

Test Instrument Based on Critical Thinking Skills Integrated Javanese Cultural Tradition in Islamic Context



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ABSTRACT: The purpose of this study was to describe the theoretical and empirical feasibility of a test instrument based on integrated critical thinking skills of Javanese local food culture in the Islamic context. This research is a development research with the ADDIE development model. This type of research is descriptive to get the quality of instruments that are valid and reliable theoretically and empirically as a measuring tool for students' critical thinking skills. Data collection uses validation instruments to analyze products carried out by expert validators as data on theoretical validity and reliability. Limited trial data were analyzed using the Rasch model as empirical validity and reliability data. The results of the study stated that all the items developed as test instrument products belonged to the theoretically and empirically valid and reliable categories. This result implies that the integrated test instrument for the meaning of Javanese culture in the Islamic context can be used in learning activities to measure students' critical thinking skills.

KEYWORDS: The instrument based on critical thinking skills, Javanese cultural traditional in Islamic context

I. INTRODUCTION

Critical Thinking Skills

Critical thinking is an activity of analyzing ideas or ideas in a more specific direction, sharply distinguishing, selecting, identifying, studying and developing them in a more perfect direction (Dewi & Prasetyo, 2016). Ennis (2011) critical thinking skills are a process of thinking reflectively and rationally so that individuals can decide what they do or believe. Collaborative critical thinking skills with creative, collaborative, and communicative thinking skills are closely related to the 4Cs, which are essential aspects of 21st century learning that teachers should practice in almost all educational programs (Moser, 2017; Saleh, 2019). In this regard, critical thinking skills are included in the 10 key competencies that have been formulated into Assessment and Teaching of 21st Century Skills (ACT21S) (Binkley et al., 2012). In essence, education wants to create students who have the ability to think critically as the main capital to face the challenges of the 21st century (Purnami et al., 2021). It is important for teachers to teach critical thinking skills which include interpretation, analysis, evaluation, inference, explanation, and self-regulation (Alsaleh, 2020).

HOTS empowerment is also considered important because students are trained to make the best decisions to think critically in analyzing arguments (Abidinsyah et al., 2019). However, there are still studies stating that the critical thinking skills of biology students are low, so they need to be improved (Erwanto, 2020). Low critical thinking skills are characterized by symptoms of difficulty working on high-level questions (C4-C6) and difficulty connecting concepts and problems (Saputra et al., 2019). Empowerment of students' critical thinking skills is not optimal because teachers rarely design HOTS-based learning in their classes. It is recorded that 80% of teachers often develop cognitive level assessments C1 (remembering) and C2 (understanding) to evaluate student understanding (Abidinsyah et al., 2019). In line with that, the instruments on the summative tests carried out by students contain indicators of critical thinking skills in the less category covering interpretation, analysis, evaluation, inference, explanation, and self-regulation (Wulandari et al., 2019). Studies state that critical thinking skills can increase the ability to preserve culture (Othman & Ali, 2023). Local culture that contains wisdom values can be integrated with test instruments to evaluate and improve students' critical thinking skills (Anisa, 2017; Hunaepi et al., 2018).

Javanese Traditional in the Islamic Context of Education

Local wisdom-based learning (LbL) is starting to be seen as a potential innovative learning because it is able to empower critical thinking skills (Putri & Aznam, 2019). LbL is also considered very appropriate for use in Indonesia where this country is known for its diversity of ethnicities, languages and traditions (Albantani & Madkur, 2018). Local wisdom in learning biology is an alternative way so that students can be trained in critical thinking skills and still maintain national identity and have a love for

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local culture (Utami et al., 2018). The teacher's ability to present real phenomena from the surrounding environment into the learning process will increase the meaning of learning (Agra et al., 2019). According to Keraf (2002) that local wisdom is all forms of belief, knowledge, insight or understanding, as well as authentic customs that demand human behavior in life in ecological communities. Local wisdom (*local wisdom*), can be understood as local (local) ideas, values, views that are wise, full of wisdom, of good value embedded and followed by community members (Hunaepi et al., 2020).

Javanese society is a community unit bound by cultural traditions that can still be maintained without conflicting with Islamic teachings (Hartono, 2018). Javanese cultural tradition is an integration between local wisdom from Javanese philosophy and Islamic values which have become the beliefs and insights of the Javanese people to demand behavior to regulate healthy eating patterns (Ahmadi, 2019). The tradition was first taught by walisongo until now it has been passed down by *Kyai* or religious leaders as agents of the production of this tradition as the behavior of Sufis, and are still followed by community members in the globalization era which is dominated by santri as followers of the *Kyai*. The Javanese cultural tradition in the Islamic context that will be presented in the developed test instrument is *ngeruh* fasting. *Ngeruh* fasting is fasting withholding food, drink, and lust from dawn to sunset, when breaking the fast, leaving all kinds of food originating from living animals, such as meat, fish, poultry, and their preparations (Ariyanti, 2019). *Ngeruh* fasting inherited to teach the value of wisdom as education for individuals who have implemented it (Suyadi & Albar, 2018). Like the implementation of *ngeruh* fasting at the Lirboyo Islamic boarding school HM Al Mahrusiyah can train yourself to love and be close to God by refraining from actions that are forbidden by God to be able to recognize yourself, be patient and grateful in every condition, and be responsible for the diploma given by the *Kyai*. Education that contains *ngeruh* fasting to improve the morals of the santri through a diet of restraint by limiting the consumption of animate animals and their processed products for some time according to the practice of the clerics (Fiddari, 2020).

Javanese Traditional Digestive System

In addition to the serenity of life from changes in the attitude of the perpetrators, Javanese cultural traditions are also beneficial for health because they can affect the human digestive system. In the current modern era, Indonesian people in general also carry out Javanese cultural traditions without realizing it, but with a different term, namely *ngeruh* fasting. *Ngeruh* fasting have the same diet as a vegetarian diet or plant-based diet (Priyamana et al., 2021). Individuals with a vegetarian diet have healthier digestive system conditions when compared to non-vegetarian diets. Backed by studies Ostrowski et al. (2018) that respondents who are transiting to a vegetarian diet have reported low Gastrointestinal symptoms experienced after following a vegetarian diet include bloating, heartburn and heartburn or vomiting, poor appetite, diarrhea or constipation. Furthermore, Xiao et al. (2021) argues that the nutrition obtained by vegetarian dieters can regulate the abundance of human gut microbes so as to control gut physiology, namely modulating intestinal immunity, protecting the integrity of the intestinal barrier, preventing colonization of pathogens.

The Instrument Based on Critical Thinking Skills

In educational research, there are many studies on critical thinking skills, especially in the context of Biology education. Several studies have focused on developing teaching materials to train critical thinking skills on digestive system material (Khikmah, N, & Susantini, 2019; Megawati et al., 2019), and other studies have discussed the development of test instruments mapping students' critical thinking skills (Khayati & Raharjo, 2020). There is also research discussing local wisdom integrated worksheets to improve critical thinking skills (Hunaepi et al., 2018). Nevertheless, among all these studies, no one has tried to develop a test instrument to measure critical thinking skills related to interpreting Javanese cultural traditions in the Islamic context from the digestive system point of view. Based on the description above, this research will produce a test instrument with each item because there is a stimulus for the phenomenon of Javanese cultural traditions in the Islamic context, especially *ngeruh* fasting and item questions contain indicators of critical thinking according to Facione including interpretation, analysis, evaluation, inference, explanation, and self-regulation. This study also aims to determine the feasibility of a test instrument based on critical thinking skills integrated with the meaning of Javanese cultural traditions in the Islamic context on digestive system material based on theoretical and empirical validity and reliability.

II. METHODOLOGY

This type of research is development research, namely to produce a test instrument based on critical thinking skills that integrates the meaning of Javanese cultural traditions in the Islamic context on the digestive system. The development model refers to the ADDIE development model consisting of five stages, namely Analysis, Design, Development, Implementation, Evaluation (Seels et al., 1998). The Analysis phase aims to analyze the curriculum, student characteristics, Javanese cultural traditions in the context of Islamic *ngeruh* fasting, and digestive system material to produce a grid formulation of test instruments consisting of critical thinking skills indicators, digestive system material indicators, question indicators, item items, and answers. The Design Stage aims to produce a draft I in the form of simple multiple choice (only 1 correct answer) and complex multiple choice (more than 1 correct answer). The Development stage was carried out through the process of draft I being reviewed by the supervisor and revision I was carried out to produce draft II, then draft II was reviewed by the validator after that revision II was carried out to produce draft III. The Development stage aims to produce a test instrument based on critical thinking skills integrated with the

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meaning of Javanese cultural traditions in the Islamic context that are theoretically valid and reliable. In the Implementation phase, limited trials of test instruments were developed to determine the quality of the questions based on empirical validity and reliability. The Evaluation stage aims to analyze and revise the test instruments that have been developed.

The data analysis technique used is the descriptive percentage technique and the Rasch model. Descriptive percentage techniques to analyze the results of expert validators (expert judgment) include components of content, construct, and language assessment. Descriptive percentage technique produces theoretical validity and reliability. Data was obtained through the results of filling in the validation instrument which was carried out by giving an assessment of each question using 4 Likert scales, namely (1) less, (2) sufficient, (3) good, and (4) very good (Riduwan, 2010). Determinants of validity for each aspect of the criteria are formulated as follows:

$$\text{Validity score (\%)} = \frac{\text{skor total yang diperoleh}}{\text{skor maksimal}} \times 100\%$$

Data validity of the test instrument that has been given a validator is then categorized using the categories according to Riduwan (2010) in the following table:

Table 1. Interpretation of Theoretical Validity

Percentage Validity(%)	Validity Interpretation
$81,50 \leq P \leq 100,0$	Very Valid
$62,75 \leq P \leq 81,49$	Valid
$44,00 \leq P \leq 62,74$	Quite Valid
$25,00 \leq P \leq 43,99$	Less Valid
$00,00 \leq P \leq 24,99$	Invalid

Source: adapted from Riduwan (2010)

The average value of the theoretical validity and reliability of the developed instrument is determined based on the value given by the validator. The reliability of learning devices is calculated using Borich's percentage agreement equation, an instrument is said to be reliable if it has a percentage agreement above 75%, or as much as 75% of the average score of validators in valid categories (Borich, 1994)

$$\text{Percentage of agreement} = 1 - \left[\frac{A-B}{A+B} \right] \times 100\%$$

Information:

A: the highest score given by the validator

B: the lowest score given by the validator

The Rasch model is assisted by the Winstep program to analyze data from limited trials on 34 students using the Google form to obtain empirical validity and reliability data. Empirical validity is determined from Item Fit Order meeting 2-3 criteria for the value of the outfit mean square (MNSQ), the outfit Z-standard (ZSTD), and the point measure correlation (Pt Mean Score). Meanwhile, empirical reliability is determined from the value of Alpha Cronbach, Person Reliability, and Item Reliability.

Table 2. Data Analysis Criteria for Empirical Validity and Reliability

	t	Score	Criteria
Empirical Validity	Outfit MNSQ	$0.5 < \text{MNSQ} < 1.5$	Accepted
	ZSTD	$-2,0 < \text{ZSTD} < +2,0$	Accepted
	Pt Mean Score	$0,4 < \text{Pt Mean Corr} < 0,85$	Accepted
Empirical Reliability	Alpha Cronbach	$< 0,5$	Very Poor
		$0,5-0,6$	Poor
		$0,6-0,7$	Fair
		$0,7-0,8$	Good
		$> 0,8$	Excellent
Person Reliability and Item Reliability	$< 0,67$	Poor	
	$0,67-0,80$	Fair	
	$0,8-0,90$	Good	
		$0,91-0,94$	Excellent

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t	Score	Criteria
	> 0,94	Special

III. RESULT

The results showed that the test instrument consisting of 10 items had been declared valid and reliable theoretically and empirically. The following are examples of items developed as a means of evaluating students' critical thinking skills. Based on Figure 1, the items developed consist of information on Javanese traditions in the Islamic context, namely fasting ngeruh, data on the similarity of foodstuffs consumed by fasting practitioners and vegetarians which are presented in tabular form, and a bar chart containing data on respondents who have reported changes in status. health before and after changing the vegetarian diet. The following is a description of the 10 items in the test instrument which contain indicators of critical thinking skills according to Facione (2011).

Theoretical Validity And Reliability

The main characteristics that must be possessed by measuring instruments can fulfill the characteristics of validity, reliability, and level of usefulness (Gronlund & Brookhart, 2009). Making development research instruments, validity and reliability are two things that must be considered (Setyosari, 2013). The validity and reliability of the test instrument based on critical thinking skills integrated with the meaning of Javanese culture in the Islamic context on the aspects of content, construction, and language will be presented in Table 4. as follows:

Table 3. The Validity and Reliability Aspect of the Test Instrument

No.	Aspect	Validator score		Validity %	Category	Reliability %	Category
		V1	V2				
	Content	2.83	3.11	74.38	Valid	92	Reliable
	Construction	2.95	3.31	78.81	Valid	94	Reliable
	Language	3.00	3.22	77.81	Valid	96	Reliable
	Average			76.84	Valid	94	Reliable

Keterangan:

V1: Validator 1

V2: Validator 2

Table 4 shows the validator's assessment of the validity of the aspects of content, construction, and language in the valid category because the value obtained is above 62.75%. Overall the validity of obtaining an average result of 76.84% valid category, so that the test instrument is declared feasible to be implemented in measuring students' critical thinking skills. The results of validity based on three aspects, namely content, construction, and language obtain validity in the valid category. Eligibility validity is based on Ridwan that the test instrument is declared valid and can be used if it obtains validity results above 62.75% (Riduwan, 2010).

While the reliability of the test instrument obtained an average of three aspects, namely 94%, so it is classified as reliable. This is based on the provisions of inter-observer agreement that an instrument can be said to be reliable if the value of inter-observer agreement is above 75% (Borich, 1994). So that the quality of the items in the instrument developed has good reliability and can be used in learning to measure students' critical thinking skills.

The details of the validity and reliability of each item in the test instrument are presented in Table 5 which also serves as a reference in developing the developed test instrument. Based on Table 5, the results of the validity of the 10 item questions developed obtained results above 62.75%. So that all items are declared valid, therefore it is appropriate to be used to measure students' critical thinking skills. This refers to Ridwan's provisions that the test instrument can be used in the learning process if it obtains validity results above 62.75%, meaning that the test instrument designed is stated to be valid (Riduwan, 2010). According to Table 5, it was found that the value inter-observer agreement on 10 items was above 75% in the reliable category. This is based on the terms of the inter-observer agreement that the instrument can be used if the value of inter-observer agreement is above 75% (Riduwan, 2010). Therefore the reliability of the 10 items in the designed instrument can be used in learning to measure critical thinking skills.

Table 4. The Validity and Reliability of 10 Item

Item	Validity (%)	Category	Percentage Agreement (%)	Of Category
75.93		Valid	96	Reliable
75.70		Valid	96	Reliable
78.94		Valid	91	Reliable
78.70		Valid	92	Reliable
76.62		Valid	95	Reliable
80.09		Valid	91	Reliable
75.81		Valid	94	Reliable
76.27		Valid	94	Reliable
76.50		Valid	93	Reliable
74.77		Valid	95	Reliable

Empirical Validity And Reliability

The theoretical feasibility of the developed test instrument is known, after that the implementation phase is carried out with limited trials to find out empirical validity and reliability presented in Table 6 as follows:

Table 5. The Quality of the Item Empirically

	Score
INFIT MNSQ	0.98
OUTFIT MNSQ	1.05
INFIT ZSTD	-0.1
OUTFIT ZSTD	0.1
Measure Item	0.00

The results of Table 6 can be explained that the INFIT and OUTFIT MNSQ values obtained sequentially are 0, 98 and 1.05 means that the test instrument developed according to the Rasch model to measure student competence is in a good category, because the score is close to the ideal value, namely 1.00 and the value lies between the intervals of $0.5 < \text{MNSQ} < 1.5$. The INFIT and OUTFIT ZSTD values are -0.1 and 0.1 respectively, which means that the instrument has good quality, because it is close to the ideal value of 0.0 and the value between the intervals is $-2.0 < \text{ZSTD} < 2.0$. The average value of measure items is 0.00, which is basically the average value of measure items is always 0.00.

Table 6. Empirical Validity With Rasch Model on Fit Order Items

Item	Outfit		Pt Measure Corr	Category
	MNSQ	ZSTD		
1	0.44	-0.57	0.79	Valid
2	0.42	-0.49	0.81	Valid
3	1.27	0.61	0.59	Valid
4	0.64	-0.47	0.68	Valid
5	2.34	1.33	0.60	Valid
6	0.98	0.17	0.60	Valid
7	0.70	-0.35	0.67	Valid
8	1.26	0.57	0.68	Valid
9	0.31	-0.72	0.82	Valid
10	2.13	1.48	0.59	Valid

Based on the Rasch analysis on Fit Order Items, it was found that the 10 items developed were classified as valid because the valid item met 2-3 criteria accepted from the MNSQ outfit score of less than 0.5 and not more than 1.5, the ZSTD outfit got a score of less than -2.0 and not more of +2.0, and the Pt Mean Score scores between 0.4 to 0.85. Based on Table 7, the 5 questions do not meet the MNSQ criteria, but meet the ZSTD and Pt Mean Score criteria, so the 5 questions can be defended.

Table 7. Empirical Reliability on Fit Order Items

Types of Reliability Tests	Score	Category
Alpha Cronbach	0.90	Excellent
Item Reliability	0.71	Fair
Person Reliability	0.00	Poor

Based on the results in Table 8 it can be explained that the item instrument developed has a Cronbach Alpha reliability of 0.90, which means that the interaction between students and the item as a whole is excellent. The personal reliability value of 0.00 means that the consistency of the student's answers is categorized as poor. While the item reliability value is 0.71, it means that the quality of the items in the instrument developed has fair reliability aspect.

IV. DISCUSSION

This development research has produced a test instrument as an evaluation tool for critical thinking skills integrated with the meaning of Javanese cultural traditions in the Islamic context on digestive system material that is theoretically and empirically valid and reliable. The test instrument contains 10 multiple choice questions in the form of multiple choice (only 1 correct answer) and Complex Multiple Choice (more than 1 correct answer). The test instrument developed reflects indicators of critical thinking skills according to Facione, namely interpretation, analysis, evaluation, inference, explanation, and self-regulation (Facione, 2011).

Each item contains the phenomenon of Javanese tradition in the context of Islam, especially fasting, which is currently being carried out by many people as a form of preserving Javanese culture. The fasting person avoids consuming meat from animate animals, therefore the Javanese tradition implementers consume fruits, vegetables, nuts, seeds, cereals, milk, and eggs (Ariyanti, 2015; Fiddari, 2020; Hartono, 2018). Based on the food ingredients consumed by the fasting person, it is the same as the vegetarian diet (Sholichah, 2021). Consumption of predominantly vegetable foods can affect the health of the human digestive system (Ostrowski et al., 2018). The vegetarian diet contains macro-micronutrients that are naturally derived from nature, thus containing less ultra-processed foods, characterized by high bioavailability of nutrients for easier assimilation in the small intestine. Therefore, the nutrients consumed in a vegetarian diet easily reach the large intestine intact, and are properly utilized by the microorganisms in the large intestine (Oliphant & Allen-Vercoe, 2019). Thus, the diversity of the colon microbiome is higher in vegetarians when compared to omnivores. One example, high dietary fiber in vegetarian food can stimulate an increase in fiber-degrading bacteria, namely *Lactobacillus* inhibits the colonization of pathogenic bacteria by reducing the pH in the intestinal lumen because lactic acid is produced during the metabolism of dietary fiber, thereby reducing the abundance of *Bifidobacterium* in the human intestine (Xiao et al., 2022).

The test instrument was designed to display fasting as a stimulus for questions, reinforced by research data presented in the form of tables, bar charts, readings related to the vegetarian diet as a food ingredient consumed by fasting people and its effects on the human digestive system. Students are required to think critically in assessing and reasoning in depth on the phenomenon of Javanese cultural traditions through a combination of various stimuli that have been presented in questions that are systematically arranged and organized. Johnson (2010), supports that the questions presented must be put forward in order to help students research and understand every phenomenon, problem, issue, project or decision. The test instrument developed makes students think about how to solve the problems they face, in the problem solving process a high-level thinking process occurs, namely critical thinking (Johnson et al., 2009). The findings of this study are in line with Ramdani et al. (2021) that the potential for local wisdom can be used as a stimulus to engage in students' critical thinking skills.

Systematic item questions affect the results of the validator according to the content, construction, and language aspects, namely an average validity of 76.84% and a reliability of 94%, so that the test instrument developed is included in the valid and reliable categories to be used in the learning process as a measuring tool for thinking skills critical. In line with the findings of Mei & Seto (2020) that each item in the test instrument can be used to measure competence if it has been declared valid and reliable. Supported by Pratiwi et al. (2022) that the test instrument has been declared valid and reliable and can be used to measure critical thinking skills. The feasibility of a test instrument based on integrated critical thinking in the meaning of Javanese tradition in the Islamic context was tested through the development stages carried out by the material validator and educational evaluation validator which included content, construction, and language aspects (Nawawi & Wijayanti, 2018). Reliable test instrument reliability results are related to multiple choice forms, namely multiple choice (only 1 correct answer) and complex multiple choice (more than 1 correct answer), where the multiple choice test form provides better reliability for mapping critical thinking (Dewi & Prasetyo, 2016).

The quality of the developed test instrument is also determined by the results of limited trials analyzed by the Rasch model. In line with Azizah & Wahyuningsih (2020) that test instruments can be analyzed using the Rasch model to determine validity and reliability. Based on the overall analysis of test instruments from INFIT MNSQ, OUTFIT MNSQ, INFIT ZSTD,

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OUTFIT ZSTD data, Measure Items obtained good results according to measuring critical thinking skills. Supported by the results of the empirical validity of each item as a product of the test instrument developed, it obtained 10 fit questions from the Outfit MNSQ, ZSTD, and Pt Mean Score scores. The validity of the test instrument is suitability, correctness, and usability which are interpreted based on the results of data analysis of the instrument used (Endang et al., 2020). Based on the empirical reliability of Cronbach's alpha value, person reliability, and item reliability, the results are reliable, meaning that the test items developed are consistent for measuring something being assessed, in this study, namely critical thinking skills. The higher the level of reliability, it can be understood that the scores obtained by students are determined by the student's ability to work on problems (Erfan et al., 2020). According to the results of empirical validity and reliability using the Rasch model, it states that the test instrument developed has valid and reliable results, so that it can be used in learning as a measuring tool for critical thinking skills.

CONCLUSION

Based on the research that has been done, it can be concluded that the test instrument based on critical thinking skills integrated with the meaning of Javanese culture in the Islamic context that has been developed consists of ten items that have been analyzed by expert lecturers to produce a theoretically valid and reliable test instrument. While the results of the limited trial were analyzed using the Rasch model which stated that the test instrument developed consisted of 10 fit and reliable items. Therefore, the developed test instrument can be used to measure students' critical thinking skills.

ACKNOWLEDGMENT

There are still opportunities for investigation despite research limitations. Especially for individuals who are interested in conducting additional studies on the development of test instruments in various local wisdoms, as well as other areas of thinking skills that can be examined to see larger and more diverse findings. Positive results on critical thinking skills have also been shown by research so that teachers can implement this product as a learning evaluation tool.

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