Journal of Environmental and Science Education

Development of Metacognitive Self Assessment for Junior High School Students on Materials Interaction of Living Things and Their Environment

Chaetsunnajah[1], Novi Ratna Dewi[1*]

[1]Science Education Study Program, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, Semarang, Indonesia 50229

Article Info

*Corresponding author:
Novi Ratna Dewi
Universitas Negeri Semarang
E-mail: noviratnadewi@mail.unnes.ac.id

Abstract

Based on the 2013 curriculum and Regulation of the Ministry of Education and Culture number 20 of 2016 concerning Achievement of Graduation Standards, graduates must not only be equipped with factual, conceptual, procedural knowledge but also metacognitive knowledge related to the field of knowledge, which is science. Metacognition can be measured by certain evaluation tools, so the instruments used in the learning assessment are oriented towards metacognition abilities. One of the characteristics of metacognitive assessment is that it involves students in their self-assessment process. Self-assessment is a habit of thinking about the relationship between metacognition and reflection. Metacognitive self-assessment is a metacognitive assessment instrument developed in this research, consisting 20 questions of metacognitive ability test and reflection journal as a self-assessment. This study aims to test the feasibility, analyze the characteristics of the product and determine the metacognitive profile of students. The results of data analysis showed that the Metacognitive Self Assessment product was very feasible with an average percentage obtained of 92.78% according to material experts, 86.43% according to evaluation experts, and the feasibility of readability data based on student responses of 83.59%. Metacognition profiles data based on their level are also supported by the results of reflection journals as a form of self-assessment that students have been able to carry out the process of reflection and evaluation of learning and what they are doing.

INTRODUCTION

Metacognition has an important role in learning science because metacognition helps students more likely to understand the process of logical thinking, causal relationship thinking process and mechanisms involved in science content (Chin and Brown, 2000; Zohar, 1994; Grotzer & Mittlefehldt, 2012). Metacognition by generally divided into two components, namely: knowledge of cognition and regulation of cognition (Schraw, 2009; Schraw et al., 2012; Cetin, 2015). Metacognitive knowledge is an important component in achievement of graduation standards in the 2013 curriculum. Implementation of the 2013 curriculum is a form of government efforts in preparing 21st-century learning. Based on Rules Ministry of Education and Culture Number 20 year 2016 concerning Graduate Competency Standards primary and secondary education used as the main reference, including one of the standards educational assessment. Graduates in addition to having to equipped with factual, conceptual, procedural, also equipped with metacognitive knowledge both in terms of the technical, specific, complex level that related to the field of knowledge, one of which is science (Herlanti, Y. et al. , 2017).

Orlich et al. (2007), metacognitive knowledge means caring about the process of ideas while thinking. A Habit of thinking about existence the link between metacognition and reflection is called with self-assessment (Donham, 2010). Self-assessment is a process of assessment formative, the form of a process of reflection and evaluation of the quality of work and learning that has been done (Spiller, 2009; Syafa'ah & Handayani, 2015). The process involves students in metacognitive reflection are also able to improve learning in science (White & Frederiksen, 1998; 2000; White et al., 2020).

Asy'ari et al. (2018), stated that if the learning objectives emphasize on facilitate metacognitive abilities, then instruments used in the assessment learning is also oriented to metacognition ability itself. Purpose of the assessment by an educator is to monitor, evaluate process, and learning progress, as well as improvement of results learn students on an ongoing basis (Permendikbud, 2016). Uno et al. (2012: 2), learning achievement information will be able to obtained when the teacher uses an assessment that appropriate to measure student learning outcomes.

Research on metacognitive assessment has been done year after year. Several among them, Sarac & Karakkele (2012), Haryani et al. (2018), Asy'ari et al. (2018), Febriyanti (2020). The results of the literature study show that the use of metacognitive assessment and empowerment efforts metacognitive ability is not yet general done at school. The metacognitive assessment generally used at the school level high school and college. This result supported by data obtained by researchers while doing practical teaching experience at SMP Negeri 26 Semarang and also during observation pre-research at SMP Negeri 2 Pekalongan, that availability of metacognition assessment is still rare applied.

In this study, the researchers tried to develop assessment which is instruments in the form of metacognitive self-assessment is mainly in aspects of involving students to assess the process of their learning and cognitive processes in the metacognitive assessment used. Metacognitive self-assessment in this study consists of 20 questions about metacognitive ability test and self-assessment which interpreted in the form of a reflective journal. The reflective journal question focuses on the process of students's reflection and the results of their thoughts on what has been studied (Septiyana, 2012). Metacognitive assessment in the form of an assessment instrument developed for junior high school students in the topic interaction between living things and their environment. Characteristics of the material interaction of living things with the environment was chosen because it is a material that most of learning resources are found in the natural environment (Wahyuningsih, 2015). Suitable material with the needs of students will be useful because it can be used in everyday life (Amalia et al ., 2019). This assessment is prepared based on metacognitive indicators adapted from McGregor, Schraw, and Anderson & Krathohl in Haryani (2012) includes: (1) Realizing the process of thinking and the ability to describe it, (2) Develop an introduction to thinking strategies, (3) Reflecting on procedures evaluatively, (4) Transferring knowledge and procedural experience on other contexts, (5) Connecting understanding conceptual with procedural experience.

Based on the description of the identification of existing problems, the objectives of this research are (1) Test appropriateness instrument evaluation metacognitive self-assessment for junior high school students at material interactions of living things and their environment, (2) Analyzing the characteristics of the assessment instrument metacognitive self-

assessment for junior high school students at material interactions of living things and their environment, (3) Measuring the metacognitive profile of students on interaction between living things and their environment.

METHOD

This type of research is a development research with a development model is ADDIE. ADDIE consists of steps, which are analysis, design, development, implementation and evaluation. The study was carried out at SMP N 2 Pekalongan which is located on Jl. Cendrawasih No.11, Long Cage, North Pekalongan District, Pekalongan City, Central Java. The research subjects in this case are students and experts which are:
(1) Expert evaluation of as many as 5 experts and experts evaluation of 5 experts.
(2) Students of class VIII E SMP Negeri 2 Pekalongan as many as 32 students (one class) at the trial stage.
(3) Students of class VII C SMP Negeri 2 Pekalongan as many as 32 students (one class) at the implementation stage.

The assessment was made consists of two components, namely metacognitive ability test questions and also reflective journal. Both are based on lattice which contains indicators of metacognition, meanwhile the ability test questions are also based on indicators basic competence in the material interaction of living things with the environment. . Instruments tested on trial consists of 30 items of ability test accompanied by 5 questions in the reflective journal. Furthermore, at the implementation stage, the questions are reduced into 20 items based on the results of expert assessment as well as empirical validation in the form of the value of reliability, power different and the level of difficulty. Research procedures carried out in the development process in the form of problem analysis with observation and literature study, followed by assessment design stage, the stage of development includes (1) making metacognitive self-assessment, (2) expert validation and phase I revision, (3) test trial and revision phase II, (4) processing and analysis data, (5) final revision (tested/final product obtained), the last stage of implementation to obtain data student metacognition profile. Data collection techniques carried out using test and non-test techniques.

Instrument tests are used to obtain metacognitive profiles students while non-test instruments are used to obtain expert judgment and response students on the feasibility and characteristics product developed. Data analysis performed quantitatively. Eligibility and characteristics analyzed descriptively percentage, then also analysis of the general characteristics of the assessment includes reliability, discriminatory power, and level of difficulty and selected items based on the criteria that have been determined. The assessment is feasible with knowing the metacognitive profile seen from the analysis achievement of the level of metacognition indicators, indicators basic competence of the material based on the results of the answers student.

RESULT AND DISCUSSION

Results of observations and literature studies shows that the use of metacognitive assessment is still rare. Generally metacognition assessment is used at the level high school and college as well. It is also strengthened that the use of self-assessment also still not widely applied (Wijayanti, 2017).The Ministry of Education and Culture (2013: 4) also states that self-assessment is an assessment technique by asking students to express it is advantages and disadvantages in the context achievement of competence. Given the importance the role of metacognition in science learning (Chin and Brown, 2000; Zohar, 1994; Grotzer & Mittlefehldt, 2012), and also self-assessment as a form of assessment technique that is still developing at this time in line with the assessment that regulated in the 2013 curriculum. Developed a product called metacognitive self assessment which includes a reflection journal as a form of self-assessment. Products developed then validated and assessed by experts including material expert and evaluation expert. Based on the test process feasibility, material experts, evaluation and results experts student responses stated that Metacognitive Self Assessment is very feasible with the average percentage value of the three is 87.60%. The results of the assessment are displayed in the Table 1.

Tabel 1. Metacognitive self-assessment validation data by material expert

| Aspect | Score Percentage (%) | | | | |
	Val. 1	Val. 2	Val. 3	Val. 4	Val. 5
Material	100	100	87.5	100	100
Construction	87.5	100	87.5	100	87.5

Display	75	75	100	75	100
Language	87.5	100	100	100	100

Tabel 2. Metacognitive self-assessment validation data by material expert

Aspect	Score Percentage (%)				
	Val.1	Val.2	Val.3	Val.4	Val.5
Construction	81.25	87.5	75	87.5	93.75
Display	100	75	50	100	100
Language	75	100	75	100	100

informaton:

Val. = Validator

Based on table 1. and table 2 shows that material experts agree Metacognitive Self Assessment is very worthy of in terms of material with a percentage of 92.78%. From In terms of evaluation, it can also be seen that the product very feasible, based on the results of expert assessment evaluation as shown in table 2. Previous research by R. Asriningrum, et al. (2013) is in line with this technique that expert judgment can determine the feasibility of the product developed and able to improve quality. Dewi (2016) any input from validators are recapitulated into one, evaluated later looking for a solution to fix it. Experts provide several inputs, which are: (1) The use of sentences that can cause double perception on questions, (2) Addition of illustrations in the form of pictures, it would be better if compared to the chart only, (3) Conformity the data presented in the question with the option on answer choices, (4) the suitability of the answer key with the right answer.

Rating reference material expert on the product is based on the appropriateness of the content of the material used. Otherfore the evaluation expert is guided by how to intact, the product has met the eligibility as a metacognition evaluation tool that contains a journal reflection. This refers to Ferdiana et al. (2013), that the preparation of evaluation tools based on the suitability of the learning objectives and basic competencies. Measuring tool construction can be also studied based on aspects of the material, technique, writing questions and the language used (Mardapi, 2018: 3) must have clarity (Ferdiana et al ., 2013). Meanwhile, the appraisal students focus on their readability, including: aspects of display and language as shown in table 3.

Table 3. Questionnaire data on student responses to metacognitive self-assessment feasibility.

No.	Rated aspect	Achievement (%)	Criteria
1.	Illustration of pictures, words and term which used in questions clear as well as could be understood.	80.46	Worthy
2.	Question in reflective journal and question test are related	75,00	Worthy
3.	The sentences which is used easy to understand	80,46	Worthy
4.	Formulas in sentences question no give rise to double perception	77,34	Worthy
5.	Formulation of the question sentence use sentence question or sentence order	87,50	Very worthy
6.	Sentences in the question and the question is not lead to answer which are expected	80,46	Worthy
7.	Usage language in instrument according to EYD	95,31	Very worthy
8.	Statements in questions no use applicable local language	92,18	Very worthy

It is presented in table 3, that students provide a response that the readability of the product very feasible with the average percentage value obtained by 83.59%. It means that product readability is by following per under needs learners.

Characteristics of the assessment in this study refers to the opinion of Arikunto (2013: 72) that An assessment can be said to be good if meet several criteria including (1) having high validity value, (2) has a value of high reliability, with several factors that affect, among others, the power of difference, the level of the difficulty of the question, (3) has an objectivity value, (4) has a practical value, (5) has a value of economical. As a special feature of the assessment developed, metacognitive self-assessment as well load a reflection journal that functions as a form of self-assessment in metacognition assessment.

Content validity data of metacognition items obtained from the results of expert validation by analyzing using the Aiken V formula. The validity of the content of the metacognition items is presented in table 4.

Table 4. Value of the validity of the contents of the questions

No	Validity Value	Criteria	No	Validity Value	Criteria
1	0.9778	Valid	16	0.9556	Valid
2	0.9556	Valid	17	0.8889	Valid
3	0.9556	Valid	18	1	Valid
4	0.9111	Valid	19	0.8889	Valid
5	0.9333	Valid	20	1	Valid
6	1	Valid	21	1	Valid
7	0.9333	Valid	22	0.9778	Valid
8	0.8889	Valid	23	1	Valid
9	0.9556	Valid	24	1	Valid
10	1	Valid	25	0.8444	Valid
11	0.9778	Valid	26	0.9111	Valid
12	0.9556	Valid	27	1	Valid
13	0.9333	Valid	28	1	Valid
14	0.9556	Valid	29	1	Valid
15	1	Valid	30	0.9778	Valid

All items are declared valid by the expert, supported by previous research according to Safitri (2020), that the validity is carried out by experts with a rating score, comments, and suggestions that different to improve the instrument that developed, and ready to be used for testing. The value of the reliability of the questions obtained is equal to 0.712 with category having high reliability Is high. These data indicate that the test questions of metacognitive ability in Metacognitive Self Assessment has a high determination as a form of test. Definition of determination in the test

according to the concept of reliability that the results obtained do not always have to be the same, but follow steady change (Arikunto, 2013: 101). (Scarvia B. Anderson, et al., 1975), as requirements of a test, its reliability and validity are urgent. That reliability is able to support establishing validity. Besides validity and the reliability of the question as the assumption used to get good quality questions.

Balance in the proportion of test difficulty, whether the test is too easy or too difficult affects the score reliability (Uno, et al. 2012: 155), as well as differentiating power questions are used to determine which items good or not. The results of the analysis of the level of difficulty The problem shows that there are 2 questions with easy category or are at 0.70 < Kindergarten 1.00 and 28 questions in the medium category with the result of the count is at 0.30 < TK 0.70. The results of the data analysis of different questions obtained that There are 6 questions with the SB category (Good Question or with DP value 0.70), 6 questions with category B (Good or with a value of 0.40 DP < 0.70), 11 questions with category C (Enough or with a value of 0.20). DP < 0.40), as well as 7 questions in the KB category (Less than Good or with a DP value < 0.20).

In addition to the characteristics of the assessment that has been described as the data above, the assessment developed by researchers also developed based on the characteristics of objectivity values, practicality, economy and special characteristics or value uniquely owned. The value of this characteristic obtained from the results of expert validation and also a questionnaire student response. The following is the result data expert judgment on metacognitive characteristics self assessment in table 5.

Table 5. Data on the results of expert assessments regarding characteristics of metacognitive self-assessment

Aspect	Material Expert		Evaluation Expert	
	Achievement (%)	Criteria	Achievement (%)	Criteria
Objectivity	80	Good	90	Very Good
Practicability	100	Very Good	95	Very Good
Economical	80	Good	85	Very Good
Characteristic /unique	91.67	Very Good	88.33	Very Good

The Objectivity of Metacognitive Self Assessment such as shown in table 5 refers to Arikunto's opinion (2013), an evaluation tool has

objectivity if in the implementation there are no factors subjective influence, especially on the system scoring. So we need a scoring system that uniform, so that the same assessment can be obtained even if it was done by a different person. To assess the objectivity of Metacognitive Self Assessment, a scoring system is prepared which is accompanied by: guide in the assessment instrument. Metacognitive Self Assessment is a practical test by meeting the criteria of being easy to use and equipped with clear instructions (Arikunto, 2013). Student response as shown in table 6 also states that the instructions The work on Metacognitive Self Assessment is clear and easy to understand with a good predicate. Could means that the instructions provided are helpful students to use Metacognitive Self Assessment well. Meanwhile, Metacognitive Self Assessment has met economic definition according to Uno et al (2012), that does not require expensive costs, extra labor and a long time of use.

Characteristic data is also obtained from the response questionnaire learners. The following are characteristic data on student response questionnaire described in table 6.

Table 6. Characteristic data on student's response questionnaires

No.	Rated aspect	Achievement (%)	Criteria
1.	Working Instructions on metacognitive self-assessment clear and easy to understand	81,25	Good
2.	Question and Statement in Instrument capable push Student know weakness and the advantages to the material that tested.	85,15	Very Good
3.	The use of instruments does not require much cost	76,56	Good
4.	Time allotted For work on question and journal review enough	72,65	Good
5.	The use of instruments does not require extra power	71,87	Good
6.	Questions tested and the reflection journal given after encourage me to use knowledge and metacognitive strategy	76,56	Good
7.	self-assessment in the form of a reflection journal are able students knowing their abilities	76,56	Good
8.	self-assessment in the form of a reflection journal are able students to know their weakness faced in learning	82,81	Very Good
9.	self-assessment in the form of a reflection journal are able students know the advantages in learning process	82,03	Very Good
10.	self-assessment in the form of a reflection journal make students are able knowing their abilities	77,34	Good
11.	self-assessment in the form of a reflection journal help participant learn to review return what has been impassable during the process learning	88,28	Very Good
12.	self-assessment in the form of a reflection journal make students are able know the obstacles encountered in learning process	84,37	Very Good
13.	self-assessment in the form of a reflection journal make students are able know the error and success in process learning.	81,25	Good

14.	self-assessment in the form of a reflection journal help participant to repair process in next learning.	83,59	Very Good

The Average characteristics of the assessment results from the questionnaire student response are 80.02% and include in the good category. With average percentage Its unique value is from aspect points number 6 to 14 by 81.42% with a very good category. Where the highest percentage is obtained on aspect points number 11, 12, amounted to 88.28% and 84.37%, respectively. achievement of assessment characteristics based on results of expert opinions and student responses.

That Assessment which developed based on the characteristics referred to by the researcher achieve the value of amounted to 86.11% and included in the category of very good.

As a characteristic or characteristic, Metacognitive Self Assessment as an assessment metacognition in which there is a form self-assessment in the form of a reflection journal. Referring to Septiyana (2012), that journal reflection focuses on student self reflection and results thinking about what is being learned.

Guided by sub-level metacognition level 1 in the form of realizing one's abilities in carry out the assigned tasks included in the reflection activities or in KBBI it is also called by providing an overview. Arranged indicators questions in the journal of reflection point one and two which asks students to name a number or the part that is considered or found to be wrong along with the sub the topic of the matter. Students at level 5 metacognition able to mention the parts found or considered wrong is part of the reason. Students too mention the part that is difficult or wrong that is in the food pyramid and population density. At level 1 students, students do not fully mention what topic, but students remember in which part there was an error or The difficulty is in the table section in the last question. Meanwhile, students at level 1 metacognition also do the same. The difference, student level 2 This activity is in accordance with the definition of self-assessment according to Spiller; Syafa'ah & Handayani, (2009; 2015), that in the self-assessment of students reflect and evaluate the quality work and learning that has been done.

Furthermore, in points 3 and 4, based on the results of the answers in the reflection journal, students are also seen conduct a review of what is known and reflection on mistakes made when do the test. This question is guided by sub-level metacognition level 2 and 3, namely thinking about goals that have been set and identify sources of error from the experiment. Each of the two students mentions the part that have been mastered, meanwhile students at level 1 metacognition states that the difficulties experienced due to forgetting the material because they did not study. Unlike the student level 5 which states that the difficulties encountered are in the give reasons. This shows that students write down what is actually experienced, in accordance with the opinion of Alfiah, et al (2018), that reflection journals lead students to analyze what he has and does not know about the material learned and the obstacles encountered.

Reflection Journal on Metacognitive Self Assessment as a form of evaluation tool has been able to guide students to analyze ways face their weaknesses and difficulties. Analyze whether this method is able to overcome the difficulties encountered. This matter implemented on journal question points reflection numbers 5 and 6. Based on the results of the answers students on reflection journals, students look convey the usual strategy or method done. Level 5 and 1 students give results the same that usually students study or read first before the test. Activity where students mention the usual strategies carried out and analyze whether is successful or not, in line with research beforehand that the reflection journal can be used to assist in the evaluation process of what has been done, achievements, weaknesses and for develop an improvement plan (San Fauziya, 2015). Added by Zammi et al. (2018), self-evaluation is knowing the level of self-awareness to the progress of behavior and thinking accordingly learning targets.

Student self-evaluation is not only up to points 5 and 6 only. Help with questions further on points 7 and 8. This question arranged based on sub-level metacognition level 5 namely analyzing the efficiency and effectiveness of the procedure. Questions are structured to help students know strategies or ways of learning that work done so that the difficulties encountered can be overcome. Based on the results of student answers in the reflection journal, both students at level 5 and level 1 metacognition mention the strategy or the way it should be done to be successful, as well as strategies or methods that done and it worked.

Based on the description provided, that Metacognitive Self Assessment is stated has been able to achieve the special characteristics that expected. Based on the compiled questions in the journal of reflection, adheres to Kainde & Tahya (2020), a self-assessment-based reflection journal able to make students express knowledge newly learned and relate it to prior knowledge so as to be able to guide students take further action. As already previously explained, that knowledge meant not only about the material that learned, but knowledge about students' self themselves about their strengths and weaknesses and evaluate what has been previously known. Can be concluded that the characteristic points contained on the sheet expert assessments, response questionnaires, and in particular on reflection journals. Stating that the characteristics typical with the acquisition of the highest score, namely that Self-assessment in the form of a journal of reflection in Metacognitive Self Assessment is able to encourage students to carry out the evaluation reflection process proven by the empirical results of the work student. Characteristics of the assessment completed and also strengthened by the characteristics of the assessment general include the value of practicality, economy, objectivity and also empirical data as a tool requirement good evaluations such as the value of validity, reliability, the difference, and level of difficulty.

Student metacognition profile data obtained during the implementation phase, final product assessment which has been declared to have passed the previous stage of the test then used at this stage. Profile metacognition is obtained from the test question instrument metacognitive abilities. Then as a reciprocal form, there is a reflection journal as a form of self-assessment in metacognition assessment. The data can be seen in Figure 1.
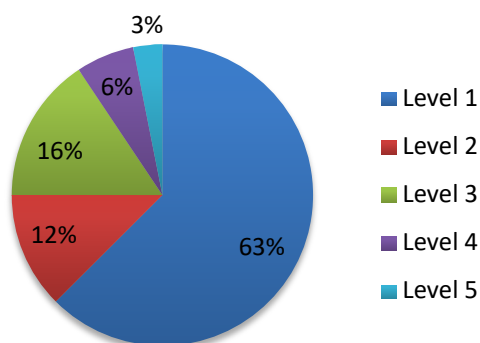
Figure 1. Metacognition Profile Data Based on Level

Information:
Level 1: Be aware of thought processes and able describe it
Level 2: Develop strategy recognition think
Level 3: Evaluatively reflecting on procedures
Level 4: Transferring experience and knowledge in another context
Level 5: Connecting conceptual understanding with procedural experience

Based on Figure 1. the results show that the average On average, most of the students are at level 1 with a percentage value of 63% represented by the blue color is then followed by level 3, as well as followed by level 2, level 4, and level 5. This achievement indicated by the scores obtained by students based on the results of the ability test questions metacognition. The scores obtained by students are different for each item, based on a different system created and declared the scores that have been made and declared valid by the expert. The average percentage student achievement scores are at level 1. This shows the majority of students are still at stage realize the thinking process and capable describe it.

Questions on Metacognitive Self Assessment classified by level metacognition as in table 3.3 which later regrouped by sub-indicator metacognition adapted from McGregor, 2007, Schraw, 1995 and Anderson & Krathohl, 2001 in Haryani (2012) and also the basic competencies that different. The better the metacognitive profile on a question in the sub-indicator of metacognition and basic competence matter. There should be a higher percentage obtained by sub-indicator in where the questions are grouped, the higher percentage of achievement indicator competency question. Metacognition achievement data based on sub-Metacognition indicators are presented in Figure 2.
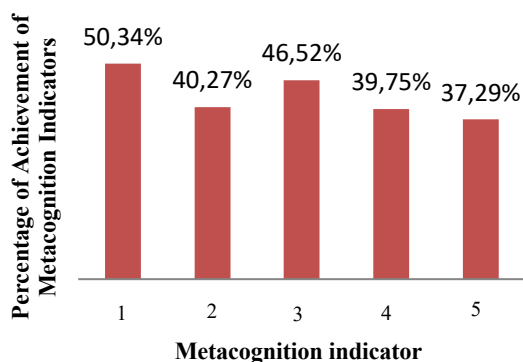

3%
6%
16%
12%
63%

- Level 1
- Level 2
- Level 3
- Level 4
- Level 5

Figure 2. The proportion of Achievement Indicator Metacognition Ability Test Questions
Information:
Indicator 1: Identifying information
Indicator 2: Elaborating information from various
source
Indicator 3: Compile and interpret data
Indicator 4: Applying understanding to a situation
Indicator 5: Linking observational data with discussion

Percentage of achievement of the most sub-indicator low on indicator 5 sub-indicators link observational data with a discussion of 37.29% meanwhile the achievement of sub-indicators highest on indicator 1 sub-indicator identify information by 50.34%. For In more detail, metacognition profiles are also presented based on indicators of achievement of basic competencies on the material. The proportion of metacognitive profiles based on basic competency indicators are presented in the figure 3.
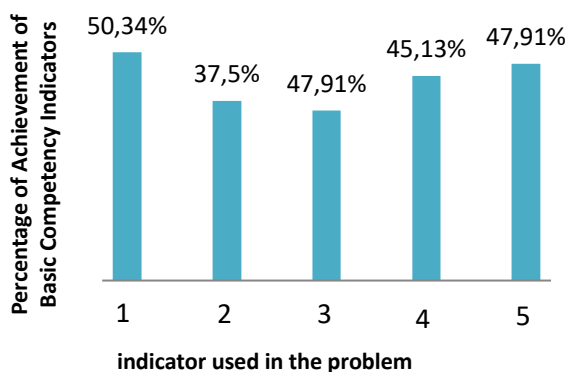

Figure 3. The proportion of Achievement of KD. Indicators

based on the material used in the question
Information:
1: The concept of the environment and its components
2: Interaction patterns
3: The concept of the interdependence of beings life
4: Impact of Interaction on the dynamics of living things
5: Population dynamics due to interactions between creatures life and environment

Achievement profile metacognition based on indicators of achievement of basic competencies the highest is 50.34% by indicator basic competencies of environmental concepts and components components. This shows that 16 students out of 32 students are able to work on KD concepts environment and its components with very good. Meanwhile, the lowest profile percentage of metacognition achieved by indicator basic competence concept of mutual form dependence of living organisms by 37.50%. Percentage of achievement of metacognitive profile on environmental concept competency indicators and higher components compared to indicator competence other shows that most of the students have able to understand this KD better

CONCLUSION

The results of the research " Metacognitive Development" Self Assessment for Junior High School Students on Material The Interaction of Living Things and Their Environments" the following conclusions were obtained:

1. Feasibility of Metacognitive Self Assessment by material experts get an average rating by 92.78% and included in the category very worthy. Metacognitive Self Eligibility Assessment by evaluation experts obtains an average the average rating is 86.43% and includes in the very decent category. As well as eligibility readability data based on student responses obtained an average assessment of 83.59% and is included in the very decent category.

2. Metacognitive Self Assessment Own characteristics include: (1) having validity high, (2) has good reliability, (3) has the value of objectivity, represented with a scoring system accompanied by scoring guide on the assessment instrument, (4) has

practical value, represented with instructions for use for teachers and students, (5) has economic value, represented by sufficient processing time, affordable cost and manpower, (6) publish a reflection journal that focuses on the process of reflection and self-evaluation of students as well as results of his thoughts on what was learned. With an achievement percentage of 89.16% by material experts, 89.16% by experts evaluation with very good category as well as 80.02% based on student responses with good category.

3. Profile Metacognition based on level metacognition obtained the highest results at the level 1 of 63% of the total number of students. Where At this level, students are aware of the process think for yourself and be able describe it. This is followed by highest achievement profile percentage metacognition based on student sub-indicators able to identify the information in the question that is equal to 50.34%. Next achievement metacognition profile based on indicators basic competence is obtained the highest score by 50.34% on the concept indicator environment and its components.

REFERENCES

Alfiah, A. N., Putra, N. M. D., & Subali, B. (2018). Media Scrapbook sebagai Jurnal Refleksi untuk Meningkatkan Kemampuan Kognitif dan Regulasi Diri. *JP (Jurnal Pendidikan): Teori dan Praktik, 3*(1), 57-67.

Amalia, S., Mun'im, A., & Yunus, S. R. (2019). Pengaruh Metode Pembelajaran Outdoor Learning Terhadap Motivasi Dan Hasil Belajar Peserta Didik Kelas VII Smp Negeri 15 Makassar (Studi Pada Materi Pokok Interaksi Makhluk Hidup Dengan Lingkungan). *Jurnal IPA Terpadu, 2*(1).

Arikunto, Suharsimi. (2013). *Dasar-Dasar Evaluasi Pendidikan Edisi 2 Cetakan 2.* Jakarta : Bumi Aksara.

Asy'ari, M., Ikhsan, M., & Muhali. (2018). Validitas instrumen karakterisasi kemampuan metakognisi mahasiswa calon guru fisika. *Prisma Sains: Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA IKIP Mataram, 6*(1), 18-26.

Cetin, B. (2015). An Investigation of Teacher Candidates' Metacognitive Skills According to Their Year of Study at Canakkale. *Academic journal : Educational research and reviews, 10* (1), 10 – 16.

Chin, C. E., & Brown, D. E. (2000). Learning in Science: A Comparison of Deep and Surface Approaches. *Journal of Research in Science Teaching, 37* (2), 109–138.

Dewi, N. R., & Akhlis, I. (2016). Pengembangan perangkat pembelajaran IPA berbasis pendidikan multikultural menggunakan permainan untuk mengembangkan karakter siswa. *Unnes Science Education Journal, 5*(1).

Donham, J. (2010). Creating Personal Learning Through *Self Assessment. Teacher Librarian, 37*(3), 14.

Febrianti, Erta A. (2020). *Desain Instrumen Tes untuk Mengukur Metakognisi Peserta Didik pada Materi Asam Basa.* Skripsi, Pendidikan Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Semarang.

Ferdiana, S., Rinnie, P, P, & Widowati, B. (2013). Pengembangan Perangkat Pembelajaran IPA Terpadu Berbahasa Inggris Tipe Integrated dengan Tema Mengamati Jasad Renik dalam Setetes Air untuk Kelas VII SMP. *Jurnal BioEdu, 2(1)*, 31-34.

Grotzer, T., & Mittlefehldt, S. (2012). The role of metacognition in students' understanding and transfer of explanatory structures in science. In *Metacognition in science education.* Springer, Dordrecht.

Haryani, S. (2012). *Membangun Metakognisi dan Karakter Calon Guru Melalui Pembelajaran Praktikum Kimia Analitik Berbasis Masalah.* Semarang: UNNES Press.

Haryani, S., Wijayati, N., & Kurniawan, C. (2018). Improvement of Metacognitive Skills and Students' Reasoning Ability Through Problem-Based Learning. *Journal of Physics: Conference Series, 983*(1), 012174.

Herlanti, Y., Mardiati, Y., Wahyuningtyas, R., Mahardini, E., Iqbal, M., & Sofyan, A. (2017). Discovering learning strategy to increase metacognitive knowledge on biology learning in secondary school. *Jurnal Pendidikan IPA Indonesia, 6* (1).

Kainde, E. W., & Tahya, C. Y. (2020). Pemanfaatan Jurnal Refleksi sebagai Penuntun Siswa dalam Menemukan Makna pada Mata Pelajaran Kimia. *Journal of Educational Chemistry (JEC), 2*(2), 49-56.

Mardapi, D. (2018). *Teknik Penyusunan Instrumen Tes dan Nontes*. Yogyakarta : Parama Publishing.

R. Asriningrum, dkk. (2013). Pengembangan Self Assessment sebagai Alat Evaluasi Karakter Berbasis Konservasi pada Mahasiswa Pendidikan Fisika Fmipa Unnes. *Unnes Physic Education Journal*, 2(3), 41-46.

Safitri, R. K., & Dewi, N. R. (2020). The Development of Diagnostic Test with Testlet Model to Detect Difficult Learning Students in Temperature and Its Changes Materials. *Unnes Science Education Journal*, 9(2), 98-110.

San Fauziya, D., & Suhara, A. M. (2015). Evaluasi Pembelajaran melalui Penulisan Jurnal Reflektif Berbasis Penilaian Diri di PBS. Indonesia STKIP Siliwangi. *Jurnal Ilmiah P2M STKIP Siliwangi*, 2(1), 46-52.

Scarvia B. Anderson, Samuel Ball, Richard T. Murphy, and Associates. (1975). *Encyclopedia of Educational Evaluation*.San Fransisco: Yessey Bass, Inc Publishers.

Schraw, G. (2009). Measuring Metacognitive Judgement. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Handbook of Metacognition in Education*. New York : Routledge Taylor & Francis.

Schraw, G., Olafson L., Weibel M., Sewing D. (2012). Metacognitive Knowledge and Field Based Science Learning in An Outdoor Environmental Education Program. In A. Zohar & Y. J. Dori (Eds.), *Metacognition in Science Education:Trends in Current Research*. Dordrecht Heidelberg London. New York : Spriger.

Septiyana, K. (2012). Penerapan Jurnal Belajar Sebagai Strategi Berpikir Metakognitif pada Materi Sistem Imunitas terhadap Hasil Belajar Siswa di SMA Negeri 1 Kajen *Unnes Journal of Biology Education*, 2(1), 1-9.

Spiller, Dorothy. (2009). *Assessment: Feedback to Promote Student Learning*. New Zealand: Teaching Development Unit The University of Waikato.

Syafa'ah, H. K., & Handayani, L. (2015). Pengembangan metacognitive self–assessment untuk mengukur keterampilan berpikir evaluasi dalam membaca teks sains berbahasa Inggris. *UPEJ Unnes Physics Education Journal*, 4(1).

Uno, Hamzah B., Koni, Satria. (2012). *Assesement Pembelajaran Ed.1, Cet.3*. Jakarta : Bumi Aksara.

Wahyuningsih, S. (2015). *Pembelajaran IPA Berpendekatan JAS (Jelajah Alam Sekitar) Materi Interaksi Makhluk Hidup Dengan Lingkungannya Terhadap Hasil Belajar dan Karakter Ilmiah Siswa*. Disertasi. Universitas Negeri Semarang.

Wijayanti, Anisa. (2017). Efektivitas *Self Assesement* dan *Peer Assesement* dalam Pembentukan Karakter Siswa. *Realita, 15* (2).

White, B. Y., & Frederiksen, J. R. (1998). Inquiry, modeling, and metacognition: Making science accessible to all students. *Cognition and Instruction, 16* , 3–118.

White, B. Y., & Frederiksen, J. R. (2000). Metacognitive facilitation: An approach to making scientifi c inquiry accessible to all. In J. L. Minstrell & E. H. Van-Zee (Eds.), *Inquiry into inquiry learning and teaching in science,* 331–370. Washington, DC: AAAS.

White, B. Y., Shimoda, T. A., & Frederiksen, J. R. (2020). Metacognition and Learning Through Inquiry. *Computers As Cognitive Tools, 2*, 114.

Zammi, M., Endang, S., Kasmadi, I. S. (2018). Pengembangan Instrumen *Self Assessment* untuk Meningkatkan Keterampilan Laboratorium Calon Guru Kimia. *Jurnal Profesi Keguruan*, 4(1), 37-41.

Zohar, A. (1994). Teaching a thinking strategy: Transfer across domains and self-learning versus class-like setting. *Applied Cognitive Psychology, 8* , 549–563.