# 4 Development Instruments Dimension Cognitive Anderson- Krathwol In Biology Learning Class Xi Of South Jakarta Senior High School

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***ABSTRACT***

The purpose of this study was to develop an assessment instrument based on the biology of learning outcomes dimension of processes cognitive and dimension of knowledge Anderson-Krathwohl. The development of test instruments required because the purpose of learning is students can develop cognitive dimension. So, develop the test instrument will improve biology learning. The assessment instrument are eligible: 1) fit to the Rasch models and 2) the difficulty level of the item. Respondents in this study were all students of class XI-MIA in the academic year 2015/2016 in six senior high schoolof South Jakarta. Developed test instrument, relating to the material digestive system, respiratory system and excretory system. Research steps include: (1) the initial development of the test, (2) the trial tests, (3) measurement. Based on the results of the application of the instrument, it is known that the reliability of test multiple choice test items is 0,94 and essay is 0,62. Then, the level of difficulty about multiple-choice test is between -1,16 to 0,56 and essay is between 0,00 to 0,25. Thus, we can conclude that the instruments developed eligible to measure the dimensions of cognitive processes and dimensions of biological knowledge learners. The implications of this study was produced instruments biological tests to determine cognitive dimension of learners' achievement.

**Keywords**: *Instrument development, the dimensions of processes cognitive and dimensions of knowledge, high school biology*

**Topic area: Inovation in Teaching Learning and (assessment) of Teacher Training and Education**

## 1 PRELIMINARY

As part of the efforts to improve the quality of Indonesian human resources, national education has been orienting its goal the development of a number of competencies for learners. Thus, all components contained in educational praxis need to support the achievement of competencies that have been formulated. In essence, the competencies expected to be developed relating to cognitive, affective and psychomotor. Bambang Subali(2012: 3) explains, "cognitive include competent and knowledgeable, affective includes noble character, faithful, devoted, independent and democratic, and psychomotor includes skilled and creative. In other words, the expected competencies are knowledgeable, creative and noble".As noted, one of the competencies that enough concern to be developed by Indonesian human resources in the era of global is cognitive domains. At the national level, which made reference to cognitive theory is the theory of Samuel Benjamine Bloom. Bloom cognitive theory itself, composed of six parts, namely: knowledge, comprehension, application, analyze, synthesis and evaluation. On development, Bloom's taxonomy was revised by

Anderson and Krathwohl. Revised by Anderson and Krathwohl cognitive divide into two dimensions, namely cognitive process dimension and the dimension of knowledge. Dimensions cognitive processes associated with the process of the six categories (C1-C6), which is expressed in the form of the verb, remembering, understanding, applying, analyzing, evaluating and creating. While the dimensions of knowledge consists of four categories, namely factual knowledge, conceptual knowledge, procedural knowledge and metacognitive knowledge.

Prompts for developing cognitive abilities based on the dimensions of cognitive processes and dimensions of knowledge, noted in standard graduate in Permendikbud No. 54 Year 2013, which reads: "For students of high school level, the cognitive effort learners have factual knowledge, conceptual, procedural and metacognitive in science, technology, art, and culture with human insight, national, state, and civilization-related causes and effects of phenomena and events". Based on this, it is understood that the process of learning in high school education is directed to develop cognitive ability, within the frame dimensions of cognitive processes and dimensions of knowledge.

As part of the subjects studied by students in upper secondary education, biology subject matter is directed to develop their thinking skills of students through the learning process. As stated in Permendiknas No. 22 year 2006 regarding the biology of learning content standards, which states that the group of subjects in science and technology in education SMA/MA/SMALB intended to gain further competences in science and technology and cultivate scientific thinking critically, creatively and independently.

However, in reality, learning orientation biology to be able to develop the ability to think oflearners, has not achieved optimally. Results of a study conducted by Adi Rahmat in 2010 showed that some of the difficulties experienced by learners in the subjects of biology, relates to the difficulty in memorizing terms, remember and understand the concepts, as well as the link and apply concepts. Based on this information, it is understood that the achievement oflearners that are lowin terms of understanding, application and reasoning on the subjects of biology, became a natural thing for learners themselves still have difficulty in thinking that a low level.

Basically, the subjects of biology has the potential to develop the thinking skills of students through the materials, as stated by Nuryani Rustaman (2005: 12) states that, in physiology or biology function, people who study were asked to develop thinking cybernetics, while in systematic biology or taxonomy developed logical thinking skills through logical classification or classifications. In genetics required thinking chance or probability (especially for population genetics) and combinatorial. In other writings, Nuryani Rustaman (2005: 5) suggested that some biological materials have been successfully developed the habit of thinking of learners, such as logical thinking through the classification; creative abilities through problem solving and inquiry, critical thinking through practical Botanical Phanerogamae, decision-making in the taxonomy and the habit of thinking through the complex ecological interactions.

In addition to the learning process that plays an important role in the development of cognitive processes mastery dimension and the dimension of biological knowledge of learners, assessment of learning outcomes into factors that also determine the dimensions mastery of cognitive processes and dimensions of biological knowledge learners. Based on research conducted by researchers in 2016, it is known that in the development of test instruments, teacher high schools in South Jakarta, has

yet to develop all aspects of the cognitive process dimension and the dimension of knowledge. In fact, as conceived, assessment used by teachers of course, can influence the management of the learning process. Thus, so that learners can be more motivated in studying biology, and also so that teachers can improve the quality of learning, it would require the development of test instruments biological assessment of learning outcomes, which includes aspects of cognitive process dimension and the dimension of knowledge. In order to be produced by the test instrument dimensions of cognitive processes and dimensions of biological knowledge, it is necessary to study the development of test instruments dimensions of cognitive processes and dimensions of biological knowledge, in accordance with the principles of the development of test instruments.

## 2  RESEARCH METHODS

Development tests in this study refers to the development of tests Edi Istiyono (2010: 22) that modify the development of tests Wilson and Oriondo., Namely: (1) the initial development of the test, (2) the trial tests, (3) measurement. In this case, an early development stage tests include: (1) determining the test objectives, (2) the determination of competence that will be tested, (3) the determination of the material tested, (4) preparation of grating tests, (5) that the item is based on the principle cognitive dimension Anderson and Krathwohl, (6) the preparation of the scoring guidelines, (7) validation test items, and (8) repair and assembly of the test item. In the test phase consists of several steps, namely: (1) determining the subject of the trial, (2) the implementation of the trial, and (3) the analysis of the test results. Whereas, at this stage of implementation has the purpose not only determine the characteristics of the instrument but also determine the ability of the individual respondents. This stage includes: (1) The test assembly for the application, (2) the implementation of the application of the test, (3) analysis of the results of the application, and (4) the interpretation of the results of the application.

Then, the instrument will be developed relating to biological materials eleventh grade second semester, ie material digestive system, respiratory system and excretory system. In this case the basic competence in the subject matter digestive system, respiratory system and excretory system reads, (1) to analyze the relationship between network structure constituent organs of the digestive system and link it with nutrients and bioprosesnya so as to explain the process of digestion and impaired functions that may occur in human digestive system through the study of literature, observation, experiment and simulation. (2) to analyze the relationship between network structure constituent organ of the respiratory system and associate it with bioprosesnya so as to explain the process of breathing and impaired functions that may occur in the human respiratory system through the study of literature, observation, experiment and simulation. (3) to analyze the relationship between network structure constituent organ of the excretory system and associate it with the excretion process so that it can explain the mechanism and function disorders that may occur in the human excretory system through the study of literature, observation, experiment and simulation. Furthermore, test instruments that will be developed objective form of written tests, multiple choice and objective description. Then, the test device was made into two packages I and II packages. Manuscript multiple-choice test device and

description, with details: the form of multiple choice tests each package totaling 30 items, while tests shaped item description with the   number  13.  In  both  these packages are 20%  anchor  or  7  items  equalizer. The validity of the tests carried out with the validity (face validity), which deals with aspects of material, construction and language. To meet face validity, it is done by asking expert opinion (expert judgment). In this case, the researchers received input from experts regarding the test developed.

The next stage is the pilot tests conducted in three SMA South Jakarta. The third is the high school SMA Negeri 8 Jakarta, SMA Negeri 97 Jakarta and SMAN 37 Jakarta. Subject trials totaling 250 students. Then, after the pilot phase, carried out the application of instruments is done in three SMA South Jakarta, namely SMAN 28 Jakarta, Jakarta SMA 109 and SMA Negeri 55 Jakarta. Subject application of instruments amounted to 300 learners. The trial results and the application of the instrument and then analyzed using the QUEST program to determine the validity and reliability of the test. The validity of the instrument with Rasch models can be seen from match items or fit to the model. With a margin of error of 5%, an item fit for the model if the value INFIT MNSQ between 0.77 to 1.30 and use INFIT t with limits -2.0 to 2.0. Reliability of the test is obtained also from the analysis using the QUEST program.  Because the QUEST program presents the of reliability according to Rasch models. Then, will also be displayed item characteristic curve (ICC) and the graph of the function with the help of information and Parscale Bilog program.

## 3  RESULTS AND DISCUSSION

### 1. Quality Instrument Test Cognitive Process Dimension and Dimension Biological Sciences

Before carrying out the test instrument, grating instruments, items and assessment guidelines that had been developed further studied and validated by measurement experts, biologists, and experts in biology education. In this case the so-called validation of expert judgment. Input from experts measurements, with regard to the truth of the measurement, the effectiveness of the sentence, the length of the sentence in the answer choices or posing (distractor on multiple choice). Then from biologists with regard to the suitability of the test material with the biological concepts and applicable curriculum at school. Based on input from experts, then the preparation of test items do sentence, adjustment of some of the terms and double check the accuracy of the material. Furthermore, the test instrument, to obtain information related to the validation of instruments and grain quality instruments. Validation of the instrument and item analysis of instruments on the stage of this trial, processed using the Rasch model approach. Based on the Rasch model approach obtained 58 item instrument fit with the model because it meets the criteria INFIT MNQS of 0.77 up to 1:30 as shown in Figure 1. It can be concluded that each item has a valid instrument used to measure mastery dimension and the dimension of cognitive processes pengetahuaan biology learners empirically.
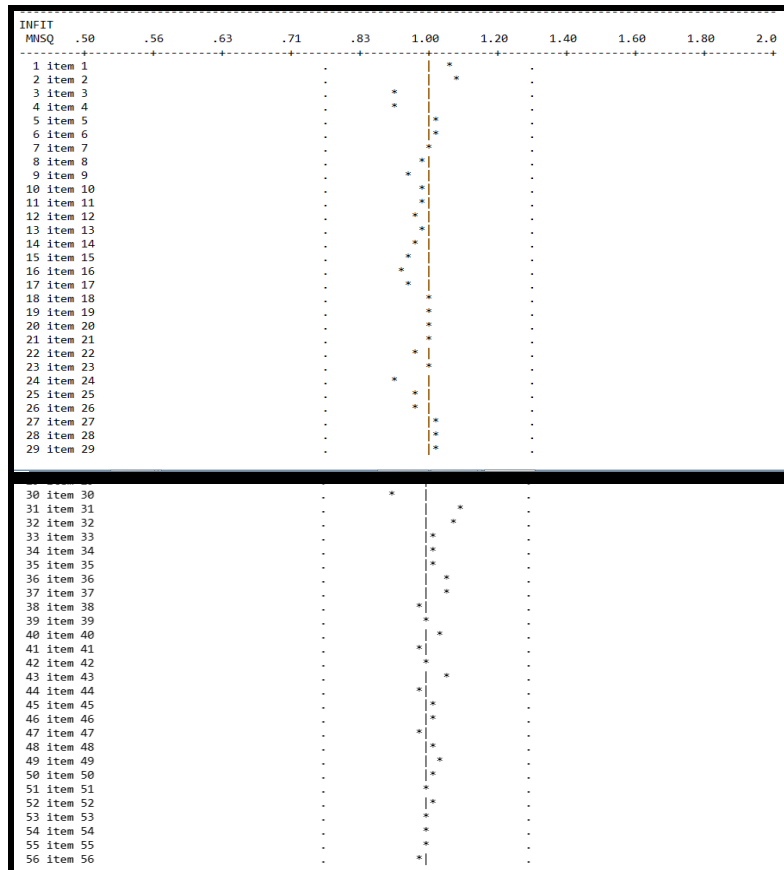
**Figure 1. Diagram Infit MNSQ Problem PG Cognitive Process Dimension and Dimension Life Sciences High School in South Jakarta Based Test Results**

Based on Figure 1, can also be obtained information that the difficulty level can be measured by the instrument are in jangkuan -2 up to +2, making it a good instrument to be used to measure the dimensions of cognitive processes and dimensions of biological knowledge.

Furthermore, the analysis performed on the test instrument description. Results of analysis of test description can be seen in Figure 2.
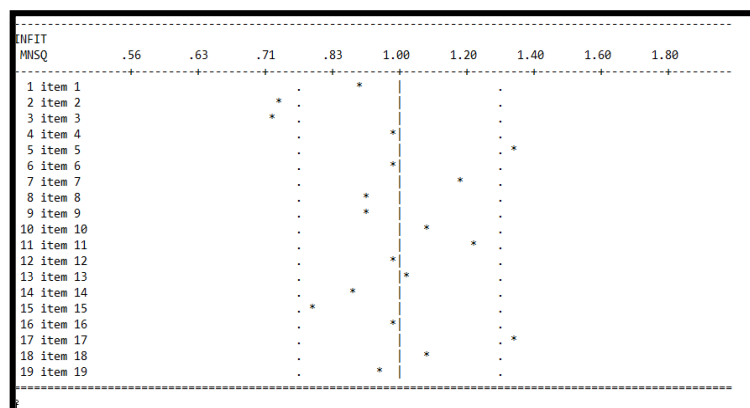


**Figure 2. Diagram Infit MNSQ Problem Description Cognitive Process Dimension and Dimension Life Sciences High School in South Jakarta Based Test Results**

Based on Figure 2 can be seen that, the results of tests on 19 items soal tes description, it is known that there are some items that do not fit with the model, as it stands at less than 0.77 and more than 1.30. Item number that does not fit is 2, 3, 5 and 17 or item numbers 32A, 32B, 33c on the first package and item numbers on packages II.

According to the table 2 can be seen that, the reliability of test item description is based on the test results is 0.62.

## 2. Difficulty Instrument Analysis of Cognitive Process Dimension and Dimension Biological Sciences Students Based Test Results

The level of difficulty of items based aspects can be analyzed using the QUEST program. The results of the analysis item multiple choice questions based on this aspect, as shown in Figure 3. Based on the analysis, it is known that the difficulty level of the test showed the highest rate of 0.57 which is in C3 (applying) the procedural, while the lowest difficulty level stands at -1.16 namely the aspect of C1 (remember) factual.
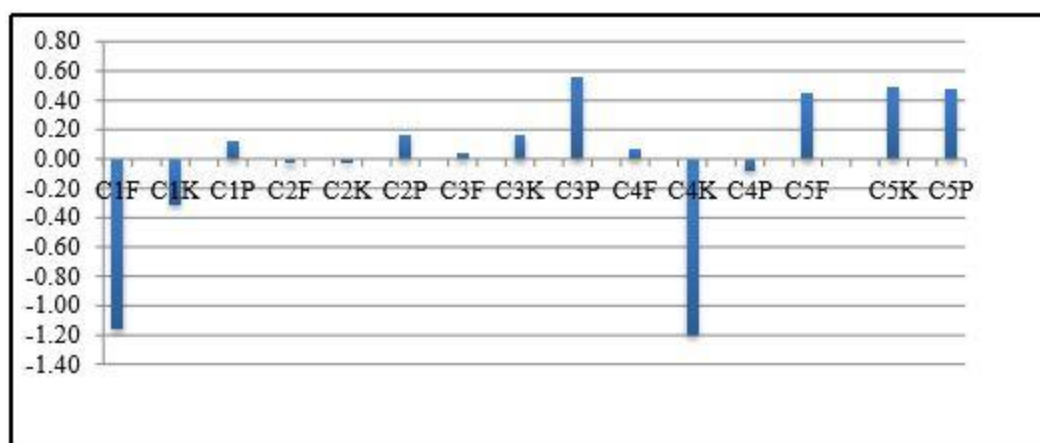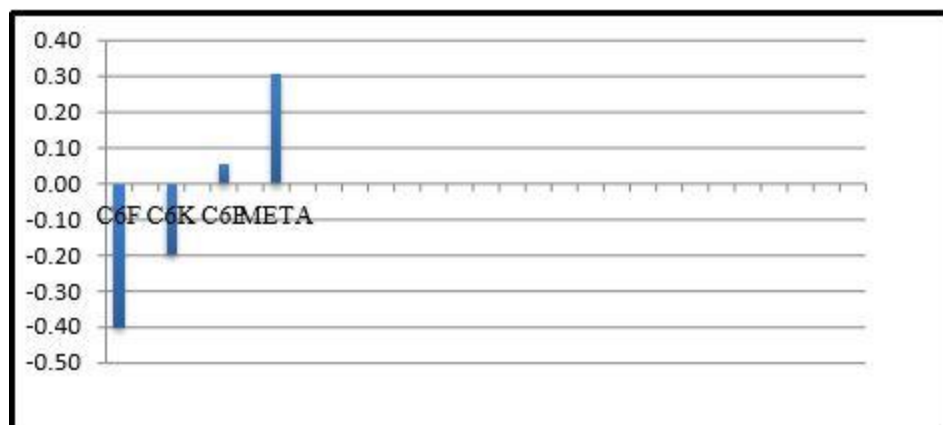


**Figure 3. Distribution of Difficulty Problem PG Tests on Every Aspect Based Test Results**

Then, the test item description, item difficulty levels based on the aspects can be analyzed also by using the QUEST program. The results of the analysis items based on this aspect, can be seen in Table 3 and Figure 4. Based on the analysis, it is known that the difficulty level of the test showed the highest rate of 0.31 which is on the dimensions of metacognitive knowledge and the lowest difficulty level stands at -0.40 namely the aspect C6 (create) factual.

**Table 3. Problem Description Item Difficulty in Every Aspect Based Test Results**

| Dimensions of Processes Cognitive | Dimension of Knoeledge | No Item | *Difficulty* | Category 1 | Category 2 | Category 3 |
|---|---|---|---|---|---|---|
| C6 | Conceptual | 31C | 0,67 | -1,66 | 0,56 | 1,10 |
| | Factual | 32A | -0,69 | -0,89 | 0,33 | 0,56 |
| | Conceptual | 32B | -0,67 | -0,90 | 0,28 | 0,62 |
| | Procedural | 32C | -0,01 | -1,00 | 1,22 | -0,22 |
| | Metacognitive | 33C | -0,83 | -0,12 | -0,65 | 0,77 |
| | | 34A | -0,42 | 0,66 | 0,22 | -0,88 |
| | | 34B | 0,83 | -0,08 | -0,30 | 0,38 |
| C6 | Factual | 31A | 0,29 | -1,31 | 0,77 | 0,55 |
| | Procedural | 31B | 0,30 | -1,29 | 0,75 | 0,54 |
| | Metacognitive | 33A | 0,30 | -2,57 | 0,08 | 2,49 |
| | | 33B | 0,36 | -1,41 | 0,59 | 0,82 |
| | Metacognitive | 34C | 1,02 | -0,02 | -0,16 | 0,18 |
| C6 | Conceptual | 31C | 0,81 | -1,74 | 0,55 | 1,18 |
| | Factual | 32A | -0,80 | -0,59 | 0,72 | -0,13 |
| | Conceptual | 32B | -0,73 | -0,30 | 0,44 | -0,14 |
| | Procedural | 32C | -0,12 | -1,15 | 1,33 | -0,18 |
| | Metacognitive | 33C | -0,57 | -0,62 | -0,64 | 1,26 |
| | | 34A | -0,33 | 0,49 | 0,09 | -0,57 |
| | | 34B | 0,59 | -0,59 | 0,05 | 0,54 |

For more details, please refer to item difficulty level distribution diagram according to the aspect in Figure 4 below.



**Figure 4. Distribution of Item Difficulty Problem Description Based Aspects of the Trial**
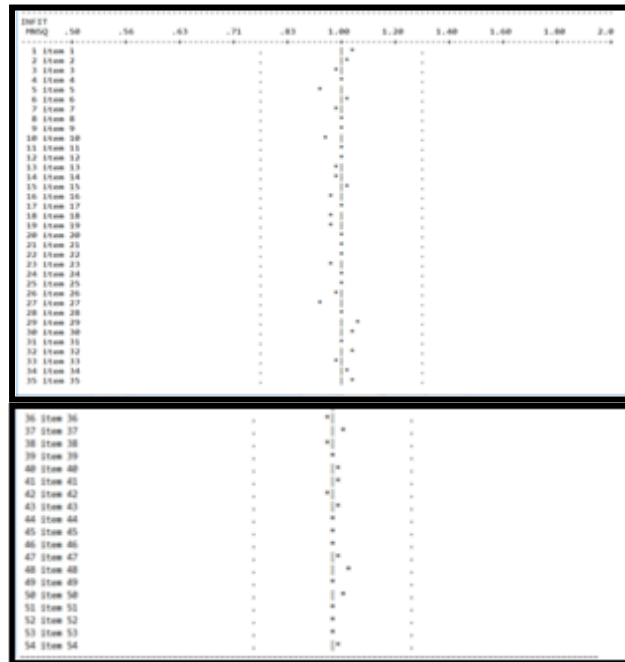
## 3. Revision Instrument Based Testing Results

Based on trial results on the multiple-choice test item and description, then made revisions to any form of testing. At the level of difficulty about multiple-choice test, seen some inconsistency about the item. Because the test instrument dimensions of cognitive processes and dimensions of knowledge should be able to demonstrate the level of cognitive ability learners, then the test items should indicate the level of difficulty that is able to support the observation of the cognitive abilities of learners. Item number 21 represents a conceptual C4 indicator considered too easy, the items were eliminated, but the indicator remains conceptual C4 represented by item number 22. The same thing happened to item 23, which represents an indicator of procedural C4, which is also considered to be too easy then the item number 23 abolished and indicators of procedural C4 is represented by item number 24. thus, it can be seen that MCQs in the pilot phase totaling 58 items, at this stage of the application be around 54 items. Then, the test item description, based on the analysis of the level of difficulty about, item numbers 32A, 32B and 33c on the package I and II did not fit with the model, then the items. Then, because the number 32C relates to items 32A and B, the items 32C was also abolished. Thus, the indicator C6 (create) factual, conceptual and procedural represented by item number 31A, 31B and 31C on the package I and II. Thus it can be seen that the problem descriptions in the pilot phase totaling 19 items, at the stage of implementation to 11 items.

## 4. Quality Analysis Instrument Test Cognitive Process Dimension and Dimension Biological Sciences Based on results of implementation

After the revision, the test instrument enters the implementation phase, which can then be analyzed using the Rasch model approach. Based on the Rasch model approach obtained 54 item instrument fit with the model because it meets the criteria INFIT MNQS of 0.77 up to 1:30 as shown in Figure 5. It can be concluded that each item has a valid instrument used to measure the dimensions of cognitive processes and dimensions of biological knowledge learners.

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**Figure 5. Diagram Infit MNSQ Problem Multiple Choice Cognitive Process Dimension and Dimension Life Sciences High School in South Jakarta Based Application Results**
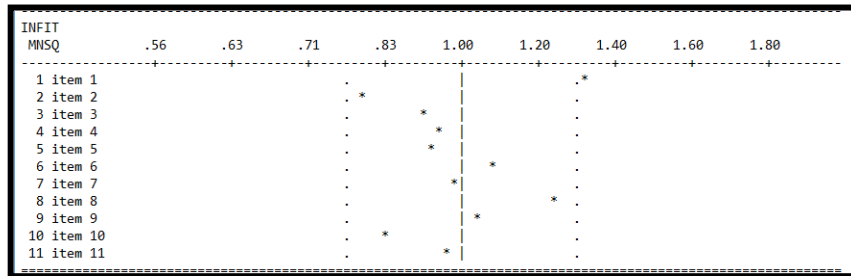
Based on the results of the test of 54 multiple choice items, indicating that all matter pertained fit, it can be seen on the sign (*) which are located around the enrollment rate of more than 0.77 to less than 1.30. Furthermore, based on analysis of data from application activity, also obtained estimation results on multiple choice tests as set out in Table 4.

**Table 4. Results Estimates Testi Item and Multiple Choice Problem Based Application Activity**

| No | Parameter | Estimasi untuk item | Estimasi untuk testi |
|----|-----------|---------------------|----------------------|
| 1 | Reliabilitas | 0,94 | |
| 2 | Nilai rata-rata dan simpangan baku INFIT MNSQ | $1,00 \pm 0,04$ | $1,00 \pm 0,08$ |
| 3 | Nilai rata-rata dan simpangan baku OUTFIT MNSQ | $0,99 \pm 0,08$ | $0,99 \pm 0,16$ |

Based on table 4 it can be seen that the reliability for the multiple-choice test questions based on the results of the application is 0.94.

Then, in a matter of description, data analysis was also performed with QUEST program to determine the test items fit with the model. QUEST output results in the problem description can be seen in Figure 5 below,

```
----------------------------------------------------------------------
INFIT
MNSQ     .56    .63    .71    .83   1.00   1.20   1.40   1.60   1.80
---------+------+------+------+------+------+------+------+------+------+
 1 item 1                         .                    .*
 2 item 2                       . *         |          .
 3 item 3                            *      |          .
 4 item 4                              *    |          .
 5 item 5                              *    |          .
 6 item 6                         .         |  *       .
 7 item 7                         .        *|          .
 8 item 8                         .         |      *   .
 9 item 9                         .        *|          .
10 item 10                       .     *    |          .
11 item 11                       .          *          .
======================================================================
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**Figure 5. Diagram Infit MNSQ Problem Description Cognitive Process Dimension and Dimension Life Sciences High School in South Jakarta Based Application Results**

Based on the results of the application, it is known that all the items belonging to fit with the model, except for one item or package 31C number I were classified as not fit because it is outside the enrollment rate, which is more than 1.30. Furthermore, based on analysis of data from application activity, also obtained estimation results on test item description as stated in Table 5.

**Table 6. Estimation Results and Estimated Testi Item Description Problem in Application**

| No | Parameter | Estimasi untuk item | Estimasi untuk testi |
|----|-----------|---------------------|----------------------|
| 1 | Reliabilitas | 0,62 | |
| 2 | Nilai rata-rata dan simpangan baku INFIT MNSQ | $1,00 \pm 0,16$ | $0,98 \pm 0,62$ |
| 3 | Nilai rata-rata dan simpangan baku OUTFIT MNSQ | $0,98 \pm 0,27$ | $1,01 \pm 1,01$ |

Based on Table 6 it can be seen that the reliability of test questions based on the description of the application is 0.62.

## 5. Difficulty Instrument Analysis of Cognitive Process Dimension and Dimension Biological Sciences Students Based Application Results

The level of difficulty of items based aspects can be analyzed using the QUEST program. The results of the analysis items based on this aspect, as shown in Figure 7. Based on the analysis, it is known that the difficulty level of the test showed the highest rate of 0.56 which is in C3 (applying) the procedural, while the lowest difficulty level stands at -1.16 namely the aspect C1 (remember) factual.
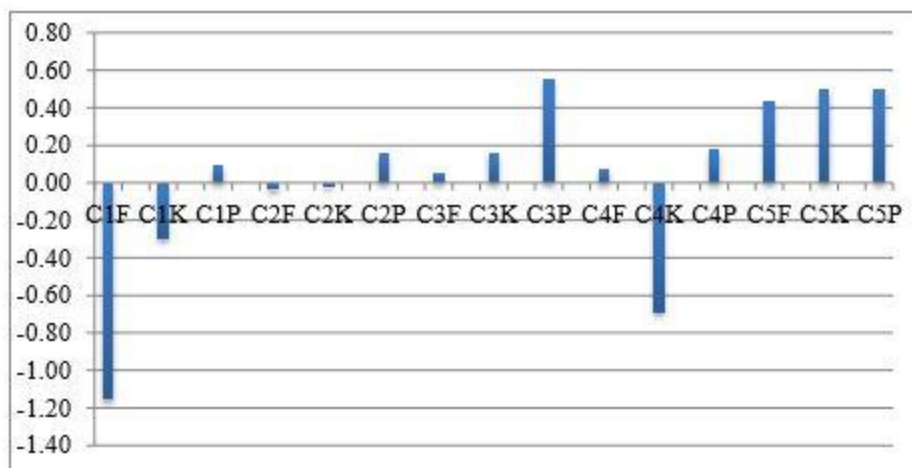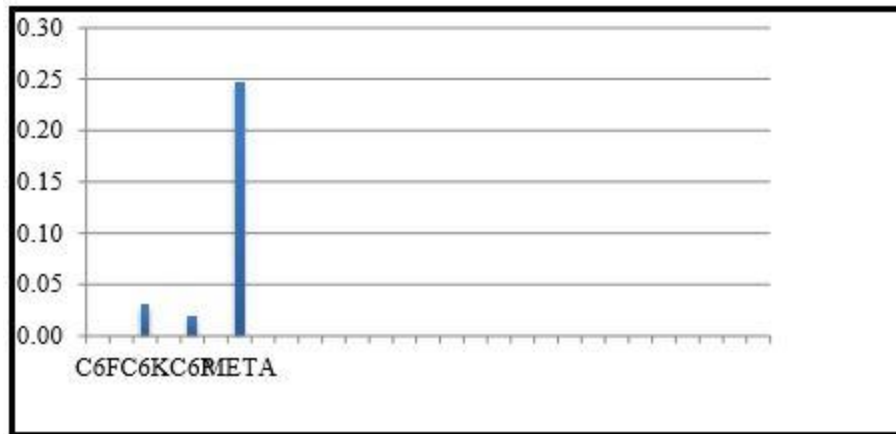
**Figure 7. Distribution Difficulty PG Tests on Every Aspect Based Application Results**

The level of difficulty of items based aspects can be analyzed using the QUEST program. The results of the analysis items based on this aspect, can be seen in Table 6 and Figure 8. Based on the analysis, it is known that the difficulty level of the test showed the highest rate of 0.25 which is on the dimensions of metacognitive knowledge, while the lowest difficulty level is at 0.00 which is the number aspect C6 (create) the factual indicated by number 31A.

**Table 6. Level of difficulty Item Description Every aspect of the Application Activity**

| Dimensions of Cognitive Processes & Dimensions of Biological Knowledge | No Item | *Difficulty* | Category 1 | Category 2 | Category 3 |
|---|---|---|---|---|---|
| C6 Konseptual | 31C | 0,82 | -0,14 | -0,15 | 0,30 |
| Metakognitif | 34A | -0,22 | 1,25 | -0,07 | -1,18 |
| Metakognitif | 34B | 0,63 | 0,31 | -0,69 | 0,38 |
| C6 Faktual | 31A | 0,00 | -0,67 | 0,60 | 0,06 |
| C6 Prosedural | 31B | 0,02 | -0,48 | 0,58 | -0,10 |
| Metakognitif | 33A | -0,21 | -1,13 | -0,06 | 1,19 |
| Metakognitif | 33B | 0,23 | -1,26 | 0,98 | 0,28 |
| Metakognitif | 34C | 0,72 | 0,41 | 0,49 | -0,90 |
| C6 Konseptual | 31C | 0,88 | -0,09 | -0,63 | 0,73 |
| Metakognitif | 34A | -0,04 | 1,03 | 0,00 | -1,03 |
|  | 34B | 0,62 | 0,08 | -0,41 | 0,33 |

The following explanation of the level of difficulty in the aspect of C6 (create) factual, conceptual and procedural and metacognitive knowledge dimension based distribution diagram based on aspects of item difficulty level.

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**Figure 8. Distribution of Test Item Difficulty Essay Aspects of the Activity Based Application**

## 6. Characteristic curves Multiple Choice Test Item Cognitive Process Dimension and Dimension Biological Sciences at the Application

Based on the analysis using the program Bilog MG, obtained the characteristic curve of the items on each item. In figure 9 is presented an example of ICC's item number 18.
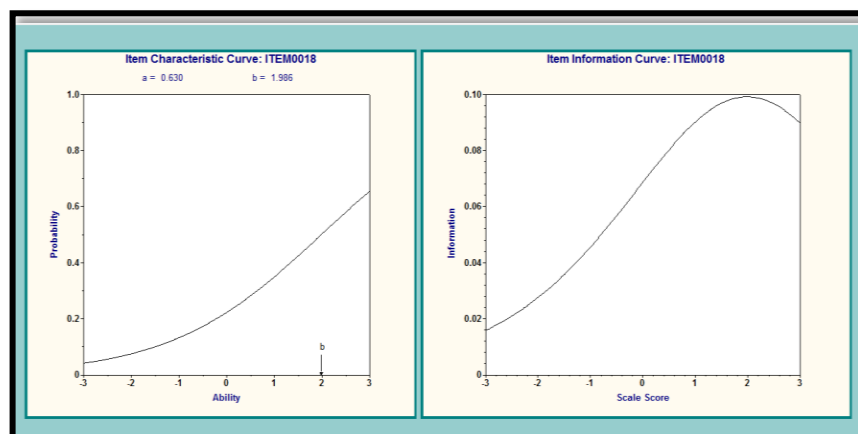


**Figure 9. The curve characteristics of the PG Item Item Number 18 Based Application Results**

Based on the image curves can be understood that the item number 18 can be done by learners with the ability (b) or a high capacity, because the curve is at number 2.

## 7. Characteristic Curve Test Item Description Cognitive Process Dimension and Dimension Biological Sciences at the Application

Based on the analysis of the program Parscale, ICC obtained as many as 11 pieces. In the figure 17 is presented an example of ICC's item number 33A, which can

be explained that: (a) a score of 1 (category 1) mostly obtained learners with low ability ($\theta$ = -1.13), (b) a score of 2 (category 2) mostly obtained learners with low ability ($\theta$ = -0.06), (c) a score of 3 (category 3) mostly obtained learners with high ability ($\theta$ = 1.19).
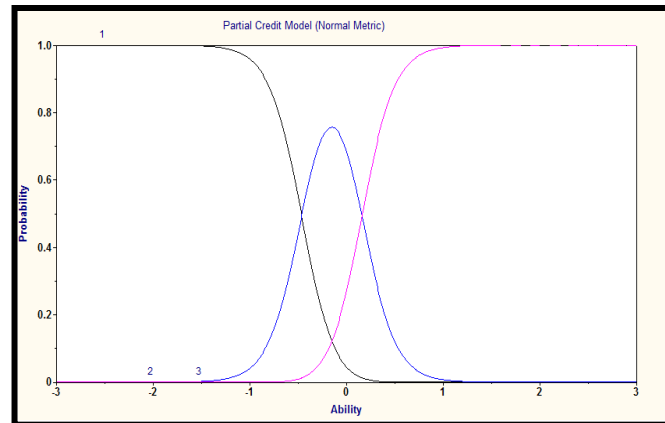


**Figure 10. Characteristic Curves Problem Description Item Number 33A Based Application**

## 8. Grafik Information and SEM graphs Function Tests Multiple Choice Cognitive Process Dimension and Dimension Biological Sciences at the Event Application

Analsisis results on the multiple choice questions are presented in Figure 11 below, is a function of information and SEM.
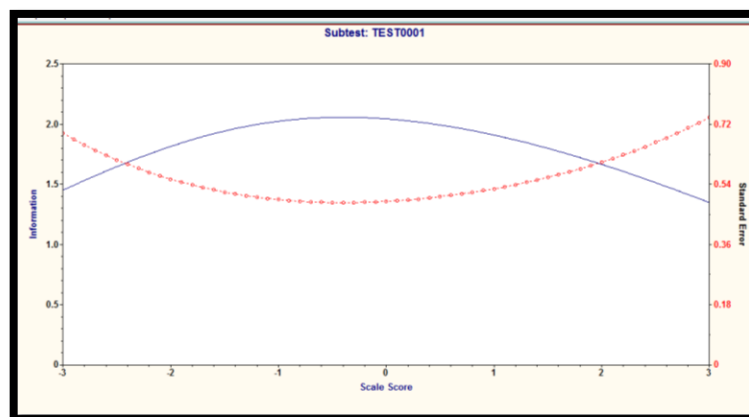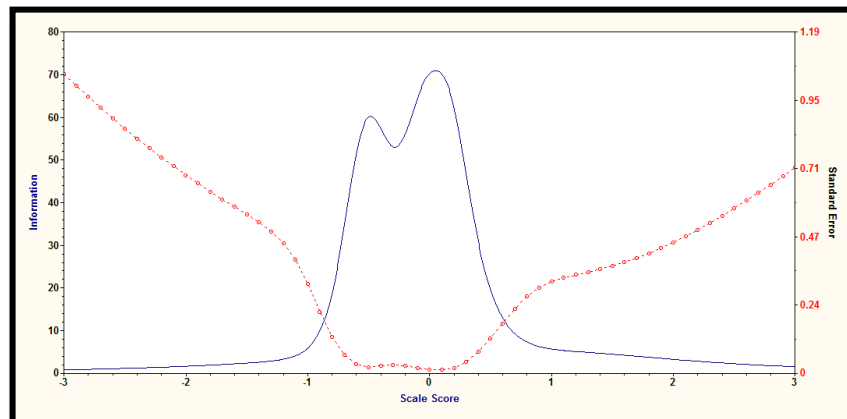


**Figure 11. Function of Information and Standard Error measurment (SEM) Multiple Choice Questions in the Application Event**

Based on the figure 11 is known that test cognitive process dimension and the dimension of knowledge appropriate for learners who have the ability between categories of low to high, as demonstrated by the numbers of -2.5 $\leq$ $\theta$ $\leq$ 2.0.

### 9. Graphs and SEM Test Information Function Description Cognitive Process Dimension and Dimension Biological Sciences at the Event Application

Analsisis results on the multiple choice questions are presented in Figure 19 below, is a function of information and SEM.



**Figure 12. Function of Information and Standard Error measurment (SEM) Problem Description Based Application Results**

Based on the figure 12 is known that the graph of the function information showed two peaks of information, which means that there are two peaks optimal information obtained by the test, ie at low and high ability individuals at once. Thus, it is known that test cognitive process dimension and the dimension of knowledge appropriate for learners who have the ability between medium and high categories of - $1.8 \leq \theta \leq 0.7$

### CONCLUSION

Based on the description of the results of research and discussion, the research instrument development test cognitive process dimension and the dimension of knowledge high school biology class XI can conclude matters as follows:

1. Step-by-step development of instruments are as follows: (1) the initial development of the test, (2) the trial tests, (3) measurement. In this case, an early development stage tests include: (1) determining the test objectives, (2) the determination of competence that will be tested, (3) the determination of the material tested, (4) preparation of grating tests, (5) that the item is based on the principle -prinsip cognitive dimension Anderson and Krathwohl, (6) the preparation of the scoring guidelines, (7) validation test items, and (8) repair and assembly of the test item. In the test phase consists of several steps, namely: (1) determining the subject of the trial, (2) the implementation of the trial, and (3) the analysis of the test results. Whereas, at this stage of implementation has the purpose not only determine the characteristics of the instrument but also

determine the ability of the individual respondents. This stage includes: (1) The test assembly for the application, (2) the implementation of the application of the test, (3) analysis of the results of the application, and (4) the interpretation of the results of the application.

2. The biological material on which to base the development of the instrument is the digestive system, the respiratory system and the excretory system. In this case the basic competence in the subject matter digestive system, respiratory system and excretory system reads, (1) to analyze the relationship between network structure constituent organs of the digestive system and link it with nutrients and bioprosesnya so as to explain the process of digestion and impaired functions that may occur in human digestive system through the study of literature, observation, experiment and simulation. (2) to analyze the relationship between network structure constituent organ of the respiratory system and associate it with bioprosesnya so as to explain the process of breathing and impaired functions that may occur in the human respiratory system through the study of literature, observation, experiment and simulation. (3) to analyze the relationship between network structure constituent organ of the excretory system and associate it with the excretion process so that it can explain the mechanism and function disorders that may occur in the human excretory system through the study of literature, observation, experiment and simulation.

3. The results showed that the test phase and the application of instruments based on the criteria INFIT MNSQ mean and standard deviation 0,0 1,0 proven multiple choice test and the description fit the Rasch models. Based on the criteria of lower and upper bounds INFIT MNSQ 0.77 and 1.30, there are items that do not fit with the model. Therefore, the revision of some items. Based on the results of the application of the instrument, it is known that the reliability of test multiple choice test items is 0.94 and the description is 0.62. Then, the level of difficulty about multiple-choice test is between -1,16 to 0,56 and the description of test questions is between 0,00 to 0,25. Thus, we can conclude that the instruments developed eligible to measure the dimensions of cognitive processes and dimensions of biological knowledge learners.