

# **Description of Test Model Development and Testing Results Literacy Contextualized Text Information Biology Assessment Competency**

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## **Abstract**

This article describes the results of an analysis of biology learning achievement testing for class X high school students using Minimum Competency Assessment (AKM) model questions to measure literacy in reading scientific texts in a biological context. The research was conducted in the FMIPA UNNES Community Service series with a sample of 185 students from various high schools in Central Java. A total of 15 questions with a biological context were taken from the AKM question collection on the page <https://pusmendik.kemdikbud.go.id/> and assembled in a Google form. Student responses were analyzed using the Rasch model with Winstep 5.2.2.0. The results of the analysis show that the questions used fit based on the MNSQ and PT Measure Corr values, or it can be interpreted that all the question items are valid. The question set is also estimated to be reliable because it meets Cronbach's Alpha value in the sufficient category. The item reliability value for measuring the quality of the

questions is estimated to be adequate, and even the reliability value for measuring students' consistency in answering is estimated to be excellent. The sample of students can be classified into the literate group reading scientific information texts requiring particular intervention, basic, proficient, and proficient, with the most significant proportion being the proficient group.

## Keywords

*Test literacy, scientific contextual biology, assessment minimum competency.*

## Introduction

One of the assessments is assessment minimum competency (AKM). Findings (Ridlo et al., 2022) show that teachers still have not developed good questions, especially something similar to the test model literacy text AKM information, so they still Keep going for the needed workshops. Teachers need to be pushed to train in a way that keeps going continuously. They can develop good questions in general and AKM model questions in particular. All teachers must be reminded that AKM is not quite enough to answer the eye teachers' Indonesian and Mathematics lessons but is not enough to answer together all eye teachers' lessons.

Enhancement system evaluation education is part of the Independent Learning policy (Ministry of Education and Culture, Research and Technology, 2021). The main goal is to push for quality learning and outcomes. Study participants educate. National Assessment is designed to replace National Examinations and Exams School National standards and as a marker of change in paradigms of evaluation education. Minister of Education and Culture states that changes fundamentally to the National Assessment are No Again evaluate achievements participants educate in a way an individual will but evaluate and map system education in the form of input, process, and results. Nadiem says: "Portrait service and performance every school from results This National Assessment Then become mirror For We together do reflection speed up repair quality Indonesian education,"

Assessment Minimum Competency (AKM) is the evaluation competence fundamentals that all students need to develop capacity and participate positively in society. There are two fundamental competencies thing that AKM measures: literacy reading and literacy mathematics (numeracy). Good at literacy, reading, and numeracy, the competencies assessed cover Skills to think logically, skills to use the drafts and the knowledge that has been studied, and Skills to sorting and processing information. AKM presents problems with diverse expected contexts that students can complete using competence literacy reading and numeracy (Pusmenjar, 2020a). AKM is intended to measure competence deeply, not just mastery of content but process and context. AKM consists of over six levels, including level 4 for grades 7 and 8 and level 5 for grades 9 and 10 (Pusmenjar, 2020b; Crocker & Algina, 2008).

Literacy is understanding, using, evaluating, and reflecting on various types of written text. To develop the capacity of individuals as Indonesian citizens and world citizens and contribute in a productive way to the public. Numeracy is the ability to think and use concepts, procedures, facts, and tools for mathematics to finish problems daily in various relevant contexts for individuals such as Indonesians and world citizens (Crocker & Algina, 2008). Understanding read-text information has Been debated and introduced at all levels of education in Western countries. However, it has not yet received sufficient attention in developing countries. Informational text is a vital part of learning for students at school (Li et al., 2018). Informational / nonfiction text is a purposeful text that conveys factual information to readers (Duke, 2007). Informational text is written based on factual data, events, and something else that exists and happens in life. Data and facts in the text can be in the form of data and facts from history, society, and science. Certain ones can empirically or logically prove the truth (Nurgiyantoro, 2015). Proficiency in understanding text information helps participants understand the phenomena of natural and social surroundings. Skills in understanding text information influence the success of participants who interact in the environment socially and professionally in the future (Duke, 2007) and relate tightly to the performance of academic students (Li et al., 2018). Research results in Suwastikasari and Ridlo (2023) show that similar questions with

construction about AKM can be used to measure scientific students' literacy ability.

Research results Initially, FMIPA UNNES Biology Education Study Program alums did not. There is a problem with the participating teachers about UN and AN. Going into depth about AKM, half of the participants understand what is meant by Minimum competency, which is competence equal to that must be owned by students and not. Half of the participants (43.8%) understood that content in literacy includes reading cover, reading text, fiction, and text information. Participants understand that AKM questions must be relevant to the real world and application to identify questions like what is included in AKM. However, only 25% of participants understand domains and subdomains when given case questions. This means they must identify competence from the domain – AKM level to the next level, where they can develop questions about the AKM type. Based on the analysis study results, they concluded that there is already no required knowledge base generally related to AKM. However, more AKM testing is required on students, and teachers (alums) can then reflect exposure descriptive result data analysis using the Rasch model. Modern tests are not yet. Lots of alums understand.

Analysis process item is an activity performed to inspect every item by collecting information from students' answers to obtain quality questions before questions are used (Ratumanan & Laurens, 2011). Rasch modeling can measure validity and reliability based on principle probability (Tennant et al., 2004). The Rasch measurement model is family theory item responses (IRT) for dichotomous and polytomous items (Fischer & Molenaar, 1995). Chance can finish One question with a Correct depending on the ratio between the individual's ability and the questions' difficulty level (Sumintono & Widhiarso, (2015). The Rasch measurement model has five primary conditions (Kreiner, 2013; Mesbah & Kreiner, 2013). Unidimensionality: The item in question measures one underlying latent variable – deep matter. This is the AKM (literacy) value read text scientific) Biology. Monotonicity: Probability “high” item responses increased monotonously as a function of latent variables - in the matter, probability agreement with statement in items increases Because AKM Biology score increases. Homogeneity: Order ranking

item difficulty is the same for all respondents independent from level variable latent – -deep matter. This is the easiest (or most difficult) AKM Biology item for Approved in Matter level on the AKM Biology scale. It is the easiest (or hardest) to support all students regardless of level mastery of AKM Biology. Local independence/ independence is local (without local dependence/LD): Independent items conditional. Remember latent variables. In this matter, the response to the answer depends on the level of mastery and not on the answer to another question. There is no differential item functioning/ differential item function (no no DIF): Items and variables exogenous independent conditional considering latent variables – in matter this, response to question only depending on the level mastery of AKM Biology and not membership student in subgroup like type gender, age, university affiliation, etc.

A set of AKM Biology questions containing various types of items, namely: choice double, optional double complex, matching, true-false, and fill-in short, as well as description. With this, one set of questions consisting of scored items is dichotomous and polytomous. One set of questions is about the Rasch model for dichotomous items or the credit model partial (PCM), which is a Rasch model for polytomous items (Nilena et al., 2017).

## Method

Real AKM held in a way adaptive. The testing model of an adaptive computer contains an understanding of the participant's test, which will ask questions following his abilities. The testing model uses modern theories (item test theory/IRT) (Pusmenjar, 2020b). Testing needs equipment and networks that are not simple. In the implementation study in frame devotion, this approached with the test model virtually using the application Google Forms. The question was taken from the AKM collection on <https://pusmendik.kemdikbud.go.id/> for level 5. Selected questions are questions with context relevant to KD Biology Curriculum 2013. Questions were assembled in Google form and tested against 185 class X high school students across Central Java School, where alums teach. The test results were analyzed using a one-parameter logistic model IRT approach known as the

Rasch Model with Winstep 5.2.2.0. Analysis results are furthermore displayed in descriptive form.

## Results and Discussion

### 1. Validity and Reliability

According to (Boone et al., 2014; Erfan et al., 2020), items question can be valid or worthy if they already fulfill the following criteria. a. Outfit Mean Square (MNSQ) values accepted:  $0.5 < \text{MNSQ} < 1.5$ ; b. Standard Outfit Z-value (ZSTD) accepted:  $-2.0 < \text{ZSTD} < +2.0$ ; c. Point Measure Correlation (Pt et al.) value accepted:  $0.4 < \text{Pt Measure Corr} < 0.85$ . Proof validity construct use Winstep can read in the Output Table menu 14. Entry items can be seen in Table 1.

**Table 1.** Outer analysis Winstep for Proof Validity

Item No	MNSQ outfit	ZSTD outfits	Pt Measure Corr
1	1.37	2.77	0.32
2	0.89	-0.91	0.49
3	1.51	3.99	0.31
4	1.58	2.29	0.23
5	1.29	2.40	0.36
6	0.70	-2.94	0.2
7	0.72	-1.13	0.56
8	1.17	1.29	0.35
9	1.00	0.06	0.45
10	0.70	-1.48	0.58
11	1.16	1.40	-0.38
12	0.84	-1.22	0.53
13	0.44	-2.66	0.63
14	0.68	-2.40	0.62
15	0.58	-1.23	0.47
<b>Average</b>	0.98	0.02	
<b>P. SD</b>	0.34	2.11	

Source: Winstep Output Table 14

Based on Table 1, it can be described that item valid questions are item numbers 2, 7, 8, 9, 10, 11, 12, and 15, and invalid are 1, 3, 4, 5, 6, 13, and 14, seen from ZSTD value. According to Boone (2014), if one item questions Where MNSQ and PT Measure Corr values are not fulfilled, the criteria will be, but the ZSTD value meets the criteria, so the item is Still considered fit and maintained. Based on item ZSTD value data, numbers 1, 3, 4, 5, 6, 13, and 14 are outside value  $-2.0 < ZSTD < +2.0$  but by MNSQ value still is between  $0.5 < MNSQ < 1.5$ , so also seen from PT Measure Corr value is  $0.4 < Pt \text{ Measure Corr} < 0.85$  so item the stay fit (interpreted as valid) and can be maintained.

Estimate mark reliability question use can be known by reading the Output Table 3.1 Statistics menu concisely while paying attention to Cronbach's Alpha, Item Reliability, Person Reliability, Outfit MNSQ, and Outfit ZSTD. The value of person and item reliability used is Real RMSE because mark This is the condition with the worst lower limit reliability based on the instruments analyzed (Sumintono & Widhiarso, 2015). Estimation results show Cronbach's Alpha value = 0.73 with the category Enough reliable. Item Reliability and Person Reliability values for measuring quality from item questions and consistency student in answer show mark Person Reliability = 0.68 with the category Enough reliable, and item reliability = 0.96 with the category particular. Based on the three-criteria mark estimation, the question is considered reliable or adequate (Sumintono & Widhiarso, 2015). Whereas average Outfit MNSQ value = 0.98 and average Outfit ZSTD value = 0.02. Based on the second mark, the stated question is reliable. In another research, Zahra & Ridlo (2022) used 15 content AKM simulation items biology provided by the Ministry of Education and Culture, generated four valid items, ten valid items that need revision, and one that is proven invalid. However, if both have similar characteristics, the mark estimation reliability question is 0.81. In the second study, the sample size needs to be enlarged to increase the ZSTD outfit value (Tornabene et al., 2018).

Analyze level difficulty item questions using the Winstep program. This can be seen in the Output Table 13 menu. Item Measure should consider the JMLE Measure (Boone et al., 2014; Sumintono & Widhiarso, 2015). Next,

for grouping item questions into the difficulty level, easy points or complex can be seen using the criteria in Table 2.

**Table 2.** Difficulty Level Distribution Question Items

<i>Measure Value</i> (logit)	Criteria Difficulty Item	Number question
<i>Measure logit &lt; -</i> 1.21	Items are straightforward	7, 13, 15
<i>-1.21 ≤ Measure</i> <i>Logit ≤ - 0.00</i>	Easy items	9, 10, 12, 14
<i>0.00 ≤ Measure</i> <i>Logit ≤ 1.21</i>	Difficult items	1, 2, 3, 5, 6, 8, 11
<i>Measure logit &gt;</i> 1.21	Items are complicated	4

Based on Table 2, it can be seen that the most challenging item is number 4 (6.67%), which is classified as very easy. There are three items (20%): 7, 13, and 15. Meanwhile, the others are classified as brutal; there are seven items (46.67%), and they are categorized as easy; there are four items (26.67%).

## 2. Description Ability Student Participant Test

Analysis results in a connection between level difficulty items and abilities students can explain from the outer correct map as in Figure 1. Item 4 occupies a position at the top of map distribution. No crossed the upper limit Standard Deviation (T), which means item 7 is the most difficult. However, several capable students still answered item questions with Correct. On the map distribution, we found item question number 15 occupied at the bottom, which means the item is the most straightforward question. Some



students pass the lower limit standard deviation (T) if seen in return. However, item question number 15 is the most accessible; several students still cannot answer item questions correctly. Based on Figure 1, students can then be grouped according to ability. Assumptions used for classification are as follows. First, the question set already has question standards, and each has unique item difficulty or threshold characteristics as described in the results analysis, proof validity constructs, and levels above difficulties. Second, capability stretched from -3 to +3 on the logit scale. Third, the deviation standard = 1.5, so the level of competence needs intervention specifically in the range  $-3 \leq \text{basic}$  in the range  $-1.5 < X \leq 0$ , competency competent in the range  $0 < X \leq +1.5$ , and competency proficient in the range  $+1.5 < X \leq +3$ . Fourth, For identified students' ability  $< -3$  and or  $> 3$ , then consider their ability  $-3$  or  $+3$  because actually scale continuum capability by Winstep can be measured from minus or not finite until it is plus or not finite ( $\infty - < X < +\infty$ ).

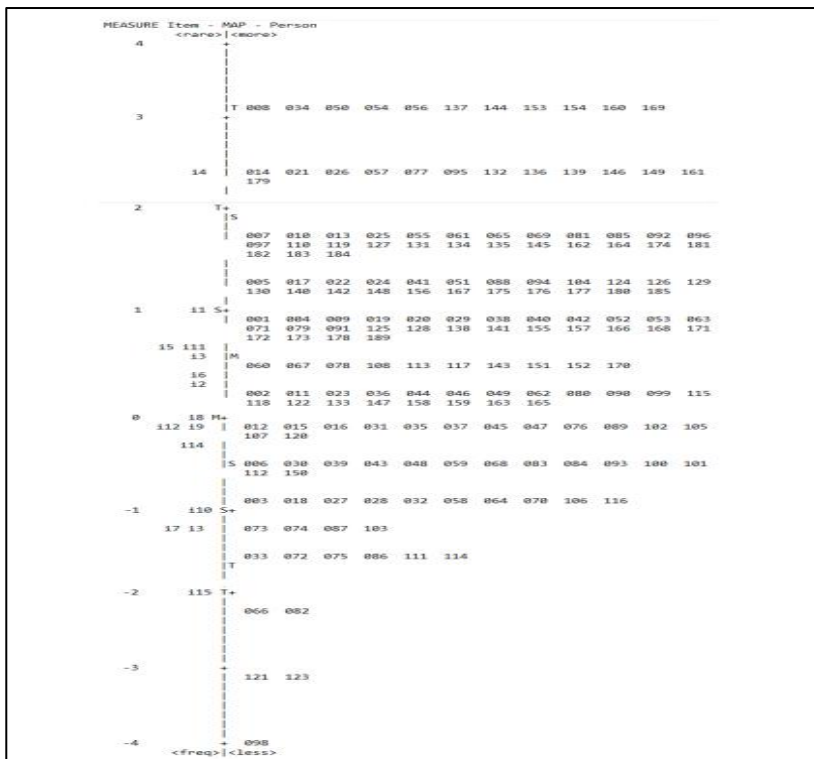


Figure 1. Outer wright map Winstep

Based on outer results analysis distribution literacy read text information biology in accordance package the question given can seen in Table 3.

**Table 3.** Literacy Distribution Reading Informational Text Biology

Competency Level	Amount Student	Percent (%)
Need intervention	5	2.70
Base	48	25.95
Competent	108	58.38
Proficient	24	12.97

Based on the results in Table 3, it can be said that class X high school students or students at the AKM 5 level were identified as dominated by students who are competent in literacy and read text information with context biology. Students who are in groups need intervention, incredibly only a little. AKM does not measure specific achievements learned by eye lesson; however, reporting AKM results obtained are utilized to improve the learning process subjects (Pusmenjar, 2020b). Although the questions used were chosen just in the context of biology, they can also interpreted as measuring results. Studying biology mainly focuses on the dimensions of literacy reading. The test results above are exciting news specifically for science/ biology teachers.

Reporting level competence can be used by biology teachers to develop effective and quality learning strategies, and they are expected to adapt their learning per the level of competence (Pusmenjar, 2020b). Students in the Need Intervention Special group are students who are not capable of finding and taking information existing explicitly in the text or making interpretations simple. Biology Teacher No Enough relies on material reading related material provided in the curriculum. Students need to be given material other than learning audio and visuals and mentoring specifically (Pusmenjar, 2020b; Pusmenjar, 2021). In groups, literate base interpreted is group capable students find and take information explicitly in the text and make interpretation simple (Pusmenjar, 2020b).

In groups, the teacher can give a source study companion through notes, shorts, or a conclusion for complete understanding. In groups, literate students can interpret information implicit in the text and make conclusions from the results of integrating several information in a text. This can be

achieved by learning identification conditions in the pupil environment, linking Need Intervention, especially Basic proficiency, with the functions and benefits of material study and learning. A group containing peak students in the category of literate proficiency can integrate information across text, evaluating the content, quality, method of writing something text, and attitude reflective to fill text. The teacher can do this for the group, learning from compiling various utilization strategies for material study material learning (Pusmenjar, 2020b; Pusmenjar, 2021).

As (Nguyen, 2019) researched development professionals among maker policy education, leadership institutions, and teachers in Vietnam. One of his findings stated that increasing the knowledge and skills of teachers in activity learning requires the development of concrete, specific, and practical professions. Based on the description results, deep teacher learning should, in a way, Keep using student-centered learning strategies by applying the learning model-based inquiry and solution problem. Already, much revealing research uses these strategies and models and proves their advantages, among others (Abidin & Karmila, 2022; Manek et al., 2022; Widyaningrum et al., 2023; Indriyani et al., 2023; Bulan et al., 2024). In fact (Hidayah and Ridlo, 2023) prove it with application learning-based problems and results assessed using the AKM model test for literacy text. It turns out that 54% of students are categorized as proficient, and 46% are categorized as proficient. Teacher skills in developing technique learning are in demand in the era of AKM testing to accommodate various group abilities in the student population.

## Conclusion

Analysis results show that the questions used are fit-based MNSQ and PT Measure Corr values or can be interpreted as valid questions for all items. The question set is also estimated to be reliable because it fulfills Cronbach's Alpha value with the category Enough. Reliability value item for measuring quality from item question estimated enough, and even people's reliability for measuring consistency student in answer estimated special. Student samples can be classified into literate groups, read text information, scientific needs

intervention, unique, essential, proficient, and advanced with the proportion in the group competent.

It is recommended that teachers continue learning using student-centered learning strategies by applying the learning model-based inquiry and solution problem using possible variations of strategy to accommodate the level of literacy reading text information, scientific student.

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