used to determine the proper alternative in making decisions. Measurement is the process of collecting data through observation to obtain images in the form of numbers and symbols where students have achieved certain characteristics of a level (Ezer & Ulukaya, 2018).

Lecturers must have skills in designing assessments and measurements in order to know the abilities of their students appropriately. (Waree, 2019). Learning instruments are an integral part of learning evaluation. Learning instruments can be used as a tool to obtain information related to student learning outcomes with cognitive, affective and psychomotor domains. In this research, a learning instrument will be developed to obtain information on student learning outcomes in the cognitive domain.

Based on the results of observations, the assessment instruments used by lecturers in Integrated Science course are still conventional. Lecturers are still conducting assessments using the paper and pencil test technique. The implementation of evaluation in the Integrated Science course found problems, namely allowing the evaluation to be carried out by students outside the predetermined time limit and information on learning outcomes or the scores obtained could not be displayed in real time so it needed improvement, especially in the preparation of assessment instruments. In addition, in this pandemic condition, lecturers have

difficulty conducting direct assessments so that e-learning-based media is needed which is able to facilitate lecturers in developing question instruments and conducting tests of students' cognitive abilities.

One of the software that lecturers can use in making quizzes to make assessments easier is Kahoot!. Kahoot! is an online classroom that can facilitate lecturers to assess student learning outcomes, review concepts and conduct discussions (Graham, 2015). Kahoot! is a game-based learning platform that allows lecturers to make quizzes and conduct surveys (Ismail & Mohammad, 2017). Kahoot! Is able to create competitions to encourage students to be able to prepare themselves before engaging in learning (Licorish et al, 2017). The advantage of Kahoot! is that quizzes not only contains multiple choice questions, but there are additional features such as images, videos, sound effects that can create an interactive and fun learning environment (Kapsalis et al, 2020). Kahoot! can also build student learning motivation, increase focus in learning and enjoy the learning process (Toth et al, 2019).

Through Kahoot!, lecturers can monitor students' cognitive learning outcomes from the test results displayed directly in front of each user's screen. According to Graham (2015), Kahoot! not only facilitate lecturers to make quizzes but also can conduct discussions consisting of one question that can be answered by students, but there are no right or wrong answers and no points are obtained. Lecturers can derive the sequence of questions given to students. According to Kapsalis et al (2020) each question answered will be shown the points immediately and the student scores that appear can be saved in the form of an excel file after the test is completed as an effort to review the cognitive development of students. This platform can be a formative assessment software that is easy to apply and can be used at any time to increase student participation in the learning process (Cetin, 2018).

Clark and Mayer (2008) explain that the benefits obtained from the use of new technology will depend on the extent to which the technology is used in a way that is appropriate to the learning process. Using Kahoot! will help support students' metacognition by providing direct feedback. Kahoot! not only assesses students' conceptual understanding but also supports the construction of new knowledge and understanding through further explanation during or after the game.

According to Licorish et al., (2017), the use of educational games in the classroom tends to minimize

distraction, thereby improving the quality of teaching and learning beyond what is provided in conventional classrooms. Other factors that contribute to the acceleration of students' conceptual mastery of learning, include preparation and appropriate content combinations in Kahoot!, providing timely feedback to students, and the existence of game-based learning strategies.

The technical use of the Kahoot! software is that students who play Kahoot! will be given a question that is displayed on the screen, then given a time limit to answer and students will get points for each question that is answered correctly (Bicen & Kocakoyun, 2018). The questions in Kahoot! are accompanied by music whose length of time is adjusted to the length of time the student takes to answer the questions (Wang & Tahir, 2020). So that Kahoot! can make it easier for lecturers to evaluate, manage and display grades directly in front of students, it creates an attractive learning atmosphere, effective and efficient assessment.

According to Abduljabbar and Omar (2015) learning objectives can be achieved by applying an assessment to measure the cognitive level of students. In this study, the instrument technique developed was an objective test instrument with 20 multiple choice questions. The learning outcome test is used to measure the extent to which the desired behavior changes so that the learning objectives can be achieved by students (Zulfadli, 2017). According to Brame (2013), multiple choice questions can be used to assess various levels of learning outcomes from C1 to C6. In this study, the cognitive levels of the questions used were C3 (applied) and C4 (analyzed).

Multiple choice questions must be well designed to motivate students to acquire the desired knowledge and skills (Tarman & Kuran, 2015). In developing a learning test instrument, it must be adjusted to the achievement of the curriculum, the learning objectives to be achieved and student characteristics. So that validation by experts needs to be done to provide an assessment, review and provide suggestions and criticism of the product developed in order to improve the quality of the resulting assessment instrument.

The Integrated Science course is one of the scientific courses at the Department of Science Education, which study science holistically, intact, and not partially. Based on the 2013 curriculum, science learning in junior high schools must be implemented in an integrated manner so that it cannot be separated between the disciplines of Biology, Physics, Chemistry and Earth and Space

Science (Usmeldi & Amini, 2019).

Curriculum integration is said to be successful if in learning it can provide challenges for students to solve problems that occur in daily life (Alghamdi, 2017). Science learning must also feature the integration of content in the learning process (Hoa et al, 2015).

Integrated Science learning is expected to make it easier for students to apply scientific concepts to solve problems in daily life (Yamin et al, 2017). Integrated Science learning can improve student competencies that are interrelated between one science f ield and stimulate the formation of constructivist learning (Lamanauskas, 2010) and can provide meaningful learning experiences for students (Harrell, 2010).

The integrated model applied in this study is the webbed model. The webbed model is a model that combines various disciplines starting with determining the theme first. The chosen theme will be developed into a sub-theme by paying attention to the linkages between scientific disciplines (Puspita et al, 2020). This webbed model can encourage students to learn and help students to create ideas to solve contextual problems (Prayuda & Ratnawulan, 2019).

The learning theme used in the research is the Corona pandemic theme which is a contextual and actual issue and relates to existing material in the field of science studies. The Corona pandemic is an event of the rapid and mass spread of disease over a certain period of time caused by a Corona Virus infection. The Corona Virus spreads rapidly and has a form like the influenza Virus (Li et al, 2020).

The Corona Virus is able to infect the respiratory tract (Song et al, 2020) which is transmitted through droplets or direct contact (Qasim et al, 2020). Covid-19 is closely related to SARS and MERS (Kumar, 2020). A person infected with the Corona Virus will show clinical symptoms such as high fever and cough (Khavandi et al, 2020). Symptoms of Covid-19 can appear as late as 14 days (Sharma & Singh, 2020). One of the efforts that can be made to prevent the spread of the Corona Virus from becoming more widespread is the resulting of the Covid-19 vaccine (Shoenfeld, 2020). Coronavirus is an encapsulated but unsegmented RNA Virus (Mesoraca et al, 2020) that comes from the Coronaviridae family, can attach to objects or living things. This study aims to identify the level of validation of questions with the corona pandemic theme in an integrated science course.

METHOD

The research method used in this

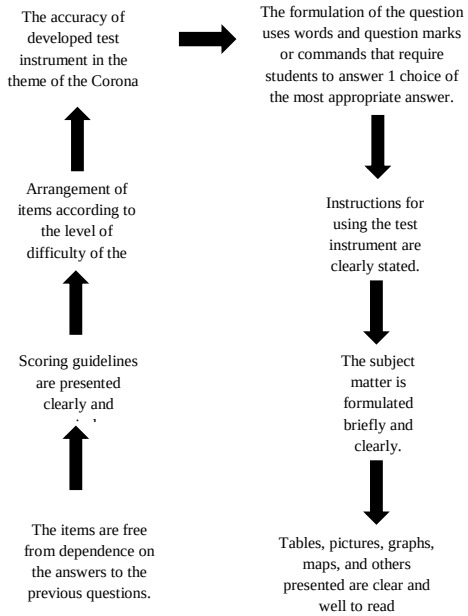
study is research and development (R & D). There are three steps in this research namely: producing learning instrument, testing the validity, and testing the effectiveness of the products (Sugiyono, 2008).

The stages in instrument development research include: needs analysis, planning, development of initial product formats, initial product validation, early stage product revisions, small group trials, product revisions. However, the things that will be discussed in this study is only up to the stage of the initial product revision.

The instrument that has been developed will be tested for expert validation. Expert testing is carried out with respondents who are experts in designing a model or product. The validation test of the test instrument focuses on the construction aspects consisting of the accuracy of the questions formulation, the instructions for handling the questions, the accuracy of using pictures, and the accuracy of the questions that are arranged based on the difficulty level of the questions. The material aspect consists of the accuracy of the questions with the level of students and the measured cognitive level, as well as the suitability of the questions with core competencies and basic competencies. The validation test for the linguistic aspect consists of the accuracy of the language used in the questions, the questions using communicative language, the language and terms used in accordance with the guidelines, and the accuracy of the sentences used in the questions.

Expert validation activities carried out to review the initial product, provide input for improvement. To obtain validity data from the learning instruments developed, the validator is given an assessment questionnaire sheet and the learning instruments that have been developed to assess construction, material (substance) and language aspects. The results of the assessment are then analyzed to determine the level of validity.

The Figure 1 is an assessment criteria for developing a test instrument and Figure 2 is an example of developed Kahoot!-based cognitive test instrument:



Construction Aspect

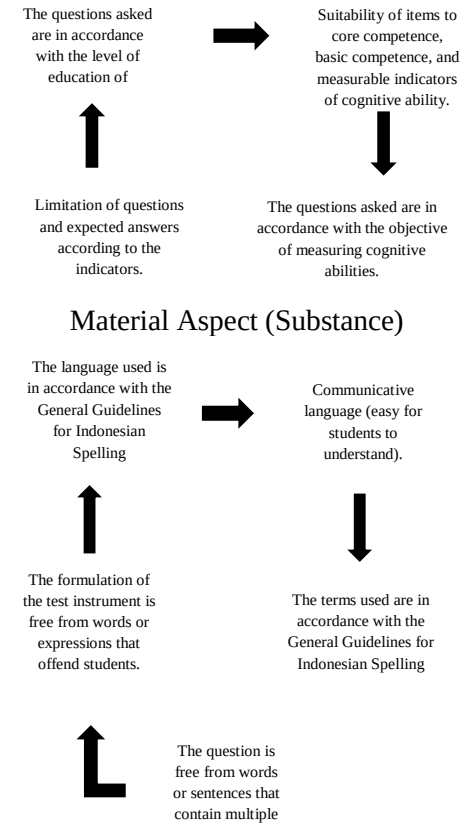


Figure 1. The assessment criteria for developing a test instrument

The data analysis technique for expert validation test consisted three steps:

1. Analysis of Validity Data

a) Conduct recapitulation of the validators assessment results.

b) Finding the mean of the validator assessment results for each aspect.

c) Determine the validity category of each aspect and all aspects that are determined using a rating scale, the raw data obtained in the form of numbers are then interpreted qualitatively using Table 1 (Fitriya, Lesmono, & Wahyuni, 2013).

Table 1. Criteria for the Level of Validity

Score	Criteria
$4{,}5 < Score \leq 5$	Very Valid
$3{,}5 < Score \leq 4{,}5$	Valid
$2{,}5 < Score \leq 3{,}5$	Valid Enough
$Score \leq 2{,}5$	Invalid

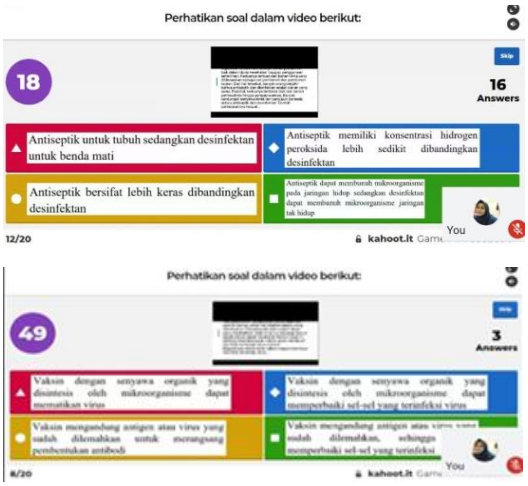


Figure 2. Kahoot!-Based Cognitive Test Instrument

The steps in this research and development are limited to the Initial Product Validation stage based on the results of expert validation. The following below are the stages as follows (Borg & Gall, 1996):

1. Needs Analysis

Needs analysis is an analysis of assessment instruments which is a systematic process for analyzing learning outcome assessment instruments commonly used in Integrated Science course, analyzing curriculum, analyzing material, analyzing learning objectives, and analyzing the characteristics of the fifth semester.

a. Assessment Instrument Analysis

One of the student abilities that

will be measured and assessed in research is the ability of students in the cognitive aspect. Evaluation techniques that can be used to measure student cognitive learning outcomes are tests. Types of tests that are commonly developed in Integrated Science course are objective tests in the form of multiple choice questions and non-objective tests in the form of descriptions. However, the tests developed so far are still conventional based on paper and pencil tests.

b. Curriculum Analysis

The learning theme used in this research is the Corona pandemic. The theme of the Corona pandemic includes basic competencies in the Junior High School curriculum such as basic competencies in 1st grade in odd semesters, namely 1). 3.3. Explaining the concept of mixtures and single substances, physical and chemical properties, physical and chemical changes in everyday life, 2). 3.4. Analyze the concepts of temperature, expansion, heat, heat transfer, and their application in everyday life including monitoring of body temperature stability in humans and animals. The basic competence of in 1st grade even semester is 3). 3.8. Analyze events environmental pollution and its impact on the ecosystem. While competence basic grade in 2st grade even semester, 4). 3.9. Analyze the respiratory system on Humans and understand disorders of the respiratory system as well as maintenance respiratory system health and basic competence for in 3st grade semester 2, 5). 3.7. Apply the concept of biotechnology and its role in human life.

c. Material Analysis

The theme of the Corona pandemic is related to material in the field of science studies ranging from biology, chemistry, physics, earth and space science or the environment. Based on the results of the analysis, chemical materials in accordance with the theme of the Corona pandemic are disinfectant and antiseptic compounds, biological materials are respiratory disorders in humans and vaccines as biotechnology products. The physical material is temperature and environmental material is the positive impact of the Corona pandemic on the air quality produced and the negative impact of the Corona pandemic on water and soil pollution.

d. Learning Objectives Analysis

The purpose of learning integrated science course is through integrated theoretical and practical lectures, students are able to apply lesson plans that have been designed in peer teaching activities. After participating in this lecture program students have interdisciplinary knowledge in the scientific field and have the ability and skills to determine themes, plan,

implement, manage and evaluate Integrated Science learning activities according to Junior High School or Islamic Junior High School Curriculum Standards. Learning plans are also carried out in preparing assessment tools (Suryani et al, 2020).

d. Student Characteristics Analysis

Science students have various levels of knowledge but the average level of knowledge is in the medium category. The fifth semester in Department of Science Education's students are classified as the millennial generation who are updated with the development of science and technology. Students also have a high curiosity about technological advances.

2. Planning

Planning stage includes determining the assessment media used, determining the test instrument technique to be used and determining the cognitive level to be used.

a. Determination of the media used

The assessment media used in this research is e-learning based using Kahoot! software. Choosing the use of Kahoot! software as an e-learning-based assessment medium with the hope of being a solution to solving problems faced by lecturers related to evaluation work. This Kahoot! software can provide opportunities for students to be able to answer questions (quiz) directly (real time) with a predetermined time limit and every right or wrong answer will be immediately displayed on the screen.

b. Determination of the test instrument technique

The test instrument technique used in this study was an objective test with form multiple choice questions of 20 questions. This selection is based on the suitability of the tests that can be entered into the Kahoot! software. The objective test is a test of all the information needed to answer the test is available. The items on the multiple choice objective test contain the answers that must be chosen by the students. Possible answers have been prepared by the lecturer and students only choose answers from the possible answers provided.

c. Determination of the cognitive level

The cognitive level used in this study is C3 (applying), C4 (analyzing). The choice of cognitive level is based on the knowledge of the fifth semester's students and the demands of the selected basic competencies which are adjusted to the theme of the Corona pandemic. The questions used in this study are included in the MOTS and HOTS category as an effort to prepare the competencies needed by students in facing the 21st century.

3. Initial product format development

The development of the initial product format stage includes making guidelines for multiple choice questions

with the theme of the Corona pandemic, totaling 20 questions, the preparation of a multiple choice objective test instrument. The program development format referred to in the form of Kahoot! software.

a. Making a multiple choice question guidelines

The instrument table of question specification used as a guideline for writing instrument items is arranged based on an authentic assessment guidelines. By using a guidelines, the question maker can produce questions that match the test objectives. The table of question specification is made in the form of a matrix which includes: basic competence, question indicators, subject matter, question number and question cognitive level.

b. Preparation of objective test instruments

Multiple choice objective test is the most widely used type of objective test. There are 20 multiple choice questions that will be used. The construction of a multiple choice test consists of two parts, the guidelines for the preparation of multiple choice questions consist of subject matter and alternative answers (options). In the preparation of multiple choice questions, there are 3 aspects that need to be considered, namely the construction aspect, the material aspect and the language aspect.

4. Initial Product Validation

Expert testing or validation is carried out to review the initial product, providing input for improvement. This validation process is called Expert Judgment. Validation is carried out after the initial draft has been developed. In this question validation activity, expert lecturers provide assessments and other input such as the suitability of questions with construction aspects, material aspects and language aspects. Cognitive question validation activities were carried out on September 15 2020 through an online system

RESULTS AND DISCUSSION

Based on the results of the curriculum analysis, the multiple choice test instrument developed had a level of distribution of questions ranging from C3 level of 6 questions to C4 of 14 questions. The unbalanced number of questions is because the basic competencies in accordance with the theme of the corona pandemic require more students to have higher-order thinking skills by involving the C4 cognitive level (analysis). Then the compiled questions have been adjusted to the basic competency achievements selected based on the breadth and depth of the material as well as the student's cognitive abilities.

The test developed must be able to describe changes in student behavior.

This is in line with the opinion of Tavakol & Dennick (2011) that the tests made must meet standards, be objective and display the quality of student learning outcomes. The test is said to meet the standard if the questions made have been analyzed both quantitatively and qualitatively (Puspendik Balitbang Depdiknas, 2007).

This test was developed with the aim of increasing students' understanding of the learning material, so the type of test developed is a formative test in the form of multiple choice based kahoot!. Through formative tests, lecturers are able to get positive feedback because they can get information regarding the shortcomings of applied learning (Palmen, 2015) and can be used as a guide for monitoring the learning process (Baleni, 2015). To obtain a test instrument that is in accordance with the standards and quality, an expert validation test is conducted first.

The results of the validation test are qualitative data in the form of criticism and suggestions from the validator and quantitative which can be in the form of the results of the product assessment developed. This validation result data is used as material for consideration in revising the early stages of a product being developed (learning outcome assessment instrument).

The results of the validation of the learning outcome assessment instrument in the cognitive domain with the theme of the corona pandemic are as follows:

Table 2. Expert Validation Results

Aspects Assessed	Final Average Score	Category
Construction aspects	4,68	Very Valid
Material aspects	4,63	Very Valid
Language aspects	4,4	Valid
Amount	4,57	Very Valid

Based on the validation results obtained from two expert lecturers, it can be said that the developed cognitive test instrument is in the very valid category by looking at the distribution of the three aspects of the assessment where the construction and material aspects are in the very valid category and the language aspects fall into the valid category. According to Erfianti et al (2019) an assessment instrument can be said to be valid when it meets the construction, material and language requirements and is not biased.

The Questions are said to meet the requirements of the construction aspect if they contain clearly formulated items, the choice of answers and questions do not depend on previous answers; material aspects such as questions arranged according to the achievement of indicators and also basic competencies, or in other words

questions according to the concept being taught; linguistic aspects such as questions do not have much meaning and the language used is easy to understand by students.

Based on input from the validator that the instrument was developed very well, this cognitive instrument is expected to provide an overview of students as science teacher candidates to be able to compile multiple choice questions according to curriculum standards. Putri et al (2020) said that the characteristics of valid question instruments are sol items arranged based on problem indicators and learning from a teaching material in this case material related to the corona pandemic theme, the questions in the questions are arranged based on predetermined cognitive levels and given a work instructions test.

The Validators considers the questions made according to the level of cognitive development of the fifth semester students by looking at the characteristics of science students and the questions given are also contextual and actual MOTS and HOTS questions. According to Yunita et al (2020) through HOTS questions, students are trained to have high-level thinking skills such as critical and creative thinking and apply these concepts in real and complex situations to solve a problem. HOTS test instruments can also help students to think broadly and deeply about learning material (Kusuma et al, 2017).

CONCLUSION

Based on the research that has been done it can be concluded that the Kahoot!-Based Cognitive Test Instrument in the Integrated Science course with the theme of the Corona pandemic is very valid, meaning that the test instruments made meet the standards and assessment criteria in terms of construction, material and language.

The results of the validation test through an expert judgment process, the quality of a Kahoot!-based cognitive test instrument on Corona pandemic theme shows that 2 aspects of the assessment (material aspects and construction aspects) are very valid category by the two validators and for the language aspect is in valid category.

So, the developed Kahoot!-based cognitive test instrument can be used to assess the cognitive aspect of pre-service science teacher on Corona Pandemic Theme.

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