



Development of E-Book Biology Question Bank Model for Minimum Competency Assesment To Train Information Literacy

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Abstract

The question bank developed in this study contains biology questions on the Minimum Competency Assessment (AKM) Level 5 Class 10 model to train students' information literacy. This question bank is intended to train students' literacy and familiarize students with AKM questions. A question bank contains a set of items that are calibrated for validity, item difficulty and reliability. The purpose of this research is to create a question bank based on validity proof, analysis of item difficulty levels and estimating the reliability of AKM model biology questions. This research uses the ADDIE model with the stages of analysis, design, development, implementation and evaluation. The feasibility of AKM model biology questions that will be tested is validated by material experts. Item analysis uses the Rasch 1PL model approach with the Winstep application. The results of the study showed that the AKM biology questions were declared feasible by experts and 48 items were valid, 7 items were very easy, 18 items were easy, 17 items were difficult, 8 items were very difficult, and the reliability value was in the excellent category. The conclusion of this question bank is that 34 items are included in the question bank and 16 other items are not included.

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INTRODUCTION

The development of education continues over time in order to improve the quality of education in Indonesia, a new policy established by the Minister of Education and Culture for mapping and evaluating the education system in Indonesia in 2020 is the National Assessment based on information obtained from the page (Direktorat Sekolah Menengah Pertama, 2021). Based on Permendikbud regulation number 23 of 2016 Article 4 concerning Educational Assessment Standards, the purpose of assessing learning outcomes by educators is to monitor and evaluate the process, learning progress and improvement of student learning outcomes on an ongoing basis (Mahdiansyah, 2019). Based on the circular letter of the Minister of Education and Culture No. 1 of 2021 dated February 1, 2021, the National Examination (UN) as a determination of standards for improving the quality of education was eliminated and replaced by the National Assessment (Safitri, 2021). The reason the UN was eliminated was because the UN was too dense and focused on memorization, besides that it did not assess all cognitive aspects of students. AKM questions do not make students memorize and remember material but are able to analyze problems based on information (Pusmenjar, 2020). The concept of Minimum Competency Assessment is emphasized by (Rohim et al., 2021) AKM is designed to encourage innovative learning based on developing students' reasoning skills and not focusing on memorization. The establishment of the National Assessment does not completely replace the national exam (UN) but only replaces the role of the UN as an evaluation and mapping of educational evaluation in an area.

The National Assessment is divided into three parts, Minimum Competency Assessment (AKM) is one of them. AKM is a new policy inaugurated by the Minister of Education and Culture, Nadiem Makarim in 2021 as a source of mapping the evaluation of the quality of learning or education in an area. The ultimate goal of AKM is to provide information for the improvement of learning and teaching and learning quality, which is expected to create a conducive learning environment (Pusmenjar, 2020). AKM has two component aspects that hone students' ability to digest written information and numbers quantitatively, namely literacy and numeracy. AKM Literacy has the aim of measuring students' competence in understanding, finding information, integrating, interpreting, evaluating, reflecting on the content of reading texts with other contexts (Sani & Prayitno, 2020). By working on this literacy AKM question, students can train and hone their literacy, because AKM is one of the question models that has a stimulus in accordance with following the PISA policy standards.

Based on the results of research on reading literacy of high school students is still very low, some efforts have been made previously to train and stimulate students' information literacy. The efforts that have been made are socialization of literacy activities, providing facilities in the form of reading corners in each class and school, adding interesting reading books in the library, reading books 15 minutes before teaching and learning activities take place, and others. The school literacy movement that has been carried out has not shown optimal results in arousing students' enthusiasm for literacy. There needs to be encouragement or other efforts to foster student interest and hone student literacy through classroom learning.

According to (Mansur, 2018) in his research entitled Training Students' Mathematical Literacy with PISA Problems, mathematical literacy problems with PISA standards can overcome students' low literacy by providing routine PISA problem exercises with this students become accustomed to facing problems with PISA policy standards, so students' literacy improves. According to (Sani & Prayitno, 2020) basically AKM questions are made following the standards of PISA questions starting from the context of literacy, namely reading literacy, mathematical literacy, science literacy and financial literacy and the form of PISA questions, namely short description, long description, matching, true/false, ordinary multiple choice, complex multiple choice.

Application in the classroom can be done by giving questions with a stimulus in the form of discourse text so that students' analytics are more pronounced because they need to understand the reading text to do the questions properly and correctly. If someone can master and understand information from a reading and can interpret information from imperfect to perfect, they can be called literate (Mulyono & Ansori, 2020). Questions with stimulating stimuli are Minimum Competency Assessment questions or called AKM. Providing questions to train student literacy

during KBM takes place by giving students AKM type questions with long texts from a collection of calibrated questions.

The collection of calibrated questions is the Problem Bank. According to (Suyata et al., 2011) question banks need to be developed as a reference for test devices and can be reused to compare the characteristics of the items to be used. According to (Retnawati, 2014) the question bank refers to the collection of questions, monitoring to storing questions with the aim of making it easier to take to assemble questions. The question bank is very useful for teachers and students, the benefits of developing a question bank for teachers to make it easier for teachers to prepare tools for measuring student learning outcomes whose item characteristics have been tested (Widana, 2014), and for students the question bank makes it easier for students to access or practice working on AKM questions in one medium that has a set of tested questions. The question bank can be presented with several options, both with hard files (print) and soft files (electronic). By following the times, question banks should be presented in the form of electronic books so that learning becomes effective and efficient (Alwan, 2018). Another advantage of e-books is that they are easy to carry anywhere, practical, save paper (Us & Mahdayeni, 2019).

There are several steps that need to be considered in developing a question bank, namely the purpose of test development, writing items related to the scope of the material, validation and calibration, and ringing new items (Suyata et al., 2011). The assembled items cannot be directly put together and included in the question bank, but need item analysis through the validation and calibration process by proving validity, analyzing the level of difficulty of the items and estimating the reliability of the AKM model biology questions. According to item analysis, it is intended to obtain information about the characteristics of each item and can be used to test the quality of each item (Elviana, 2020). According to (Ashraf & Jassem, 2020) Item analysis aims to examine examinees' responses to items to assess the characteristics of an item from the test as a whole.

Based on the background of the problems that have been described, in developing questions, it is necessary to analyze the items to test the characteristics of the items before they are included in the question bank.

RESEARCH METHODS

The development of this E-Book Problem Bank uses the ADDIE model which consists of five stages of analysis, design, development, implementation, and evaluation. According to (Hidayat & Muhamad, 2021) ADDIE is a process for providing the results of the development of education and other learning resources. At the analysis stage, what is done is an analysis of the needs and basic competencies in the 2013 Curriculum (K-13) as a basic reference for making grids, stimuli, and questions. At the design stage, what is done is designing the overall framework of the book both from the appearance, grids, and stimulus drafts. At the development stage, what is done is to develop what has been designed at the previous stage, compile the stimulus, assemble the questions, and review the questions by involving experts. At the implementation stage, the items that have been made are applied or tested on class X students to determine the effectiveness of a test item. At the evaluation stage, what is done is scoring followed by analyzing the items that have been tested and evaluating the items from the results of the item analysis. Scoring is divided into two, namely for dichotomies scored 0 and 1, while for polytomies scored more than 2 score categories (Anisa, 2013).

The instruments used to collect data are test and non-test instruments. Test instruments in the form of AKM model biology questions level 5 grade 10 that have been validated by experts. Non-test instruments in the form of questionnaire sheets assessing the feasibility of AKM model biology questions by material experts by assessing aspects of content, construct, and language feasibility.

Data from the validation test by experts were analyzed and calculated the total score obtained to determine the feasibility of the question with the following formula:

$$P = \frac{\sum R}{N} \times 100\%$$

Description:

P = Percentage score

$\sum R$ = Total number of answer scores given by each respondent
 N = Total ideal score in one item

The results of the feasibility assessment of the AKM model biology questions are interpreted with the eligibility criteria in Table 1.

Table 1. Question Eligibility Criteria

Percentage	Qualification	Description
81 – 100%	Very good	Very Good/No need revision
61 – 80%	Good	Feasible/No need for revision
41 – 60%	Fairly Good	Less feasible/needs revision
21 – 40%	Not Good	Not feasible/need revision
<21%	Not Good	Very unfeasible / needs revision

(Source: (Arikunto & Jabar, 2018))

Data collection techniques in this study by applying questions that have been developed and validated by experts. The implementation of the AKM model biology question test was carried out at SMA Al-Muslim Tambun in class XI in the 2021/2022 school year and the questions were distributed via google drive. Data analysis techniques through the Winstep 5.2.2.0 program with the Rasch model 1 PL approach to obtain the results of empirical validity, difficulty level and reliability estimation. Rasch model is part of item response theory that classifies item and person calculations in one distribution map (Azizah & Wahyuningsih, 2020). Another advantage of the Rasch model approach according to (Chan et al., 2014) is that this model is able to identify whether there is bias or not in an item, the abilities of two or more people can be compared even though they do not have the same item, and can estimate the difficulty of items from various samples. The analysis results of the Rasch model are very accurate by reviewing the chances of answering correctly on the item and comparing the student's ability with the difficulty level of the item (Ibnu et al., 2019).

Validity, level of difficulty and reliability that determine the characteristics of an item, declared a good or bad item. Questions that have good characteristics will be included in the question bank. Tests that are balanced between tests and criteria have high validity (Tarigan et al., 2022). Validity is a measurement to see an instrument can measure what should be measured (Chan et al., 2014). Empirical validity to see the suitability of the items (item fit) with the aim of seeing the items function normally or not in measurement (Sumintono & Widhiarso, 2015) The validity of an item can be seen in the Outfit MNSQ, ZSTD, and Point Measure Correlation values with the following interpretation (Erfan et al., 2020):

- 1) Accepted Outfit Mean Square (MNSQ) value: $0.5 < MNSQ < 1.5$;
- 2) Accepted Z-Standardized Outfit Value (ZSTD): $-2.0 < ZSTD < +2.0$;
- 3) Accepted Point Measure Correlation (Pt Measure Corr.) values: $0.4 < Pt Measure Corr. < 0.85$.

The level of difficulty of the items aims to determine the level of difficulty of the question. Analyzing the level of difficulty of items to examine items in the categories of very easy, easy, difficult and very difficult, this level of difficulty is obtained from the ability of students to answer the items (Bagiyono, 2017). A good question is a question that has a balanced level of difficulty, not too easy but also not too difficult (Nurhalimah et al., 2022). Criteria for interpreting the level of difficulty of questions in Table 2.

Table 2. Problem Difficulty Index

Measure Value (logit)	Interpretation of Item Difficulty
Measure logit < -S.D	Very easy item
-S.D ≤ Measure Logit ≤ -Mean	Easy item
Mean ≤ Measure Logit ≤ S.D	Difficult item
Measure logit > S.D	Very difficult item

(Source: (Erfan et al., 2020))

According to (Widi, 2011) reliability is an index that estimates the measuring instrument can be trusted or relied upon. Estimating reliability aims to determine how much variability occurs due to measurement error (Supranata, 2004). Reliability is shown from the item reliability value obtained and Cronbach's Alpha to show how good / good a set of items in the test instrument (Sumintono & Widhiarso, 2015)

The following is the index to determine the quality:

- a. Cronbach's alpha value to measure reliability (interaction between person and item):

Table 3. Cronbach's Alpha Value Reliability Criteria

Cronbach's Alpha Value (Reliability)	Interpretation
$\alpha \geq 0.80$	Excellent
$0.70 \leq \alpha < 0.80$	Good
$0.60 \leq \alpha < 0.70$	Fair
$0.50 \leq \alpha < 0.60$	Bad
$\alpha < 0.50$	Very Bad

(Source: (Sumintono & Widhiarso, 2015))

- b. Person Reliability and Item Reliability values:

Table 4. Person/Item Reliability Criteria

Reliability Value (Person/Item)	Interpretation
> 0.94	Excellent
$0.91 - 0.94$	Good
$0.81 - 0.90$	Fair
$0.67 - 0.80$	Bad
< 0.67	Very Bad

(Source: (Sumintono & Widhiarso, 2015))

RESULTS AND DUSCUSSION

AKM model biology questions that are included in the question bank are questions that have good item characteristics, good item characteristics are feasible, valid, ajek and have a balanced level of difficulty. Assessment of the feasibility of AKM model biology questions involving 3 material experts. The feasibility of AKM model biology questions assessed by content, language and construct assessments. The results of the feasibility assessment of questions assessed by material experts are presented in Table 5.

Table 5. Question eligibility according to experts

No	Aspects to be assessed	Percentage
1	Content Feasibility	94,4%
2	Language Feasibility	100%
3	Construct Feasibility	100%
Criteria		Very good

Item analysis using the winstep 5.2.2.0 program with the rasch model approach. Rasch model 1 PL (Logistic Parameter) approach by measuring the level of difficulty of the items because the differential power in Rasch modeling has equality (Rochyati, 2022).

In the winstep application to measure the validity of an item can be seen in the output menu table 14. Item Entry by paying attention to the outfit Mean Square (MNSQ) value, Outfit Standarized Fit Statistics (ZSTD) and Point Measure Correlation, so that the results of item validity are presented in Table 6.

Table 6. Validity Analysis Results

Description	Item
Valid	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 46, 47, 48, 49, 50
Invalid	19 and 45

Item 19 is invalid because it does not meet the MNSQ and ZSTD outfit criteria, the MNSQ outfit value obtained is 2.17 which means that it reduces the quality of the measurement system and the ZSTD value obtained is 2.82 which means that the data cannot be predicted. In item 45, the MNSQ value obtained is 1.64, which means that it is not good for making instruments and the ZSTD value obtained is 3.74, which means that the data is not expected if it fits the model (Sumintono & Widhiarso, 2015). Then items 19 and 45 are not included in the question bank, because they do not meet the criteria for good test items. Looking at the criteria for good test items is not only from validity but the difficulty level of the questions is also considered. Valid test items mean that they are able to carry out their measuring function, otherwise invalid items produce data that is not relevant to the purpose of measurement (Elviana, 2020).

The level of difficulty in Rasch modeling is grouped into 4 criteria, namely very easy, easy, difficult, and very difficult. The level of difficulty of the questions in the winstep application is seen in the Output Table 13. Item Measure menu by paying attention to the Number of Measures, so that the results of the level of difficulty of the questions presented in Table 7 are obtained.

Table 7. Difficulty Level Analysis Results

Interpretation of Item Difficulty	Number of Items	Item
Very easy item	7	1, 3, 5, 10, 16, 30, 49
Easy item	18	2, 4, 7, 8, 11, 13, 21, 24, 25, 26, 27, 28, 29, 41, 42, 46, 47, 48
Difficult item	17	6, 17, 18, 19, 20, 22, 31, 32, 33, 34, 35, 36, 37, 38, 40, 44, 50
Very difficult item	8	9, 12, 14, 15, 23, 39, 43, 43

A good question is a question that has an easy and difficult level of difficulty. Items that are classified as too easy or too difficult are considered bad questions (Yusuf, 2015). Items that have very easy item difficulty criteria are not good questions because they do not stimulate students in solving their problems and very difficult items are not good questions because they will cause students to despair and there is no encouragement to try again if it is beyond their ability (Arikunto, 2015). Items that are too easy do not stimulate students' ability to increase their efforts in solving problems, on the other hand, items that are too difficult cause students to have no enthusiasm for trying to solve them (Elviana, 2020).

Reliability estimation in the winstep application is seen in the Output Table 3.1 Summary Statistics menu by paying attention to Cronbach Alpha and Item Reliability, so that the reliability estimation results are presented in Table 8.

Table 8. Reliability Estimation

	Alpha Cronbach	Category	Item Reliability	Category
Dikotomi	0,91	Very good	0,90	Very good
Politomi	0,92	Very good	0,91	Very good

From the results of the item analysis, it is found that the items that have good criteria, items that have good criteria such as feasible, valid, reliable and the level of difficulty is not too difficult and not too easy are included in the question bank. Items that do not meet the criteria for good items are items number 1, 2, 5, 9, 10, 12, 14, 15, 16, 19, 23, 30, 39, 43, 45, and 49 are not included in the question bank, so that of the 50 questions developed there are 34 questions that are included in the question bank

CONCLUSION

Based on the results of research and discussion, it can be concluded that the criteria for items included in the question bank are items that are feasible, valid, reliable and difficult / easy difficulty levels. The results of the item analysis stated that 48 items were valid, 7 items were very easy, 18 items were easy, 17 items were difficult, 8 items were very difficult, and the reliability value was in the excellent category.

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