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Item Analysis of Creative Thinking Skills Using Rasch Modelling in the Ethnozoology of Traditional Foods

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ABSTRACT

Prospective biology teachers need creative thinking skills to address biodiversity issues, such as traditional food practices. Measuring these skills requires valid, reliable, and appropriate instruments. This study evaluated a creative thinking skills instrument in traditional food ethnozoology using the Rasch model. Employing a quantitative descriptive method, the instrument contains 15 multiple-choice questions based on six creative thinking indicators: curiosity, fluency, originality, elaboration, imagination, and flexibility. A pilot test involved 45 prospective biology teachers. Data were analyzed with the Winsteps application to assess item difficulty, item fit, bias detection (DIF), and reliability. Results showed item difficulty ranged from ±3.69 logits, with two items rated as difficult and three as easy. Thirteen items fit well, one was borderline, and one required revision. DIF analysis showed no significant gender bias. Item reliability was 0.86 (good), person reliability was 0.63 (poor), and Cronbach's alpha was 0.71 (fair). The instrument meets validity and reliability criteria, but adding more difficult items may improve its discrimination among high-ability respondents. Thus, the instrument can be used to diagnose creative thinking skills specifically related to traditional food ethnozoology in prospective biology teachers, helping to identify areas for further development.

INTRODUCTION

Prospective teachers with creative thinking skills tend to design innovative learning activities (Listiani et al., 2021). Gurak-Ozdemir et al. (2010) note that such teachers can help students not only understand concepts but also analyze, evaluate, and solve real-life scientific problems. Thus, developing creative thinking in prospective biology teachers is crucial, as it uncovers students' ability to produce original, relevant ideas (Jumrodah et al., 2021). However, measuring creative thinking is more accurate if instruments

match the material's context (Rachmawati et al., 2018; Sihotang & Bakar, 2023). Since each discipline has unique epistemological features and problem types, assessing creative thinking should follow a scientific approach to understanding and solving phenomena (Doncean & Doncean, 2022).

Prospective biology teachers need to develop creative thinking skills to understand, assess, and make scientific decisions about global issues, including biodiversity (McLure et al., 2024). Biodiversity issues challenge teachers to generate new ideas for addressing ecological problems such as the exploitation of natural resources, habitat degradation, and species conservation (Id-Babou et al., 2023).

Designing instruments that help develop contextual creative thinking skills related to biodiversity allows prospective teachers to not only grasp the theoretical concept of biodiversity but also analyze, evaluate, and create ethical and sustainable scientific solutions. For example, educators can use the practice of consuming animals as traditional food in local communities to assess creative thinking skills.

The use of animals in traditional foods means using animal species consumed for generations as part of a community's cultural identity, knowledge systems, and nutrition (Al-Mustafa et al., 2025; Septiani & Silalahi, 2024). This practice goes beyond food, reflecting environmental relationships, symbolic values, beliefs, and social structure (Syaputra et al., 2025). Animals eaten by local communities may be pets, livestock, or wildlife. For many, consuming wildlife or protected animals represents cultural identity, social status, traditional medicine, or an alternative protein source (Alves et al., 2013; Zukmadini et al., 2024). However, this practice can cause animal population declines, zoonotic disease risk, ecosystem disruption, and species extinction if poorly managed (Milbank & Vira, 2022).

The use of animals in traditional food is an issue that requires flexible and innovative thinking. Scientific and socio-cultural problems arise from this practice. In ethnozoological studies, biology, ecology, and cultural anthropology are connected. This demands a comprehensive understanding of both scientific and socio-cultural dimensions (Hariohay et al., 2023). Learners should understand the types of animals used in traditional cuisine. They must also consider sustainability, ethics, and species conservation. This situation requires producing innovative ideas, expanding on knowledge, and showing flexibility in thought. Together, these skills refer to creative thinking (Greenstein, 2012).

Rasch modelling can be used to develop instruments for creative thinking skills in traditional food ethnozoology. This method has advantages over classical analysis. It can map respondent ability

(person ability) and the difficulty of each question item (item measure) on the same logit scale (Sumintono & Widhiarso, 2015). Creative thinking skills are complex cognitive abilities. They involve high-level processes such as analysis, synthesis, evaluation, and the generation of original, contextually relevant ideas (Dilekçi & Karatay, 2023). Rasch modelling is suitable for measuring high-level thinking skills because each item has a unique level of complexity. Rasch analysis ensures each item contributes proportionally to the variable being measured (Chan et al., 2021).

Instruments for assessing creative thinking skills have been widely developed, but none are specifically related to the theme or ethnozoological context of traditional food. Therefore, this research focuses on developing valid and reliable instruments for creative thinking skills grounded in ethnoscience or ethnobiology. The development of these instruments is important to help educators and researchers identify and support the creative thinking profiles of prospective biology teachers in traditional food ethnozoology, contributing to improved instructional strategies and curriculum design.

RESEARCH METHODS

Study Design

This study used a quantitative descriptive method to determine the quality of the instrument grain and the overall quality of the instrument using Rasch modelling. The research focuses on analysing the question items and the overall quality of the creative thinking test instruments. Analysis using Rasch modelling was carried out on 15 multiple-choice questions developed based on six indicators of creative thinking skills: Curiosity, Fluency, Originality, Elaboration, Imagination, and Flexibility (Greenstein, 2012).

Procedure

The research began by developing creative thinking skills. The development of questions is based on indicators of creative thinking skills, as outlined by Greenstein (2012). The questions developed have undergone a validation test involving the judgments of three experts. After the validation test, an empirical trial was conducted involving 45 prospective biology teachers at the University of Bengkulu.

Data Collection

In this empirical trial, 45 students were asked to answer 15 multiple-choice questions. The students' answers were then analysed using the Winsteps 5.7.1 application. The parameters analysed included 1) question item analysis, which included the difficulty level of the question item, the level of item fit, and the detection of bias items; and 2) instrument analysis,

which includes reliability values, person reliability, and item reliability.

Data Analysis

The instrument test results were obtained from the Rasch modelling output using Winsteps version 5.7.1. These results were then analysed following established guidelines to evaluate the quality and performance of each test item.

Difficulty Level of Question Item (Item Measure)

The difficulty level of the question item is analysed using the Logit value generated from the table output. A high logit value indicates a high level of difficulty for the question, and vice versa, a low logit value indicates a low level of difficulty.

Fit Item

The level of fit items was analyzed based on the values of OUTFIT means-square (MNSQ), OUTFIT Z-standard (ZSTD), and point measure correlation (PT-MEASURE CORR). The criteria for assessing the fit items are shown in **Table 1.**

If the values of the OUTFIT mean-square (MNSQ), OUTFIT Z-standard (ZSTD), and point measure correlation (PT-MEASURE CORR) values are outside the threshold set in Table 1, then the question can be said to be unfit.

Table 1. Assessment criteria for the level of suitability of question items

Assessment Criteria	Amount of Value
Accepted means-square (MNSQ) OUTFIT value	0.5 < MNSQ < 1.5
Accepted Z-standard (ZSTD) values	-2.0 < ZSTD < +2.0
Point measure correlation value (PT-MEASURE CORR)	0.4 < PT MEASURE CORR < 0.85

(Boone) *et al*., 2014)

Bias Detection

Bias detection aims to ensure that each question item truly measures a person's ability, regardless of their group background. In this study, bias item detection was analyzed across gender groups (male and female students). The analysis of bias detection is based on the probability values generated by Rasch modeling. If the probability value for a question item is below 5% (0.05), the item is considered biased (Sumintono & Widhiarso, 2015).

Person Reliability and Item Reliability Analysis

This analysis is used to determine the consistency of respondents' answers and the quality of the instrument's items. The assessment criteria used are listed in **Table 2.**

Instrument Reliability Analysis

The reliability of an instrument is assessed using Cronbach's alpha. The assessment criteria used are listed in **Table 3.**

Table 2. Person reliability and item reliability assessment criteria

Person Reliability and Item Reliability Criteria	Value of Person Reliability and Item Reliability
Poor	< 0.67
Fair	0,67-0,80
Good	0,80-0,90
Very good	0,91-0,94
Excellent	>0.94

(Fisher, 2007)

Table 3. Reliability criteria based on Cronbach's alpha

Cronbach's alpha	Criteria
< 0,5	Poor
0,5-0,6	Fair
0,6-0,7	Good
0,7-0,8	Very good
>0,8	Excellent

(Sumintono & Widhiarso, 2015)

RESULTS AND DISCUSSION

The development of instruments was carried out using indicators of creative thinking skills, according to Greenstein (2012), which included Curiosity, Fluency, Originality, Elaboration, Imagination, and Flexibility. The question instrument was developed within the ethnozoological context of traditional food, which emphasises the use of animals in local cuisine. The test question items can be found in **Table 4.**

Table 4. Question items for creative thinking skills in the context of ethnozoology of traditional food

Question Item Number	Question Item	Indicators of Creative Thinking Skills
S1	Local communities in various Asia-Pacific countries, such as Bangladesh, Thailand, Vietnam, China, and even Indonesia, still consume bat meat as part of traditional medicine and religious rituals. The following question is most relevant and demonstrates scientific curiosity about this phenomenon.	Curiosity
S2	In one area, the younger generation is beginning to abandon traditional foods derived from wild animals. This shift prompts questions about the transmission of cultural values and local ethnozoological knowledge. Given these dynamics, which of the following statements best demonstrates scientific curiosity about the ethnozoology of traditional foods?	Curiosity
S3	In mountainous areas, communities traditionally cook langur meat during harvest celebrations, believing it brings blessings and honours ancestors. With the langur population declining because of poaching and land conversion, what research-based approach can a biology student propose to help the community maintain this tradition while supporting langur conservation?	Fluency
S4	Here are several steps that may help reduce the consumption of turtles by local communities during traditional ceremonies: 1. Replacing a live turtle with an artificial symbol 2. Inserting conservation messages into traditional ceremonies 3. Catching a limited number of turtles 4. Holding hatchling release activities as part of the ritual The following number indicates which actions align with the conservation of turtles:	Fluency
S5	Some areas still use wild animals in traditional dishes. While tied to culture, this raises environmental, ethical, health, and sustainability issues. What are the environmental and sustainability problems with using animals in these culinary practices?	Fluency
S6	If asked how to replace rare animal-based foods, what solution would you suggest?	Originality
S7	How can substitutes for rare animals in traditional foods be introduced so the public can accept them widely?	Originality
S8	Growing awareness of environmental, health, and animal welfare issues has led people to question the use of animal ingredients in traditional cuisine. The key pros and cons of using animal ingredients in traditional foods are as follows:	Elaboration
S9	In some areas, people make satay from endangered birds, a tradition that reflects local wisdom but threatens the species. The government wants to preserve the culture without harming the bird population. What creative approach best addresses this challenge?	Elaboration
S10	Coastal communities in an area have a tradition of hunting and cooking whale meat, which represents their local culture and knowledge. As a biology student familiar	Imagination

Question Item Number	Question Item	Indicators of Creative Thinking Skills
	with emerging technologies, what imaginative ways can you suggest to preserve these cultural values and traditions while considering future developments?	
S11	Teaching local communities to stop using endangered animals is challenging. The reason is that the approach is often too formal, less engaging, and does not fit with local customs. Because of this, messages about sustainability and food alternatives are poorly understood or not accepted. In this case, the *least relevant way* to educate local communities about sustainable traditional food is ...	Imagination
S12	Imagine you act as a liaison between ecologists and local communities. While respecting local culinary traditions, what ideas can you offer to convey the ecological impact of using rare animals in traditional cuisine in a way that is easily understood and accepted by the public?	Imagination
S13	A coastal community serves turtle curry at ceremonies, but turtles are now protected due to population decline. How can a biology educator address tradition, law, and sustainability?	Flexibility
S14	On a small island, burning a turtle at weddings symbolises courage. Environmental activists oppose it, while fishermen defend tradition. As a dialogue facilitator, what adaptive approach would you take?	Flexibility
S15	An international food festival invites indigenous groups from Indonesia to share dishes made from local birds that once showed a king's power. Now, the bird is rare and a global conservation symbol. As a community representative, how do you make smart choices?	Flexibility

According to **Table 4**, there are two questions each for the Curiosity, Originality, and Elaboration indicators, and three questions each for the Fluency, Imagination, and Flexibility indicators. Although creative thinking skills are often measured through open-ended questions (e.g., essays), product assessments, and questionnaires (Rusnayati et al., 2019; Karunarathne & Calma, 2024), they can also be assessed with multiple-choice questions tailored to the specific context or concept (Suherman & Vidákovich, 2022).

In this study, the multiple-choice questions used to measure creative thinking skills are not just about producing or choosing an idea freely. The multiple-choice questions developed will train students to choose and assess the most creative alternative answers, appropriate to the problem's context, and to understand complex situations with a strong reason.

Shively et al. (2018) state that creative thinking is measured not only by the ability to argue or generate ideas, but also by the ability to evaluate, select, and refine innovative, appropriate solutions within specific limits. In traditional food ethnozoology, creative thinking requires novelty, cultural appropriateness, ecological sustainability, and socio-economic considerations. Multiple-choice items using authentic scenarios can measure students' ability to evaluate creative solutions. This approach aligns with Álvarez-Huerta et al. (2025), who state that creativity involves evaluating and selecting actionable solutions

while considering cultural, ecological, and socio-economic factors.

Wright Map

Instrument tests conducted on 45 prospective biology teacher students using Rasch modelling yielded an initial analysis in the form of a Wright map (Person-Item Map), shown in Figure 1. Based on Figure 1, the respondents' abilities range from −1.2 logit to +3.5 logit. The majority of respondents were concentrated in the 0.5–2.5 logit range. Six respondents had high abilities (10L, 26P, 29P, 30P, 34P, 40P), with a logit value above +3. This indicates that the six students have high abilities, or that their abilities are far above the average difficulty of the items. The most difficult items are items 6 (S6) and 12 (S12).

According to the Wright Map (Figure 1), students' abilities are above the logical value for questions 6 and 12. The 6 respondents are likely to answer all questions correctly, so the instrument is not challenging for them, which may cause a ceiling effect. Piussi et al. (2025) state that a ceiling effect occurs when items are too easy for the respondent's ability, reducing the instrument's usefulness for those with high ability. Therefore, this instrument is suitable for moderately able groups but does not effectively measure those with high academic ability.

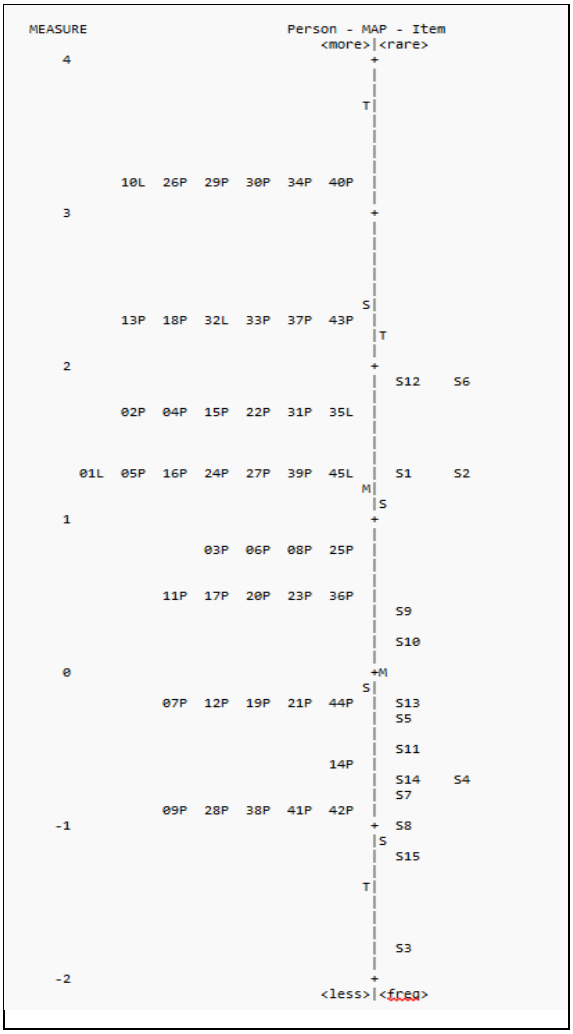

Figure 1. Wright person map instruments of creative thinking skills in the ethnozoological context of traditional food

Figure 1 shows that question 3 (S3) is the easiest, with a logit value around -2, allowing all respondents, even those with low abilities, to answer it. Five respondents with low ability (09P, 28P, 38P, 41P, 42P) had logit values around -1. On the Wright map, these five are still above the S8, S15, and S3 items.

Five students with low abilities answered all three items, indicating no floor effect. A floor effect occurs when many respondents score at the lowest level,

making it difficult to distinguish among low-ability respondents (Medvedev & Krägeloh, 2025). Recognising the absence of a floor effect sets the stage for understanding how item difficulty is measured within the instrument.

Difficulty Level of Creative Thinking Skills Questions

Higher logit values correspond to more difficult questions. Rasch analysis uses a logit scale with equal intervals to compare question difficulty. **Table 5** presents the difficulty of creative thinking questions in traditional food ethnozoology. The most difficult items, S6 and S12 (+1.94 logits), were answered correctly by only 16 of 45 students. In contrast, the easiest item, S3 (−1.75 logits), was answered correctly by 41 of 45 respondents.

The analysis showed that the question of creative thinking skills in the context of traditional food ethnozoology has a difficulty level of ≈ 3.69 logits. This range is quite good. However, compared to the Wright Map in **Figure 1**, it still falls short of reaching very high-skilled respondents, so the potential ceiling effect remains. Based on the order of the logit value, the difficult item questions (> +1 logit) are found in items S6, S12, S1, and S2. Medium item questions (−1 to +1 logit) are found in items S2, S9, S10, S13, S5, S11, S4, S14, and S7. Very easy item questions (< −1 logit) are found in items S8, S15, and S3.

Table 5. Difficulty level of creative thinking skills questions

Question Item Number	Total Score	Logit Value	Difficulty level of the question
S6	16	1.94	Difficult
S12	16	1.94	Difficult
S1	21	1.33	Difficult
S2	21	1.33	Difficult
S9	29	.36	Medium
S10	30	.23	Medium
S13	33	-.18	Medium
S5	34	-.33	Medium
S11	35	-.49	Medium
S4	36	-.65	Medium
S14	36	-.65	Medium
S7	37	-.83	Medium
S8	38	-1.02	Easy
S15	39	-1.23	Easy
S3	41	-1.75	Easy
Average value of items: .00			
Item logit standard deviation value: 1.12			
Item difficulty range ≈ 3.69 logit			

Most questions cluster around the middle logit value (−1 to +1). This test design targets respondents with moderate ability. Psychometrically, it provides maximum measurement information near average ability, but loses discriminating power with high- and low-ability respondents.

The findings are in line with the mistargeting on the Wright Map **(Figure 1)**, which shows the item's distribution centre is not aligned with the respondent's ability distribution centre. As a result, respondents with high ability tend to reach the maximum score faster, triggering the ceiling effect. Therefore, it is necessary to develop items with a difficulty level > 2 logits. In accordance with Boone & Staver (2020), adding more difficult items is needed to

expand the scope of measurement and minimise the potential ceiling effect.

Item Fit

The level of item fit was analysed using OUTFIT means-square (MNSQ), OUTFIT z-standard (ZSTD), and point measure correlation (PT-MEASURE CORR). If any question item fails to meet the three criteria in **Table 1**, it is considered unsuitable and needs revision. The Rasch analysis results for item fit are shown in **Table 6**.

Table 6 identifies S6 as an unfit item, with an OUTFIT MNSQ of 2.04, ZSTD of 3.02, and a low PT-MEASURE CORR of 0.12. These values indicate that S6 does not align with respondent ability patterns or adequately represent the constructs. Previous analysis showed S6 is particularly difficult, requiring high levels of creative thinking and originality.

Further Rasch analysis showed a severe misfit for S6, indicating the response pattern did not match the probability pattern expected by the Rasch model. According to Batchelder et al. (2020), each answer is influenced by two main parameters: respondent ability and item difficulty.

Item S6 is designed to measure the originality aspect of solutions for replacing traditional foods made from rare animals. The need to produce rare and unique ideas fits with indicators of originality in a divergent thinking framework. However, the context of questions specific to traditional foods and rare animals influences responses not only by their originality but also by the domain of knowledge related to food culture, culinary experience, and understanding of conservation issues.

Table 6. Item fit of instrument

Question Item Number	Total Score	OUTFIT		PT-MEASURE CORR	Item Criteria
		MNSQ	ZSTD		
S6	16	2.04	3.02	A .12	Unfit
S5	34	1.51	1.23	B .35	*Borderline* Item
S2	21	1.28	1.25	C .34	Fit
S12	16	1.28	1.02	D .43	Fit
S9	29	0.94	-0.14	E .46	Fit
S3	41	0.66	-0.14	F .30	Fit
S11	35	0.93	-0.01	G .41	Fit
S10	30	0.89	-0.30	H .50	Fit
S1	21	0.92	-0.29	g .56	Fit
S13	33	0.91	-0.12	f .50	Fit
S15	39	0.77	-0.15	e .43	Fit
S4	36	0.74	-0.42	d .50	Fit
S14	36	0.55	-0.96	c .54	Fit
S7	37	0.47	-1.07	b .58	Fit
S8	38	0.32	-1.39	a .65	Fit

The literature confirms that specific skills and knowledge strongly influence creativity within a particular field, so the limitations of domain knowledge can reduce abilities, even among individuals with high creativity potential (Huang et al., 2017). Reflecting this, item S6 needs to be removed or revised by clarifying the scenario's context, specifying the limitations on the originality criteria, and drafting more equal answer options.

Based on **Table 6**, the borderline item includes the S5 question item (Outfit MNSQ = 1.51; ZSTD = 1.23). Outfit Mean Square (MNSQ) is a statistic that shows how well the observed data fit the expected measurement model, while ZSTD is the standardised z-score that indicates how much an item's fit deviates from the expected. S5 questions are categorised as borderline items because they are on the border between easy questions and intermediate questions, both in terms of cognitive demands and the variety of answers produced. Item S5 requires students to analyse the negative impacts from an environmental and sustainability perspective, so the answer is not just about remembering or mentioning facts. However, the direction of the answer remains relatively predictable and normative, as the negative impact of using animals in traditional cuisine is common knowledge. In addition, the scope of the answers has been limited to environmental and sustainability aspects, so that students are not challenged to face different situations. As a result, students with average ability can still answer questions quite well. It aligns with the opinion of Schmidt-McCormack et al. (2019), who state that analytical questions that still have a clear, general answer direction tend to be solved by moderately capable students, as they do not require the formation of new ideas or the in-depth reconstruction of concepts. The S5 question item is still within the tolerance limit and can be maintained; however, it requires further study of its substance if it is to be revised.

In addition to items S6 and S5, the other 13 question items have the appropriate fit item value. Based on the PT-MEASURE CORR value, which is the point-measure correlation reflecting the relationship between an item's responses and the overall ability measure, the S6 question item has a value of 0.12 (included in the very weak category), so the S6 item has a construct problem (needs to be revised or eliminated). Question items S5 and S3 have a PT-MEASURE CORR value that is still at the lower limit, but the value is not too weak. Both items are still within tolerance limits but show greater response variation than the other items. Constructively, the two question items are still adequate, so items S5 and S3 do not need to be deleted; they need further evaluation if they are to be revised. In line

with the opinions of Yu (2020) and Robitzsch (2025), who state that items with low correlation should be substantively examined before deletion, as problems may stem from redaction, ambiguity of meaning, or inaccuracy of construct indicators.

Detection of Bias Item

The analysis of bias items was conducted across two groups: male and female students. The results of Rasch's analysis of bias points in both groups of respondents are shown in **Figure 2**. The results of the Differential Item Functioning (DIF) analysis indicated that no items showed significant differences in item functioning across the respondent groups. All items have a probability value above the significance limit of 0.05. It indicates that each item has an equal chance of success for respondents from the male and female student groups.

Therefore, based on these findings, the instrument can be declared free of group bias and meets the principle of measurement fairness. This ensures that the differences in scores more accurately reflect real ability differences between respondents rather than item function. According to Ismail et al. (2020), the absence of statistically significant DIF indicates that the instrument does not exhibit gender-based systematic bias.

Differences in scores between groups at the construct level may exist, but are not due to item bias. Martinková et al. (2017) argue that significant DIF can lead to unfair outcomes and invalid group-score interpretations.

DIF class/group specification is: DIF=$S3W1

Person CLASSES	SUMMARY DIF CHI-SQUARED	D.F.	PROB.	BETWEEN-CLASS/GROUP Item UNWTD MNSQ	ZSTD	Number	Name
2	1.0825	1	.2981	1.4390	.74	1	S1
2	1.0825	1	.2981	1.4390	.74	2	S2
2	.1394	1	.7089	.1576	-.50	3	S3
2	.0553	1	.8141	.4860	.02	4	S4
2	.1513	1	.6973	.6775	.21	5	S5
2	.2466	1	.6194	.2845	-.25	6	S6
2	.0265	1	.8706	.4049	-.08	7	S7
2	.0143	1	.9048	.3324	-.18	8	S8
2	.0011	1	.9733	.0025	-1.36	9	S9
2	.0250	1	.8742	.0284	-1.00	10	S10
2	.0976	1	.7548	.5765	.12	11	S11
2	1.5729	1	.2098	2.3001	1.15	12	S12
2	.2150	1	.6428	.7902	.31	13	S13
2	.0553	1	.8141	.4860	.02	14	S14
2	.0235	1	.8783	.2675	-.28	15	S15

Figure 2. Differential item functioning (dif) questions on creative thinking skills in the context of ethnozoology of traditional food

Table 7. Analysis of person reliability, item reliability, and instrument reliability

Item	Person Reliability	Item Reliability	Alpha Cronbach
15	0.63	0.86	0.71

Analysis of Person Reliability, Item Reliability, and Instrument Reliability

Table 7 presents result for person reliability, item reliability, and the reliability of creative thinking skill instruments in traditional food ethnozoology. According to **Table 7**, the 15-item instrument shows high reliability. The item reliability of 0.86 is considered good, indicating consistent and stable item structure across respondent groups. The person's reliability value of 0.63 is poor, indicating that the instrument distinguishes less effectively among different ability levels. This may result from a relatively uniform distribution of respondent ability or from item difficulty not spanning the full ability range (Boone et al., 2014).

Cronbach's alpha value of 0.71 indicates that the instrument has a fairly good internal consistency and is suitable for use in the study. Overall, the instrument has met adequate reliability criteria, although further development is needed to improve its differentiation from respondent variability. Analysis of question items using Rasch modelling revealed item quality in measuring students' creative thinking skills in the context of traditional food ethnozoology. In line with the opinion of Laliyo et al. (2022), Rasch analysis can objectively assess the difficulty, differentiation, and suitability of each item, thereby providing accurate information about the quality of the instruments developed.

This study was conducted on a relatively homogeneous trial sample and was limited to a specific regional context. The research is also still focused on analysing the instrument's psychometric quality. It has not tested the instrument's sensitivity to changes in ability in an experimental or longitudinal learning design. Based on these limitations, further research requires experiments involving more diverse populations, both in terms of region, educational level, and cultural background, to test the consistency of the instruments. In future research, this instrument can be used in a quasi-experimental design to test the effectiveness of ethnozoology-based learning in improving creative thinking skills. Thus, the instrument is not only psychometrically tested but also has validity for use in learning practice.

CONCLUSION

A multiple-choice instrument developed to measure creative thinking skills in the context of traditional food ethnozoology generally showed good

psychometric qualities. Respondents' abilities ranged from −1.2 logit to +3.5 logits. The most difficult question is S6 (originality indicator). Item S6 is also included in the question item that is not fit, so it needs to be replaced or revised. In addition to the S6 item, all question items are still worth keeping. The item's difficulty range of ±3.69 logit units indicates considerable variation, with high item reliability (0.86) and good internal consistency (Cronbach's alpha = 0.71). In addition, the absence of significant DIF findings suggests that the instrument is free from gender bias and meets the principle of measurement fairness.

Nevertheless, the concentrated distribution of items in the medium difficulty range led to a more optimal instrument for measuring moderately capable respondents. The person reliability value of 0.63, which falls in the poor category, indicates that the differentiation power of variation in respondents' abilities has not been maximized. The Wright map findings indicate that some high-skilled respondents are well above the item's average difficulty, suggesting a potential ceiling effect. On the other hand, no floor effect was observed, as the low-skilled respondents still answered the easiest items. Thus, this instrument is feasible for measuring creative thinking among respondents with moderate ability, but requires further development by adding items of greater difficulty to better capture their abilities.

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