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Dimensions of Cognitive Processes and Dimensions of Knowledge in School Exam Questions for Junior High School Mathematics in Subrayon 05, Semarang Regency

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a b s t r a c t

This study aims to describe the dimensions of cognitive processes and dimensions of knowledge that are measured on exam questions for junior high school mathematics in Subrayon 05 Semarang Regency for the 2021/2022 academic year. This study uses a qualitative approach with content analysis techniques. Data collection is carried out through documentation. For further analysis of the contents of the data in the form of school exam questions. The research instrument includes a question review guide that is determined based on the dimensions of cognitive processes and the dimensions of knowledge. The results showed that the dimensions of cognitive processes and the dimensions of students' knowledge as measured through school exam questions for Mathematics subjects in Sub-Rayon 05 Semarang Regency ranged from understanding facts to creating which procedures; on questions that measure understanding facts, students are asked to classify facts in the form of notation, on questions that measure understanding of concepts, students are asked to classify related to certain mathematical concepts; on questions that measure applying concepts, students are asked to use or implement certain mathematical concepts in order to solve problems; on questions that measure applying procedures, students are asked to use or carry out certain mathematical procedures in order to solve problems; In questions that measure the ability to create procedures, students are asked to generate/hypothesizing specific skills and algorithms.

K e y w o r d s :
question; school exams; the cognitive process dimension, the knowledge dimension

INTRODUCTION

In the study of assessment of learning outcomes, instruments have a very vital role. Learning outcomes assessment instrument is a tool used to collect data on learning outcomes. The instrument for assessing learning outcomes in Mathematics learning is expected to provide an overview of the thinking process and the dimensions of students' knowledge. This is as stated in Bloom's revised Taxonomy that the thinking process includes knowing, understanding, applying, analyzing, evaluating, and creating (Anderson et al., 2001). The dimensions of knowledge include facts, concepts, procedures, and metacognitive (Anderson et al., 2001).

In learning Mathematics, the learning outcomes assessment instrument used can be in the form of tests or non-tests. In the implementation of competency test assessments, mid-semester assessments, year-end assessments, end-of-semester assessments and education unit level assessments, the instrument is usually a test.

In 2021, the National Examination for primary and secondary education in Indonesia will no longer be enforced. The government has rolled out a policy regarding School Examinations as one of the requirements for graduation. The school exam is an assessment carried out at the education unit level. In this case, the authority to carry out school examinations is held by the education unit. This applies including in the preparation of questions.

Subrayon 05 is one of the sub-rayons under the coordination of the Semarang Regency Education Office which will enforce school exams, especially at the junior high school level. This sub-rayon covers a number of areas, namely Pabelan, Bringin, and Tuntang. The management of education at the junior high school level in the area refers to the sub-rayon policy which is under the control of the district of Semarang.

Several studies have discussed the analysis of exam questions. Among the National Examination questions in Banyumas, moderate level questions (C3, C4) made up the majority of the type of questions, namely 75%, easy level questions (C1, C2) were 25%, and difficult level questions (C5 and C6) do not exist, as for the National Examination Questions in Cilacap, medium level questions (C3 and C4) are the most, namely 77.5%, easy questions (C1 and C2) are 22.5% of all questions, difficult questions (C5, C6) are absent (Yulianto, 2019). The results of this study indicate that research has only been carried out on thought processes, not yet on the knowledge dimension.

There were 6 questions on remembering (C1), 7 questions on understanding (C2); 2 questions on applying (C3), As for the description questions there are 3 questions on understanding; 2 questions apply (Syafitri, 2020). The results of the analysis of the questions based on Bloom's Taxonomy found that the questions belonging to the Knowledge level (C1) were 13 questions or 32.5%, Understanding was 21 questions (52.5%), and applying was 6 questions or 15% (Elisa, 2015). In research on the analysis of the cognitive level of Mathematics textbook questions, it was found that the percentage of questions at a certain cognitive level were: C1 was 3.23%, C2 was 30.97%, C3 was 61.93%, C4 was 3.87%, absent in C5 and C6 (Giani et al., 2015).

Based on several previous studies, it is known that the problem analysis is still based on thought processes, not yet on the knowledge dimension. It is important to carry out

research in the thinking process as well as the knowledge dimension in order to obtain complete information about school exam questions based on the revised Bloom's Taxonomy.

LITERATURE REVIEW

The implementation of the School Examination is regulated in the Circular of the Minister of Education and Culture Number 1 of 2021 concerning the Elimination of National Examinations and Equality Examinations as well as the Implementation of School Examinations in the Emergency Period for the Spread of Corona Virus Disease (Durmuş, 2011). In the circular, it is stated that the 2021 National Examination and Equality Examination will be abolished. The students are declared to have graduated from the educational unit/program after completing the learning program during the pandemic, obtaining a minimum good attitude score and taking the exam organized by the education unit. This exam which is held by the educational unit is called the School Exam.

One of the subjects tested in the junior high school is Mathematics. The school exam questions will be done by class IX students. School Exam Questions for Junior High School Mathematics are prepared by referring to the grid. The grid is based on the basic competencies that have been learned in the learning process at the junior high school level.

In the perspective of assessment of learning outcomes, questions are instruments developed to measure students' abilities. The question is an instrument of the assessment technique, namely the test. The test is a form of evaluation tool to measure how far the teaching objectives have been achieved (Kadir, 2015). According to Mansyur and Harun, evaluation has always been a very crucial part to determine whether the activities that have been carried out were successful or not (Sarea & Ruslan, 2019). The process of evaluating learning outcomes involves measuring and assessment where measurement is the process of systematically comparing the measuring object with certain measuring instruments, while the assessment is the interpretation of the measurement results (Elviana, 2020). Measurement aims to determine the characteristics of an object to be measured which in the world of education includes the measurement of learning outcomes (Sudaryono, 2011).

In Mathematics, the object that will be measured in the test is the cognitive aspect of students. Jahja stated that cognitive is one of the domains that involves mental behavior related to understanding, consideration, information processing, problem solving, gaps and beliefs (Habibah, 2020). In the Big Indonesian Dictionary, cognition means the activity or process of acquiring knowledge, including awareness and feelings and the effort to explore knowledge through one's own experience and the results of acquiring knowledge (Hijriati, 2017).

Cognitive ability of students in mathematics in the form of thinking skills. Mathematical thinking ability is one of the abilities contained in mathematics which consists of low-level and high-level thinking skills (Amalia, 2016). In college, they are trained to solve problems in high-level mathematical thinking skills. There are several perspectives to assess students' thinking skills. In Trends in International Mathematics and Science

Study (TIMSS), for example, using domains of knowing, applying, and reasoning and cognitive domains in the form of domains of numbers, algebra, geometry, and data and cahance (Munaji & Jupri, 2022). Student ability can also be measured using the SOLO taxonomy (Structure of Observed Learning Outcomes) taxonomy as discussed by Biggs&Collis (Fathonah et al., 2021). The review of the dimensions of cognitive processes and the dimensions of knowledge presented in Bloom's Taxonomy are widely used in order to assess students' thinking abilities, including mathematics.

Bloom's taxonomy is a conceptual framework for thinking skills developed in 1956 by Benjamin Samuel Bloom and his colleagues, namely Englehart, Furst, Hill and Krathwohl (Utari, 2011). Bloom and colleagues present three domains of intellectual abilities, namely cognitive, affective and psychomotor (Utari, 2011). Currently, there has been a Revised Bloom's Taxonomy initiated by Bloom's students, namely Anderson and Krathwohl and several psychologists who are cognitivism in the year 1994 and published in 2001 (Utari, 2011).

Bloom's revised taxonomy is based on six dimensions of cognitive processes and four dimensions of knowledge. Dimensions of cognitive processes include 1) remember, namely the dimensions of cognitive processes that take relevant knowledge from long-term memory including recognizing/identifying and recalling/retrieving; 2) understand, namely construct meaning from instructional messages, including oral, written, and graphic communication) including interpreting, namely clarifying/paraphrasing/representing/translating; exemplifying (illustrating, instantiating), classifying (categorizing, subsuming), summarizing (abstracting, generalizing), inferring (concluding, extrapolating, interpolating, predicting), comparing (contrasting, mapping, matching), explaining (constructing models); 3) apply, namely carry out or use a procedure in a given situations including executing/carrying out and implementing/using; 4) analyze is a cognitive process dimension that separates material into parts and determines how each part relates to each other with respect to a structure or function as a whole differentiating (discriminating, distinguishing, focusing, selecting), organizing (finding, coherence, integrating , outlining, parsing, structuring) attributing (deconstructing); 5) evaluate, namely the cognitive process dimension that makes judgments based on existing criteria and standards, including checking (coordinating, detecting, monitoring, testing) and critiquing (judging); 6) create is a cognitive process dimension that unites or rearranges elements to form a new logical and functional unified pattern or structure, including generating (hypothesizing), planning (designing), producing (constructing) (Anderson et al., 2001).

To identify the dimensions of cognitive processes in a math problem and or to arrange math problems based on the dimensions of certain cognitive processes, it can be done by marking the words used. Starting from the Remembering dimension which includes Mention the definition, imitate the pronunciation, state the structure, pronounce, repeat, state, to the creating dimension which includes Assemble, change, build, create, design, establish, formulate, write (Kusuma et al., 2017).

The dimensions of knowledge include: 1) factual knowledge, namely the basic elements students must know to be acquainted with a discipline or solve problems in it including knowledge of terminology and knowledge of specific details and elements; 2) conceptual

knowledge, namely the interrelationships among the basic elements within a larger structure that enable them to function together including knowledge of classifications and categories, knowledge of principles and generalizations, knowledge of theories, models, and structures; 3) procedural knowledge, namely how to do something, methods of inquiry, and aiteria for using skills, algorithms, tedmiques, and methods including knowledge of subject-specific skills and algorithms, knowledge of subject-specific techniques and methods, knowledge of criteria for determining when to use appropriate procedures; 4) metacognitive knowledge, namely knowledge of cognition in general as well as awareness and knowledge of one's own cognition including strategic knowledge knowledge about cognitive tasks, including appropriate contextual and conditional knowledge, self-knowledge (Anderson et al., 2001). The assumption on the knowledge dimension is that it ranges from concrete, namely factual knowledge, to abstract knowledge, namely metacognitive knowledge (Anderson et al., 2001).

Bloom, Englehart, Furst et al stated that factual knowledge captures discrete, isolated content elements (terminology and knowledge of specific details and elements); conceptual knowledge consists of classifications and categories, principles and generalizations, and theories, models, and conceptual structures; procedure knowledge includes skills and algorithms, techniques and methods, as well as knowledge of the criteria used to define and determine "when to do what" in specific domains and disciplines; metacognitive knowledge contained in the strategy; knowledge of tasks that have been mastered by contextual and conditional knowledge; and self-knowledge (Vukić et al., 2020).

Anderson & Krathwohl stated that conceptual knowledge is knowledge about explicit and implicit schemas, models, or theories in different cognitive psychological models (Musyaddad & Suyanto, 2019). According to Miller & Hudson; Rittle-Johnson & Schneider, conceptual knowledge, primarily characterized by Skemp, 1978, as relational knowledge, can be expressed as a connecting network of relationships (Hurrell, 2021). According to Rittle-Johnson & Alibali, conceptual knowledge is an "implicit or explicit understanding of the principles that govern the domain and the interrelationships between pieces of knowledge within the domain" (Crooks & Alibali, 2014). Procedural knowledge is a student's ability to predict, design, formulate hypotheses, and compose steps of observation or investigation (Star & Stylianides, 2013). Procedural knowledge includes the application of procedures and explicit verbalization of sequences (actions) (Lenz et al., 2020). Metacognition is a type of knowledge and special abilities that develop through personal experiences and learning outcomes in schools (Stewart et al., 2007).

Looking at the content of Bloom's taxonomy, a person's thinking ability is not only determined from his thinking ability but also from the dimensions of knowledge he masters. For example, someone who is able to remember facts, is different from remembering procedures. A student who is able to remember procedures, is different from other students who are able to analyze procedures. That is, based on Bloom's taxonomy, there will be twenty-four categories of thinking abilities, namely: 1) remembering factual knowledge; 2) remembering conceptual knowledge; 3) remembering procedural knowledge; 4) remembering metakognitive knowledge; 5) understanding

factual knowledge; 6) understanding conceptual knowledge; 7) understanding procedural knowledge; 8) understanding metacognitive knowledge; 9) applying factual knowledge; 10) applying conceptual knowledge; 11) applying procedural knowledge; 12) applying metacognitive knowledge; 13) analyzing factual knowledge; 14) analyzing conceptual knowledge; 15) analyzing proceedural knowledge; 16) analyzing metacognitive knowledge; 17) evaluating factual knowledge; 18) evaluating conceptual knowledge; 19) evaluating procedural knowledge; 20) evaluating metacognitive knowledge; 21) creating factual knowledge; 22) creating conceptual knowledge; 23) creating procedural knowledge; and 24) creating metacognitive knowledge. This is in accordance with the illustration stated by the following:

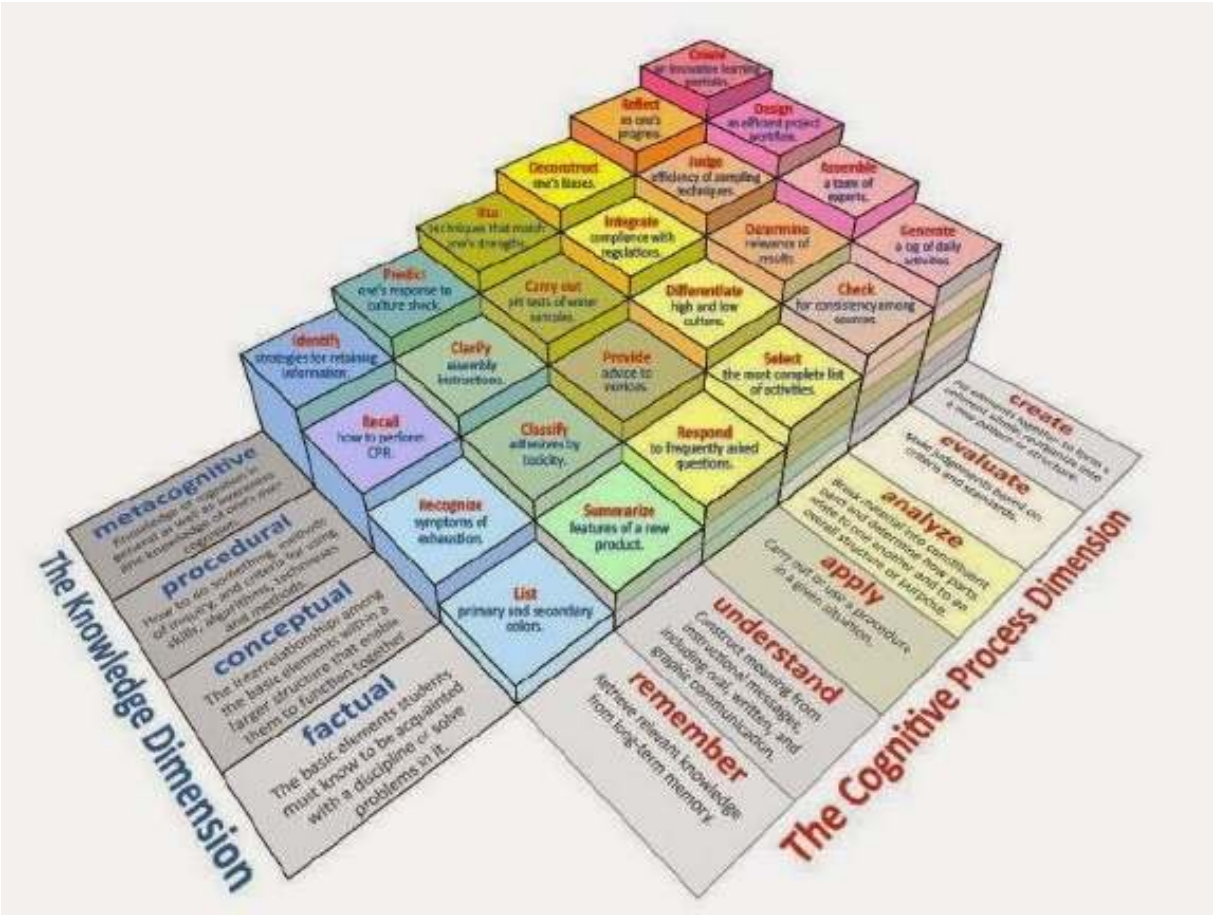


Figure 1
Combination of Cognitive Process and Knowledge Dimension (Heer, 2012)

METHODS

Research Design

This research was carried out from July to September 2021. The research sites were several junior high schools under the coordination of Subrayon 05 of the Semarang Regency Education Office. This research is a qualitative research which includes content analysis. Data retrieval is done through document review. The source of the data in this study is the school exam questions in the sub-rayon 05 junior high school, Semarang Regency, namely in the Tuntang, Bringin, and Pabelan sub-districts. Considering proportionality, from the Tuntang area, 2 schools were selected, namely SMP Negeri 2

Tuntang and SMP Islam At Tohari, 1 school from the Bringin area, namely SMP 1 Bringin, 1 school from the Pabelan area, namely SMP Negeri 2 Pabelan. The research instrument includes a question review guide that is determined based on Bloom's Taxonomy. Data were analyzed using Miles and Huberman's interactive model.

To identify cognitive levels along with dimensions of knowledge, using a table of operational verbs (Giani et al., 2015; Utari, 2011) combined with the following dimensions of knowledge (Anderson et al., 2001) as follows:

Table 1

Operational Verbs and Dimensions of Knowledge in Every category of thinking abilities

Knowledge Dimension	Dimensions of Cognitive Process					
	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual Knowledge	Recalling, recognizing knowledge of terminology and knowledge of specific details and elements	Interpreting, exemplifying, classifying, summarizing, inferring, comparing, explaining knowledge of terminology and knowledge of specific details and elements	Executing, implementing knowledge of terminology and knowledge of specific details and elements	Distinguishing, organizing, attributing knowledge of terminology and knowledge of specific details and elements	Examining, criticizing knowledge of terminology and knowledge of specific details and elements	Formulating, planning, creating knowledge of terminology and knowledge of specific details and elements
Conceptual Knowledge	Recalling, recognizing knowledge of classifications and categories, knowledge of principles and generalizations, knowledge of theories, models, and structures	Interpreting, exemplifying, classifying, summarizing, inferring, comparing, explaining knowledge of classifications and categories, knowledge of principles and generalizations, knowledge of theories, models, and structures	Executing, implementing knowledge of classifications and categories, knowledge of principles and generalizations, knowledge of theories, models, and structures	Distinguishing, organizing, attributing knowledge of classifications and categories, knowledge of principles and generalizations, knowledge of theories, models, and structures	Examining, criticizing knowledge of classifications and categories, knowledge of principles and generalizations, knowledge of theories, models, and structures	Formulating, planning, creating knowledge of classifications and categories, knowledge of principles and generalizations, knowledge of theories, models, and structures
Procedural Knowledge	Recalling, recognizing knowledge of subject-specific techniques and methods, knowledge of criteria for determining when to use appropriate procedures	Interpreting, exemplifying, classifying, summarizing, inferring, comparing, explaining knowledge of subject-specific techniques and methods, knowledge of criteria for determining when to use appropriate procedures	Executing, implementing knowledge of subject-specific techniques and methods, knowledge of criteria for determining when to use appropriate procedures	Distinguishing, organizing, attributing knowledge of subject-specific techniques and methods, knowledge of criteria for determining when to use appropriate procedures	Examining, criticizing knowledge of subject-specific techniques and methods, knowledge of criteria for determining when to use appropriate procedures	Formulating, planning, creating knowledge of subject-specific techniques and methods, knowledge of criteria for determining when to use appropriate procedures
Metacognitive Knowledge	Recalling, recognizing strategic knowledge, knowledge about cognitive tasks, including	Interpreting, exemplifying, classifying, summarizing, inferring, comparing, explaining	Executing, implementing strategic knowledge, knowledge about cognitive tasks, including	Distinguishing, organizing, attributing strategic knowledge, knowledge about cognitive	Examining, criticizing strategic knowledge, knowledge about cognitive tasks, including	Formulating, planning, creating strategic knowledge, knowledge about cognitive

	appropriate contextual and conditional knowledge, self-knowledge	strategic knowledge, knowledge about cognitive tasks, including appropriate contextual and conditional knowledge, self-knowledge	appropriate contextual and conditional knowledge, self-knowledge	tasks, including appropriate contextual and conditional knowledge, self-knowledge	appropriate contextual and conditional knowledge, self-knowledge	tasks, including appropriate contextual and conditional knowledge, self-knowledge

RESULT AND DISCUSSION

Result

The following will describe the research results according to the dimensions of cognitive processes and the dimensions of knowledge. School Examination questions were obtained from four schools, namely SMP Negeri 1 Bringin, SMP Negeri 2 Tuntang, SMP Negeri Islam At Tohari and SMP Negeri 2 Pabelan.

The total number of questions obtained is as follows: 35 questions from SMP Negeri 1 Bringin, 40 questions from SMP Negeri 2 Tuntang, 30 questions from SMP Negeri Islam At Tohari, and 40 questions from SMP Negeri 2 Pabelan. The following are the results of the analysis of questions based on the dimensions of cognitive processes and the dimensions of knowledge.

Remembering Factual Knowledge

Based on the analysis, it can be stated that none of the questions for the School Examination for Mathematics subjects in Subrayon 05 Semarang Regency specifically measure the ability to remember factual knowledge. This can be seen from the absence of demands for students to recall or recognize knowledge of terminology and knowledge of specific details and elements.

Remembering Conceptual Knowledge

Based on the analysis, it can be stated that none of the school examination questions for mathematics subjects in Subrayon 05 Semarang Regency specifically measure the ability to remember conceptual knowledge. This can be seen from the absence of demands for students to recall or recognize knowledge of terminology and knowledge of specific details and elements.

Remembering Procedural Knowledge

Based on the analysis, it can be stated that none of the questions for the School Examination for Mathematics subjects in Subrayon 05 Semarang Regency specifically measure the ability to remember procedural knowledge. This can be seen from the absence of demands on students to Recall, recognize knowledge of subject-specific techniques and methods, knowledge of criteria for determining when to use appropriate procedures

Remembering Metacognitive Knowledge

Based on the analysis, it can be stated that none of the school examination questions for mathematics subjects in Subrayon 05 Semarang Regency specifically measure the ability to remember metacognitive knowledge recall, recognize strategic knowledge, knowledge about cognitive tasks, including appropriate contextual and conditional knowledge, self-knowledge.

Understanding Factual Knowledge

There are 3 questions or the equivalent of 2% of questions that measure students' ability to understand factual knowledge. The following is one of the questions that measure students' ability to understand factual knowledge.

Para peneliti memperkirakan ukuran diameter virus corona 125 nanometer (1 m = 1.000.000.000 nano). Penulisan notasi ilmiah yang benar adalah ....

A. $1{,}25 \times 10^{-6}$ m
B. $1{,}25 \times 10^{-7}$ m
C. $1{,}25 \times 10^{-8}$ m
D. $1{,}25 \times 10^{-9}$ m

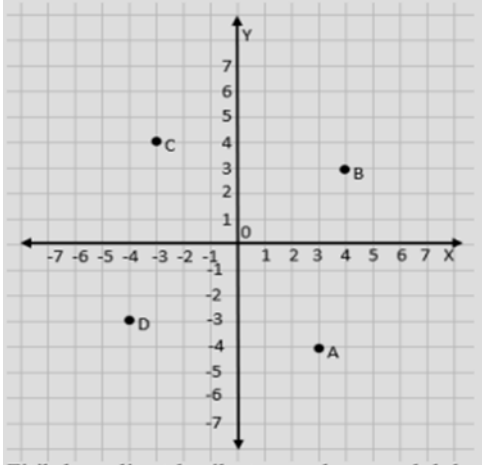
Figure 2
Mathematical Problems Measuring Understanding Factual Knowledge

The cognitive process that is measured in this question is understanding. This can be seen from the demands to classify certain mathematical objects. The factual knowledge that is measured in the problem is the writing of scientific notation of power numbers.

Understanding Conceptual Knowledge

There are 21% which is as many as 30 questions that measure understanding of conceptual knowledge. These questions include:

. Perhatikan gambar berikut.



Titik koordinat berikut yang benar adalah ....

A. $A\,(-4,3)$ dan $B\,(4,3)$
B. $A\,(-4,3)$ dan $C\,(4,-3)$
C. $A\,(3,-4)$ dan $C\,(-3,4)$
D. $A\,(3,-4)$ dan $D\,(-3,-4)$

:

Figure 3
Mathematical Problems Measuring Understanding Conceptual Knowledge (1)

These questions measure students' ability to understand. This is indicated by the demand that students classify the coordinates that are written correctly. Conceptual knowledge that is measured in this case is the concept of Cartesian coordinates, namely the position of a certain point on the Cartesian plane.

The following questions also measure students' understanding of conceptual knowledge, namely:

Diketahui himpunan $A = \{1,2,3\}$ dan $B = \{a,b,c,d\}$. Relasi berikut yang merupakan pemetaan dari himpunan A ke himpunan B adalah ....

A. $\{(1,a),(1,b),(1,c),(1,d)\}$
B. $\{(1,a),(2,b),(3,c),(3,d)\}$
C. $\{(1,a),(2,a),(3,a)\}$
D. $\{(1,a),(2,b)\}$

Figure 4
Mathematical Problems Measuring Understanding Conceptual Knowledge (2)

The ability to understand that is measured by the question is in the form of representing a relationship which is a mapping. The relationship in this matter is stated by registering its members. Conceptual knowledge in this matter is in the form of concept mapping. Of course, students must understand the definition of mapping in order to represent a mapping in the form of a set.

Perhatikan persamaan garis berikut.
(1) $3x + 2y = 5$
(2) $2x + 3y = 10$
(3) $6x + 4y = 10$
(4) $2x - 3y = 0$
Pasangan garis yang saling sejajar adalah ....
A. (1) dan (2)
B. (1) dan (3)
C. (2) dan (3)
D. (3) dan (4)

Figure 5
Mathematical Problems Measuring Understanding Conceptual Knowledge (3)

The ability to understand which is measured by the question as in figure 5 is in the form of classifying pairs of parallel lines. The relationship in this matter is stated by registering its members. The conceptual knowledge in this problem is in the form of the concept of parallel lines in which the parallel lines can be identified from the gradient.

Perhatikan kelompok tiga bilangan berikut ini.
(i) 7, 24, 26
(ii) 8, 15, 17
(iii) 9, 12, 15
(iv) 10, 24, 25
Dari kelompok tigaan bilangan di atas, yang merupakan tripel Pythagoras adalah ....
A. (i) dan (iii)
B. (ii) dan (iii)
C. (ii) dan (iv)
D. (iii) dan (iv)

Figure 6
Mathematical Problems Measuring Understanding Conceptual Knowledge (3)

The ability to understand which is measured by the question as in figure 6 is in the form of classifying groups of three numbers which are Pythagorean triples. The relationship in this matter is stated by registering its members. Conceptual knowledge is measured in the form of principles and generalizations in the form of the Pythagorean Theorem. Pythagorean triples are three numbers where the square of one number is the sum of the squares of the other numbers.

Understanding Procedural Knowledge

Based on the analysis, it can be stated that none of the questions for the School Examination for Mathematics subjects in Subrayon 05 Semarang Regency specifically measure the ability to understand procedural knowledge. This can be seen from the absence of demands on students to interpret, exemplify, classify, summarizing, concluding, comparing, explaining the knowledge of subject-specific techniques and methods, knowledge of criteria for determining when to use appropriate procedures.

Understanding Metacognitive Knowledge

Based on the analysis, it can be stated that none of the questions for the School Examination for Mathematics subjects in Subrayon 05 Semarang Regency specifically measure the ability to understand metacognitive knowledge. This can be seen from the absence of demands on students to interpret, exemplify, classifying, summarizing, inferring, comparing, explaining strategic knowledge, knowledge about cognitive tasks, including appropriate contextual and conditional knowledge, self-knowledge.

Applying Factual Knowledge

Based on the analysis, it can be stated that none of the questions for the School Examination for Mathematics subjects in Subrayon 05 Semarang Regency specifically measure the ability to apply factual knowledge. This can be seen from the absence of demands for students to execute, implement knowledge of terminology and knowledge of specific details and elements.

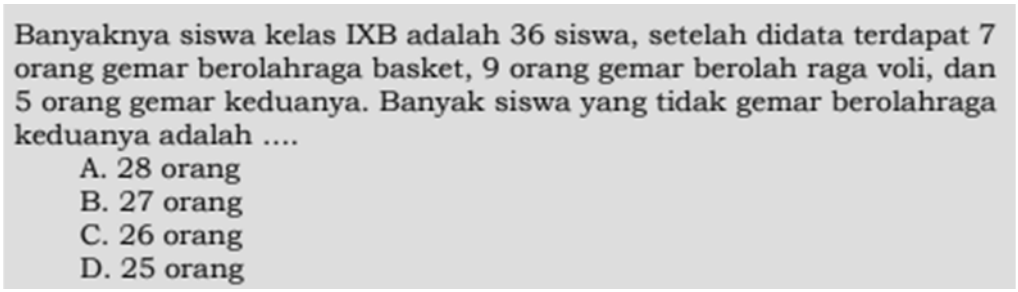
Applying Conceptual Knowledge

There are 73 questions that measure students' ability to apply conceptual knowledge. Questions that measure ability in applying conceptual knowledge are:

Jarak sebenarnya kota A dan B adalah 450 km. Pada sebuah peta jarak kedua kota tersebut adalah 30 cm, skala peta tersebut adalah ....
A. 1 : 15.000.000
B. 1 : 1.500.000
C. 1 : 150.000
D. 1 : 15.000

Figure 7
Mathematical Problems Measuring Applying Conceptual Knowledge (1)

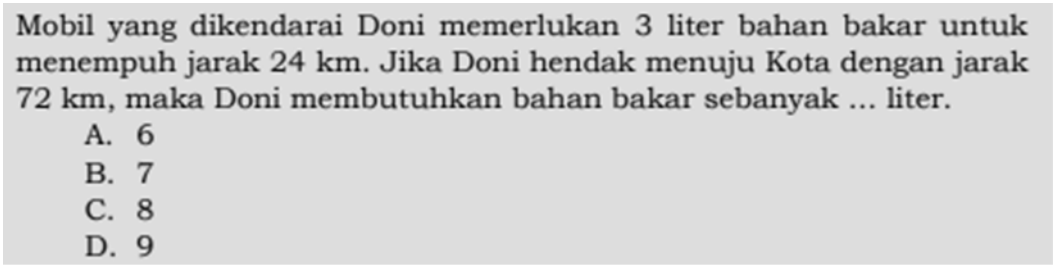
The question asks students to apply, namely carrying out the determination of the scale. Conceptual knowledge in this matter is knowledge of principles and generalizations, namely scales related to comparisons.


Banyaknya siswa kelas IXB adalah 36 siswa, setelah didata terdapat 7 orang gemar berolahraga basket, 9 orang gemar berolah raga voli, dan 5 orang gemar keduanya. Banyak siswa yang tidak gemar berolahraga keduanya adalah ....

A. 28 orang
B. 27 orang
C. 26 orang
D. 25 orang

Figure 8
Mathematical Problems Measuring Applying Conceptual Knowledge (2)

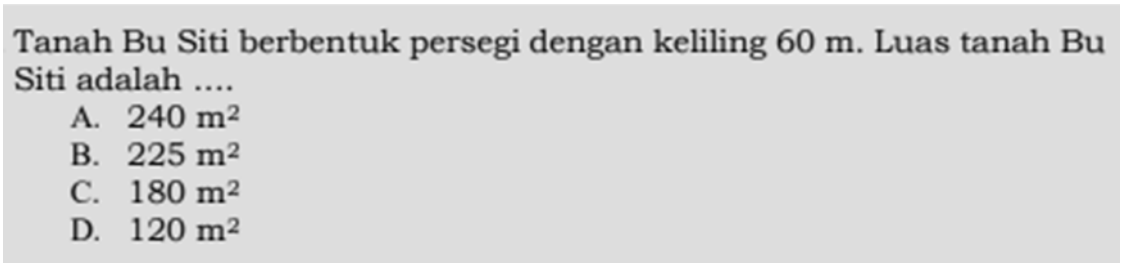
The questions measure how students can apply. This can be identified from the order to the students to carry out the determination of the number of students who do not like to exercise. Conceptual knowledge in this matter is related to principles and generalizations, namely intersection, combination, difference, and complement.


Mobil yang dikendarai Doni memerlukan 3 liter bahan bakar untuk menempuh jarak 24 km. Jika Doni hendak menuju Kota dengan jarak 72 km, maka Doni membutuhkan bahan bakar sebanyak ... liter.

A. 6
B. 7
C. 8
D. 9

Figure 9
Mathematical Problems Measuring Applying Conceptual Knowledge (3)

The problem in figure 9 asks students to apply, namely carrying out the determination of the quantity of fuel. The conceptual knowledge in this matter is in the form of knowledge of principles and generalizations, namely worth comparisons.


Tanah Bu Siti berbentuk persegi dengan keliling 60 m. Luas tanah Bu Siti adalah ....

A. 240 m^2
B. 225 m^2
C. 180 m^2
D. 120 m^2

Figure 10
Mathematical Problems Measuring Applying Conceptual Knowledge (4)

The problem as in figure 10 asks students to apply, namely carrying out the determination of the area. Conceptual knowledge measured in this problem is knowledge of principles and generalizations, namely area and perimeter.

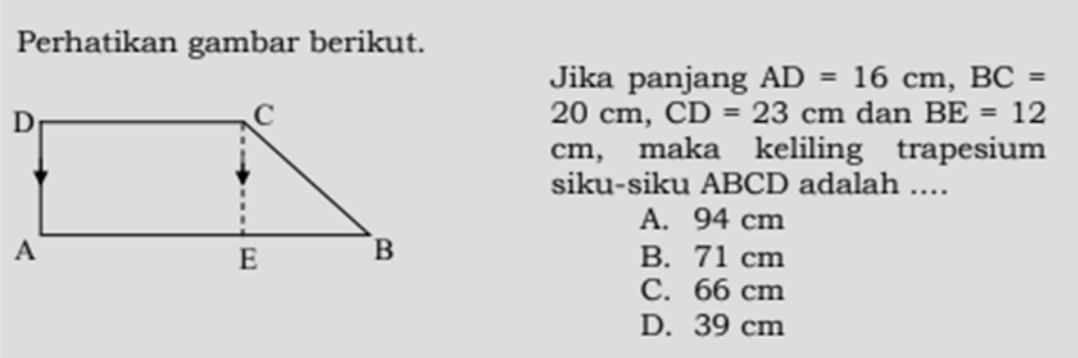


Figure 11
Mathematical Problems Measuring Applying Conceptual Knowledge (5)

This question measures students' ability to apply in the form of determining the circumference of a trapezoid. The conceptual knowledge measured is related to knowledge of principles and generalizations, namely the circumference of a plane geometry.

Applying Procedural Knowledge

Based on data analysis, there are 35 questions that measure students' ability to apply procedural knowledge, some of which are:

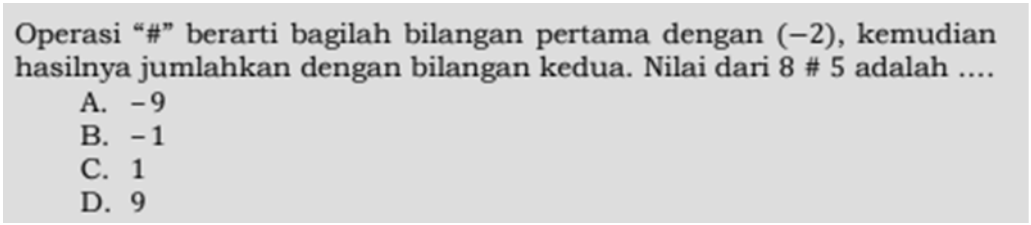


Figure 12
Mathematical Problems Measuring Applying Procedural Knowledge (1)

This question asks students to apply in the form of implementing the "#" operation as defined in the problem. The procedural knowledge measured in this problem is knowledge of specific skills and algorithms on a subject/subject in the form of the operation "#".

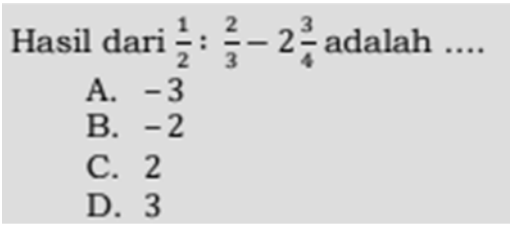


Figure 13
Mathematical Problems Measuring Applying Procedural Knowledge (2)

This question measures the teacher's ability to apply in the form of carrying out mixed arithmetic operations procedures on fractions. Procedural knowledge measured is knowledge of skills and special algorithms in a subject/subject in the form of mixed arithmetic operations on fractions.

Akar-akar persamaan kuadrat $x^2 - x - 6 = 0$ adalah ....
A. −6 atau 1
B. −3 atau 2
C. −2 atau 3
D. −1 atau 6

Figure 14
Mathematical Problems Measuring Applying Procedural Knowledge (3)

The question measures the teacher's ability to apply in the form of carrying out the procedure for solving quadratic equations. Procedural knowledge that is measured is knowledge of specific skills and algorithms in a subject/subject in the form of a quadratic equation solving procedure.

Applying Metacognitive Knowledge

There is no question that measures students' ability to apply metacognitive knowledge. Of the 145 School Examination questions, none specifically asked students to execute or implement strategic knowledge, knowledge about cognitive tasks, including appropriate contextual and conditional knowledge, self-knowledge.

Analyzing Factual Knowledge

There is no question that measures students' ability to analyzing factual knowledge. Of the 145 School Examination questions, none specifically asked students to distinguishing, organizing, attributing knowledge of terminology and knowledge of specific details and elements.

Analyzing Conceptual Knowledge

There is no question that measures students' ability to analyzing conceptual knowledge. Of the 145 School Examination questions, none specifically asked students to distinguishing, organizing, attributing knowledge of classifications and categories, knowledge of principles and generalizations, knowledge of theories, models, and structures.

Analyzing Procedural Knowledge

There is no question that measures students' ability to analyzing procedural knowledge. Of the 145 School Examination questions, none specifically asked students to examining, criticizing knowledge of subject-specific techniques and methods, knowledge of criteria for determining when to use appropriate procedures.

Analyzing Metacognitive Knowledge

There is no question that measures students' ability to analyzing metacognitive knowledge. Of the 145 School Examination questions, none specifically asked students to examining, criticizing strategic knowledge, knowledge about cognitive tasks, including appropriate contextual and conditional knowledge, self-knowledge.

Evaluating Factual Knowledge

There is no question that measures students' ability to evaluating factual knowledge. Of the 145 School Examination questions, none specifically asked students to formulating, planning, creating knowledge of terminology and knowledge of specific details and elements.

Evaluating Conceptual Knowledge

There is no question that measures students' ability to evaluating conceptual knowledge. Of the 145 School Examination questions, none specifically asked students to formulating, planning, creating knowledge of classifications and categories, knowledge of principles and generalizations, knowledge of theories, models, and structures

Evaluating Procedural Knowledge

There is no question that measures students' ability to evaluating procedural knowledge. Of the 145 School Examination questions, none specifically asked students to formulating, planning, creating knowledge of subject-specific techniques and methods, knowledge of criteria for determining when to use appropriate procedures.

Evaluating Metacognitive Knowledge

There is no question that measures students' ability to evaluating procedural knowledge. Of the 145 School Examination questions, none specifically asked students to formulating, planning, creating strategic knowledge, knowledge about cognitive tasks, including appropriate contextual and conditional knowledge, self-knowledge.

Creating Factual Knowledge

In the School Exam questions, there are no questions that measure students' ability to create factual knowledge. This can be seen from the absence of questions that ask students to formulate, plan, create knowledge of terminology and knowledge of specific details and elements.

Creating Conceptual Knowledge

In the School Examination questions, there are no questions that measure students' ability to create conceptual knowledge. This can be seen from the absence of questions that ask students to formulate, plan knowledge of classifications and categories, knowledge of principles and generalizations, knowledge of theories, models, and structures.

Creating Procedural Knowledge

Based on data analysis, the questions that measure students' ability to apply procedural knowledge are as follows:

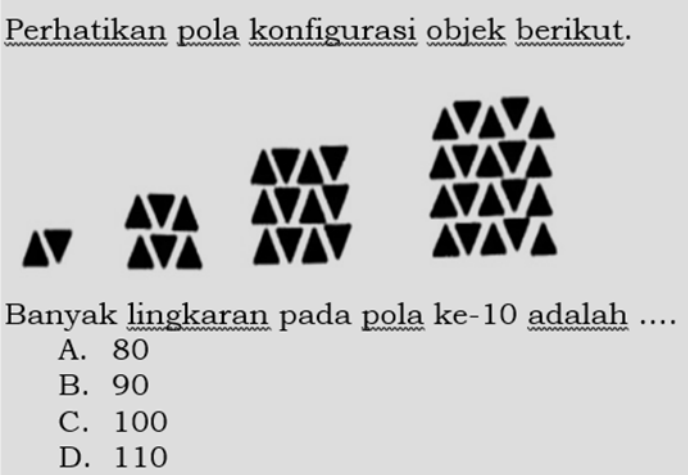


Figure 15
Mathematical Problems Measuring Creating Procedural Knowledge (3)

This problem asks students to create, namely to generate/hypothesize patterns in order to solve problems. The procedural knowledge that is measured is for specific skills and algorithms in the form of patterns. This pattern will be a strategy in solving these mathematical problems.

Creating Metacognitive Knowledge

In the School Examination questions that have been analyzed, there are no questions that measure students' ability to create metacognitive knowledge. This can be seen from the absence of questions that ask students to formulate, plan strategic knowledge, knowledge about cognitive tasks, including appropriate contextual and conditional knowledge, self-knowledge.

Based on data analysis, it is known that in the School Exam questions for SMP Mathematics subjects in Subrayon 05 Semarang Regency there are questions with the categories of understanding factual knowledge by 2%, understanding conceptual knowledge by 21%, applying conceptual knowledge by 50%, applying procedural knowledge by 24%, and creating procedural knowledge by 3%. If the percentage is expressed in the pie chart it is as follows:

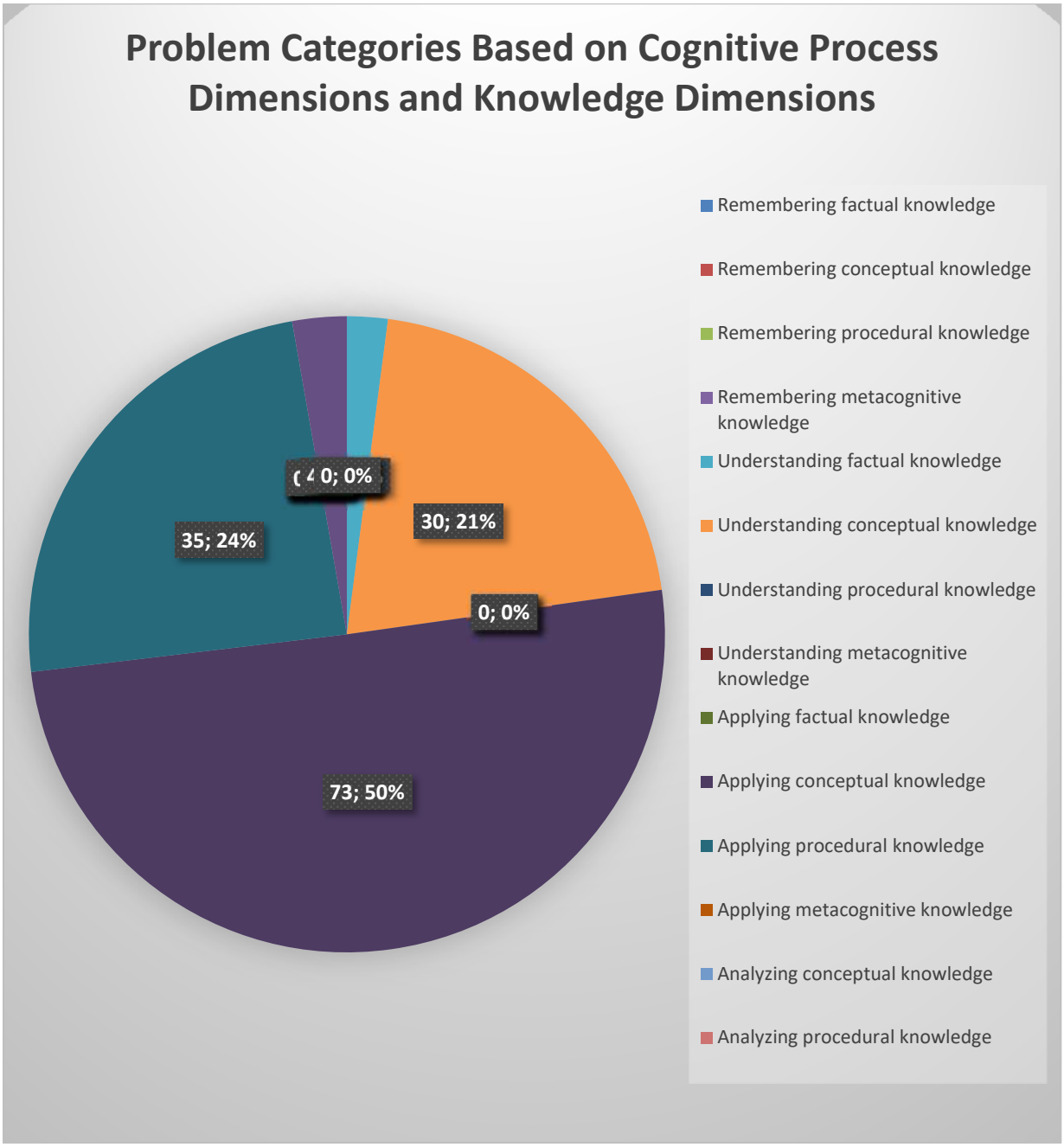


Figure 16
Problem Categories Based on 24 Combinations Between the Cognitive Process Dimension and the Knowledge Dimension

Discussion

Based on data analysis, it is known that in the School Exam questions for SMP Mathematics subjects in Subrayon 05 Semarang Regency there are questions with the categories of understanding factual knowledge (2%), understanding conceptual knowledge (21%), applying conceptual knowledge (50%), applying procedural knowledge (24%), and creating procedural knowledge (3%).

In the questions that measure students' ability to understand factual knowledge, students are asked to classify the writing of scientific notation on numbers with powers. Classifying is "Determining that something belongs to a category…" (Anderson et al.,

2001). This is in accordance with Anderson and Krathwohl who state that one type of factual knowledge is knowledge of terminology which includes knowledge of certain verbal and nonverbal labels and symbols (for example, words, numbers, signs, pictures). (Anderson et al., 2001). Factual knowledge is in the form of pieces of information or basic elements contained in certain disciplines (Yustiana et al., 2018).

Van Merriënboer et al. once presented a model in the field of computer-assisted medical education in which the model was chosen because it focuses on the transfer of procedural knowledge so problem solving strategies should be improved rather than acquiring factual knowledge (Preim & Botha, 2014). This means that from factual knowledge to procedural knowledge, it is supported by problem solving strategies.

In questions that measure students' ability to understand conceptual knowledge, students are asked to classify certain conceptual knowledge. Conceptual knowledge consists of classifications and categories, principles and generalizations, and theories, models, and conceptual structures. Conceptual knowledge includes schemas, mental models, or theories implicit or explicit in different cognitive psychological models that represent an individual's knowledge of how certain subject matter is organized and structured, how different pieces or bits of information can be interconnected and interrelated in a more systematic way and how these parts function together (Anderson et al., 2001).

In questions that measure the ability to apply conceptual knowledge, students are asked to use or determine solutions related to certain principles and generalizations. Using/implementing and carrying out/executing is included in the cognitive process "apply" (Anderson et al., 2001).

In questions that measure the ability to apply procedural knowledge, students are required to use or determine solutions using special skills and algorithms. This is as stated by Bloom, Englehart, Furst et al that procedure knowledge includes skills and algorithms, techniques and methods, as well as knowledge of the criteria used to define and determine "when to do what" in specific domains and disciplines (Vukić et al., 2020).

In questions that measure the ability to create procedural knowledge, students are required to generate/hypothesize a specific skill and algorithm in order to determine a solution. Generating/hypothesizing means “Coming up with alternative hypotheses based on criteria” (Anderson et al., 2001).

CONCLUSION AND IMPLICATION

Conclusion

The results showed that the dimensions of cognitive processes and the dimensions of students' knowledge as measured through school exam questions for Mathematics subjects in Sub-Rayon 05 Semarang Regency ranged from understanding facts to creating which procedures; on questions that measure understanding facts, students are asked to classify facts in the form of notation, on questions that measure understanding of concepts, students are asked to classify related to certain mathematical concepts; on questions that measure applying concepts, students are asked to use or implement

certain mathematical concepts in order to solve problems; on questions that measure applying procedures, students are asked to use or carry out certain mathematical procedures in order to solve problems; In questions that measure the ability to create procedures, students are asked to generate/hypothesizing specific skills and algorithms.

Implication

The implication of the research results is that in the preparation of questions, it can be directed to enrich measurements in the categories of cognitive process dimensions and certain knowledge dimensions. For example, in the School Exam questions there are no questions that measure ability in understanding procedural knowledge, applying factual knowledge, analyzing factual knowledge, analyzing conceptual knowledge, analyzing procedural knowledge, evaluating factual knowledge, evaluating conceptual knowledge, evaluating procedural knowledge, creating factual knowledge, and creating conceptual knowledge.

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