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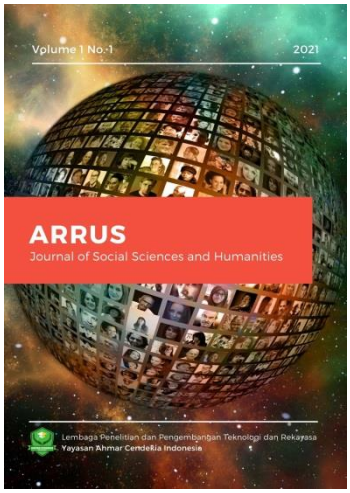

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RESEARCH ARTICLES

Assessment of Critical Thinking Ability in Science Learning Using Watson-Glaser Critical Thinking Appraisal (WGCTA)

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Abstract: Students must have critical thinking skills in order to be able to face various personal and social problems in their lives. Critical thinking ability is the ability to think reflectively and reason in making decisions. This research is a qualitative descriptive study with the aim of designing an assessment of critical thinking skills in accordance with the concept of the critical thinking test model developed by Watson and Glaser with the title Watson-Glaser Critical Thinking Appraisal (WGCTA). In this article there are 5 indicators discussed in science learning, namely indicators: Drawing Conclusions (Inference), Assumptions (Recognizing Assumptions), Deduction (Deduction), Interpreting Information (Interpretation), Analyzing Arguments (Evaluation Argument).

Keywords : Watson-Glaser Critical Thinking Appraisal (WGCTA) ; Critical thinking

1. Introduction

The independent learning curriculum is a curriculum that prioritizes diversity in intracurricular learning. Structurally, this curriculum is different from the 2013 Curriculum. The differences lie in the type of learning, basic policies, and subject selection systems. The types of learning in the independent learning curriculum are divided into three, namely intracurricular learning, co-curricular learning as an effort to strengthen the Pancasila student profile and extracurricular learning.

One of the subjects that is expected to implement the independent learning curriculum is Natural Sciences. Natural science is scientific knowledge that has been tested for truth through scientific process skills and scientific methods with objective, methodical, systematic and universal characteristics. Natural Sciences (IPA) contains material that is widely related and interconnected with other concepts and there are many foreign terms or scientific terms that require high levels of reasoning and understanding (Astriani & Nurun, 2016).

Science or Natural Science (IPA) is a human effort that includes mental operations, skills and strategies for manipulating and calculating, the truth of which can be tested again based on an attitude of curiosity, courage and persistence. carried out by individuals to reveal the secrets of the universe (Nelvianti & Fitria, 2020).

Thinking skills in science are closely related to how to find out and understand the universe systematically, which contains concepts, theories or formulas that must be understood in depth. Thus, students are required to be able to think critically in building knowledge with an active role in the learning process. It is important for students to have critical thinking skills because these skills enable students to be able to analyze and evaluate information in determining reliable information, so that it can be used as a basis for drawing valid

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conclusions. Thinking skills are not innate to students, but thinking skills can be learned and require study (Putri, Fahmi & Wahyuningsih, 2021).

Critical thinking is something that everyone has to analyze ideas or concepts in a more specific direction to obtain relevant knowledge by involving evaluation of evidence. Critical thinking skills can enable someone to analyze and evaluate critically using various mental processes such as focusing attention, categorizing, selecting and evaluating. The critical thinking process directs students to focus their minds in processing and understanding any information. The purpose of critical thinking is to test an opinion or idea, including carrying out thoughts based on the opinion put forward. The opinions expressed are based on reliable sources (Indriani, Haryanto & Gularso, 2022).

Critical thinking skills are thinking skills that involve cognitive processes and invite students to think according to their skills or think reflectively about problems. Critical thinking is an organized process in solving problems that involves mental activity which includes skills in formulating problems, providing arguments or opinions, carrying out evaluations, and making decisions. The reason why critical thinking skills are important for students is to face and respond to the explosion of information in the digital era, build quality of thinking, an attitude of accuracy and rational thinking in students, develop students' skills in thinking logically, organizing problems, and solving various types of problems. (Juliyantika & Batubara, 2022).

People who think critically see both sides of an issue, being open to new events that cast doubt on their minds. The indicators of critical thinking skills according to Watson & Glaser (2002) are: 1) Drawing conclusions (*Inference*); 2) Assumption (*Recognizing Assumption*); 3) *Deduction*; 4) Interpreting Information (*Interpretation*); 5) Analyzing the Argument (*Evaluating Argument*).

2. Methodology

This research is included in the type of qualitative research, namely research that uses a verbal approach, not numbers. This research seeks to examine the critical thinking test model and its implementation in assessing critical thinking skills in Natural Sciences (IPA) material. Therefore, the method used in this research is literature study. The primary data source is the Watson-Glaser Critical Appraise Appraisal UK Edition-Practice Test which contains guidelines and techniques for implementing WGCTA, as well as examples of WGCTA test questions.

3. Results and Discussion

Science is a way of finding out about the universe systematically to find out knowledge, facts, concepts, principles, discovery processes, and have a scientific attitude. "Science is knowledge obtained from a series of systematic processes to reveal everything related to the universe." So it really needs to be taught at the educational level. Science learning in elementary schools is a learning program that aims to develop attitudes, skills and develop the ability to increase knowledge and think critically (Hasjunianti, 2020).

The ability to think in science is closely related to how to find out and understand the universe systematically, which contains concepts, theories or formulas that must be understood in depth. Thus, students are required to be able to think critically in building knowledge with an active role in the learning process. Thinking skills are not innate to students, but thinking skills can be learned and require learning. As for critical thinking indicators derived from critical activities, according to Watson and Glaser, (2012), someone can be said to be able to think critically if they have; 1) an attitude of inquiry and exploration of supporting evidence accurately and comprehensively, 2) knowledge about the validity of inference, abstraction and generalization, and 3) skills in applying this attitude and knowledge (Putri, Fahmi, & Eko, 2021).

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The first indicator of critical thinking is inference, which is a student's activity to assess and analyze whether a given statement is true or false, namely in the form of a conclusion. The second indicator is assumption recognition, at this stage students identify relevant statements or problems, the teacher helps direct students in critical analogies and descriptions from various points of view. The third indicator is deduction which presents initial conclusions. The fourth indicator is interpretation, which requires students to assess the evidence or information provided to decide whether conclusions based on data are guaranteed to be correct. The fifth indicator is argument evaluation, in this stage students evaluate the strength and relevance of arguments in relation to a particular question or problem.

An indicator for drawing conclusions (*inference*), for example, is the ability to assess the probability level of accuracy or truth of a conclusion based on the available information. In accordance with the WGCTA question model (Watson & Glaser, 2002), it can be seen in the table below that inference questions in science material are also presented in the form of statements and several alternative conclusions. To do this, students are asked to assess five different alternative conclusions on a scale of correct (B), possibly correct (MB), insufficient data (DTC), incorrect (S), and possibly incorrect (MS). Examples of WGCTA tests on inference indicators in science learning can be seen in Table 1.

Table 1. Examples of test questions in science material on indicators for drawing conclusions (*Inference*)

Question	Answer B MB DTC MS S
Farmers receive more information from pesticide marketing than from agricultural extension workers, so they forget about the importance of integrated pest control. How to save it naturally? Farmers do not know that the use of chemical insecticides and excessive fertilization can cause pollution. Conclusion: 1. Excessive use of chemical pesticides and fertilization causes air and soil pollution 2. Excessive use of chemical pesticides and fertilization causes water and air pollution 3. Excessive use of chemical pesticides and fertilization causes water and soil pollution 4. Excessive use of chemical pesticides and fertilization causes air and ozone pollution	

In the question below, a statement is presented based on an experiment along with alternative assumptions. Next, students are asked to assess these two assumptions by answering "true" for the assumption that best suits the meaning and context or "wrong" for the assumption that is not appropriate. An example of a WGCTA test on the Assumptions indicator in science learning can be seen in Table 2.

Deduction is the ability to determine whether conclusions are made logically based on available information or data. This ability will really support students in exploring science material. In the table, a statement is presented containing a particular case. Next, students are asked to assess whether the alternative conclusions that have been provided are true or false. An example of a WGCTA test on the Deduction indicator in science learning can be seen in Table 3.

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Table 2. Examples of Test Questions **in** Science Material on *Recognizing* Assumption Indicators

Question	Answer True False
Mrs. Tini was very diligent in applying fertilizer to her garden, but over time the plants in her garden became less fertile. Mrs. Tini began to wonder whether the continuous use of fertilizer was causing the plants in her garden to become less fertile. Assumption: 1. True, because soil nutrients are reduced if excessive fertilizer is used 2. No, because excessive use of fertilizer will increase the soil Ph	

Table 3. Examples of Test Questions in Science Material on *Deduction* Indicators

Question	Answer True False
Statement: Chemicals are man-made. Some man-made things can change the natural land environment to become polluted. Deduction: 1. The natural soil environment is damaged by chemicals 2. Some man-made chemicals can change the environment of polluted land 3. All man-made chemicals can change the natural soil environment to become polluted	

The next indicator is *interpretation,* namely the ability to assess evidence *and* make a decision whether the resulting conclusions guarantee credibility based on the available data. The table above presents a fact, based on that fact, students are then asked to judge whether the conclusions offered are true or false based on the existing facts. The truth is the one that best fits the existing facts. An example of a WGCTA test on the Interpreting Information indicator in science learning can be seen in Table 4.

The final indicator of the WGCTA test is evaluation of arguments, namely the ability to evaluate the strength and relevance of an argument related to a particular issue or problem. In the table below, a short paragraph is presented in case form. In this question, three alternative conclusions are presented which students must assess whether the arguments in the conclusion are strong or weak. An example of a WGCTA test on the Analyzing Arguments indicator in science learning can be seen in Table 5.

As for scoring, each correct answer gets a score of 1 and a wrong answer or not giving an answer gets a score of 0. Next, the score obtained is converted into a value with a range of 0-100 by dividing the score obtained by the total score and then multiplying by 100 (Danaryanti & Lestari , 2017).

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Table 4. Examples of test questions in science material on the interpreting information indicator (*Interpretation*)

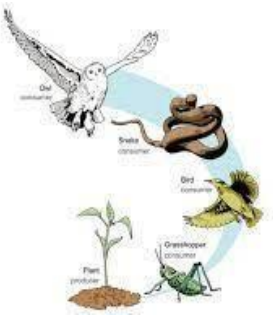
Question	Answer True False
Look at the following picture!  (Source: Docplayer.net) Disruption of the food chain results in the balance between trophic levels and populations in the ecosystem becoming uncontrolled and triggering the extinction of certain species. Conclusion: 1. There will be more and more grasshoppers because food is abundant 2. Owls are decreasing due to limited food availability 3. The population of frogs is decreasing due to limited food availability	

Table 5. Examples of Test Questions in Science Material on the Analyzing Arguments Indicator (*Evaluation Argument*)

Question	Answer Strong Weak
Biodegradable plastic has been widely made and used by the public. This plastic is believed to be able to deal with plastic problems in the environment because the basic material can decompose more quickly. However, *biodegradable* plastic is not completely capable of being destroyed by microorganisms and still leaves small, invisible pieces called microplastics. Conclusion: 1. This is not entirely correct because microplastic particles can inhibit the process of absorbing nutrients in the digestive organs 2. This is appropriate because the basic material of *biodegradable plastic* is very environmentally friendly	

4. Conclusion

Based on the results of the analysis, it is stated that the WGCTA test model with its five indicators is quite relevant to the science material. Thus, the WGCTA test can be developed further and used to assess students' thinking abilities in science material, in 5 indicators namely indicators: Drawing Conclusions (Inference), Assumptions (Recognizing Assumptions), Deduction (Deduction), Interpreting Information (Interpretation), Analyzing Arguments (Evaluation Argument).

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References

Astriani, D., & Nurun, N.I. 2016. Model Pembelajaran Learning Cycle 5E Mengaktifkan Siswa Pada Materi Suhu dan Perubahannya. *Jurnal Penelitian Pendidikan IPA*. 1(2). 71-75.

Danaryanti, A., & Lestari, A. T. 2017. Analisis Kemampuan Berpikir Kritis dalam Matematika Mengacu pada Watson-Glaser Critical Thinking Appraisal Pada Siswa Kelas VIII SMP Negeri di Banjarmasin Tengah Tahun Pelajaran 2016/2017. EDU-MAT: *Jurnal Pendidikan Matematika*, 5(2), 116–126.

Hasjunianti. 2020. Penerapan Pendekatan Sains Teknologi Masyarakat (STM) untuk Meningkatkan Pemahaman Tentang Energi dan Penggunaannya Pada Siswa Kelas IV SDN 024 Salukaili. *Jurnal Kreatif Tadulako Online*. 3(2). 113-128.

Indriani, L., Haryanto., & Gularso, D. 2022. Dampak Model Pembelajaran Problem BasedLearning Berbantuan Media Quizizz Terhadap Kemampuan Berpikir Kritis Mahasiswa. *Jurnal Penelitian dan Pengembangan Pendidikan*. 6(2). 214-222.

Juliyantika, T., & Batubara, H. H. 2022. Trea Penelitian Keterampilan Berpikir Kritis pada Jurnal Pendidikan Dasar di Indonesia. *Jurnal Basicedu*. 6(3). 4731-4744.

Nelvianti & Fitria, Y. 2020. Karakteristik Model Problem Based Learning Berbantuan ELearning Portal Rumah Belajar pada Pembelajaran IPA Tematik. *Pedagogia Jurnal Ilmu Pendidikan*. 18(02). 162-172.

Putri, M.H., Fahmi., Eko, W. 2021. Efektivitas Perangkat Pembelajaran IPA untuk Melatih Keterampilan Berpikir Kritis Peserta Didik SMP pada Materi Pokok Listrik Statis. *Journal Of Banua Science Education*. 1(2).

Putri, M. H., Fahmi., & Wahyuningsih, E. 2021. Efektivitas Perangkat Pembelajaran IPA untuk Melatihkan Keterampilan Berpikir Kritis Peserta Didik SMP pada Materi Pokok Listrik Statis. *Jurnal Of Banua Science Education*. Vol. 1(2). 79-84.

Watson, G., & Glaser, E. 2002. *Critical Thinking Appraisal – UK Edition*. Inggris : Pearson Assessmen.