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The Development of Open-Ended Math Questions on Grade V Students of Elementary School

To cite this article: Yenni Fitra Surya *et al* 2020 *J. Phys.: Conf. Ser.* **1613** 012081

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The Development of Open-Ended Math Questions on Grade V Students of Elementary School

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Abstract. The purpose of this research is to produce valid, practical and effective open-ended based mathematical questions in measuring the high-level thinking ability of grade V students of elementary schools. The study was conducted at 002 and 008 Public Elementary Schools in Bangkinang. The research was a Design Research, which is another term of development research according to Plomp and Nieveen. The development model used is the Plomp model consisting of three stages; preliminary research, prototyping phase, and assessment phase. Based on the results of the development, there were obtained 8 questions for cube and cuboid material and 8 questions for statistic material. Some characteristics of valid mathematical questions based on open-ended are (1) the questions developed have several possible answers or have various ways of answering, (2) the resulting questions can measure higher-order thinking abilities; analysing, evaluating, and creating (3) the material asked is in accordance with the level of the school, which is grade V of elementary school related to cube and cuboid, and statistics materials, (4) the questions are related to the students' daily life. The characteristics of practical open-ended mathematical questions are that can be used by teachers as an evaluation tool. This question will also be easily obtained because it will be posted in a blog owned by researchers and fellow students.

1. Introduction

Mathematical subjects need to be given to all students starting from elementary school to equip students with thinking, logically, analytically, systematically, critically, and creative ability[1]. Answering mathematical questions is a recommended way to train students to understand mathematical material and obtain the expected mathematical abilities. In fact, the questions obtained in the field are inappropriate given questions to the expected capability or competency indicators. The questions given are only ordinary exercise and are not focused on measuring any of the existing mathematical abilities. Some teachers are still unfamiliar with the term mathematical ability. The questions given are general exercises and do not facilitate students to hone their mathematical abilities so that they will have an impact on not achieving the objectives of mathematics learning have been set. One approach in learning mathematics that can give students the freedom to think actively and creatively is open-ended. This statement is based on the opinion of Heddens and Speer in Shimada which states that the open-ended approach is useful for improving students' thinking[2]. It is one of the approaches that help students solve a problem creatively and appreciates the diversity of thinking that might appear during the problem-solving process. Mahmudi suggest that the use of open questions need to be cultivated in learning because open questions have rich potential improve the quality of learning. In addition, by providing an open problem (open-ended problems) is also expected to bring



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students to address issues in many ways, thus inviting intellectual potential and experience of the students in the process of discovering something new [3, 4]. Zulkardi and Ilma, Sumarmo, and Sumardyono in Novita's articles also said the development of problem with open type and contextual nature of non-routine can be used as means of improving the quality of learning process, especially to improve problem solving skills and also as mean of assessment in mathematics[5].

According to Shimada, the definition of an open-ended approach is a learning approach that presents a problem that has more than one method or solution. It gives students the opportunity to gain knowledge, experience finding, recognizing and solving problems with several techniques[2][4]. In its process, this learning uses open-ended questions as a studying tool. These open-ended questions are not available yet among elementary school teachers.

2. Experimental Method

The development model used in this study was adapted from the model established by Tjeerd Plomp. The Plomp model consists of three phases[6], namely 1) Early research (Preliminary research) with the needs and context analysis activities, literature review, developing conceptual and theoretical frameworks for research. 2) Designing stage (Prototyping stage), which is a cyclical and sequential design process in the form of a more micro-research process and uses formative evaluation to improve and correct the product[6]. The formative evaluation adopts the Tesmer as shown in Figure 1.

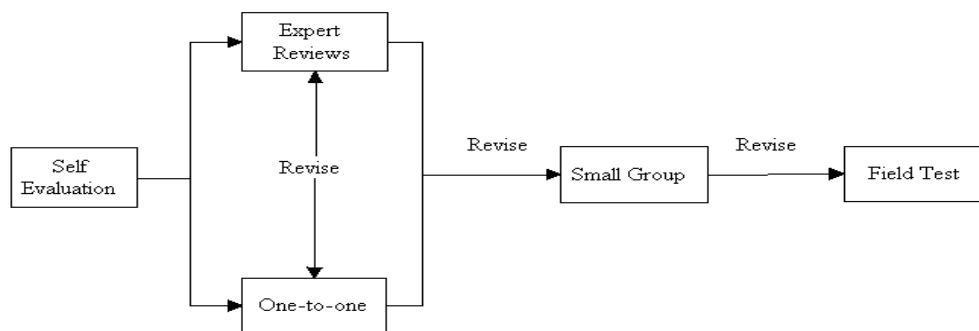


Figure 1. Flow of Formative Evaluation Design

3. Result and Discussion

3.1 Result

3.1.1 Preliminary Research Results

The preliminary study in this research was in the form of curriculum analysis, student analysis, and needs analysis

3.1.1.1 Curriculum Analysis Results

Curriculum analysis is carried out on the second semester material of grade 5 students, in KD 3.5 explains and determines the volume of geometry which uses the volume unit (such as cube unit) involves cube and cube roots. The KD 3.5 and 4.5 indicators are as follows. (1) Mentioning the formula for the volume of cubes and cuboids using unit cubes, (2) Determining the volume of cubes and cuboids, (3) Mentioning the relationship between cube volume with cube and cube root, (4) Solving daily life problems related to the volume of cubes and cuboids. While in the following is KD 3.6 and 4. 6 indicators (1) Paying close attention to the demonstration of building nets using concrete object packaging, (2) Discussing some geometry nets, (3) Identifying the shapes of some geometry nets, (4) Constructing geometry based on their nets, (5) Solving problems related to simple geometry nets (cubes and cuboids), (6) Presenting problem-solving related to cube and cuboid nets. The indicators of 3.8 basic competencies are as follows (1) Collecting data about students and the surrounding environment, (2) Resolving problems related to the single data presentation, (3) Presenting data in the form of tables, picture diagrams (pictograms), bar charts, or line charts to solve problems, (4) Using a picture diagram (pictogram), bar chart, or line diagram to solve the problem.

3.1.1.2 Student Analysis Results

In mathematics study students who have different background and different mathematical ability are also have different ability for solving mathematical problem[7]. Mahmudi said that each student has different characteristics related to problem-solving activities. There are students who often use informal methods to solve problems rather than using a formal one. There are characteristics of students who prefer to be alone in solving the problem given, there are students who like to answer problems based on the example given by the teacher before, there are students who like to solve problems with one procedure, and there are students who like to be creative in solving problems given [3]. Therefore, mathematics needs to be designed so that it can accommodate a variety of characteristics of students. Mahmudi stated one way that could be done was the use of open questions in learning. Open questions can be a solution related to various characteristics possessed by students. According to Takashi the benefit using open-ended questions in mathematics learning are students becoming more active in expressing their ideas, having more opportunities to comprehensively use knowledge and skills, and have rich experience in the process of finding and accepting approval from other students against their ideas[4].

3.1.1.3 Need Analysis Results

Interviews were conducted with several elementary school teachers in Bangkinang regarding the need for open-ended questions. Based on the interview, information was obtained that the teacher usually gave a closed evaluation, meaning that only produced one answer or one way of accomplishing. The questions given are not open-ended. The problem is also only at the stage of applying the formula, not to analyze or modify or create diverse answers. The teachers also have never made open-ended math questions. The teachers also have never gotten questions that can provide more than one possible answer or various ways of answering. Based on the results of the analysis of teaching materials used in several schools such as textbooks or student books, modules, and worksheets for cube and cuboid as well as statistics materials, it was obtained that there are no open-ended questions. The questions developed are closed questions. Therefore, it is necessary to develop open-ended questions that can hone students' higher-order thinking skills.

3.1.2 Prototyping Phase Results

3.1.2.1 Self Evaluation Results

The design of prototype 1 was personally evaluated before being assessed by experts. Evaluation is carried out to re-check the suitability of the resulting questions with the characteristics of the referred questions and the writing procedures which include typing errors, the accuracy of the use of punctuation, the accuracy of the writing size, and the accuracy of the use and layout of the illustrations used. Questions that have been evaluated personally are then revised and the results of this revision are called prototype 1. The questions on prototype 1 are then validated by the expert.

3.1.2.2 Expert Review Results

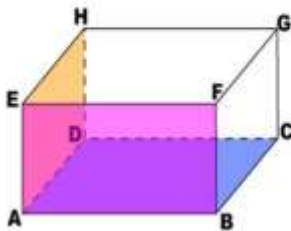
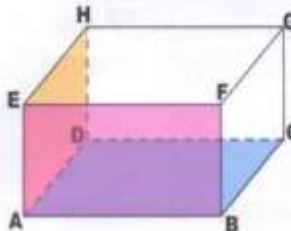


The aspects included in the validation section are content, construct, and language[8]. Each of these aspects indicators is as follows.

Table 1. Aspects of Open-Ended Questions Based Validity

Evaluation Components	Assessed Aspects Indicators
Content	<ol style="list-style-type: none"> 1. The developed questions have various answer or various way of answering (<i>open-ended</i>) 2. The Questions are contextual 3. The developed questions are not routine. 4. The developed questions refer to indicators. 5. The Content of material asked is fit to type and level of school, VIII SMP.
Construct	<ol style="list-style-type: none"> 1. The picture used are clear. 2. There is a clear instruction for working on the questions.
Language	<ol style="list-style-type: none"> 1. The question items use adapted EYD sentence. 2. The sentence of the question fits to the knowledge level of students. 3. Disuse of ambiguous expression causing multiple interpretation.

Based on the validation process, several suggestions and comments related to prototype 1 were obtained. Suggestions and comments from experts on open-ended math questions can be seen in Table 4. below.

Table 2. Expert Validation Results for Material Cubes and Cuboids

No	Before Revision	After Revision
1	<p>Hitunglah volume balok jika panjang , lebar dan tinggi berturut-turut nilainya bilangan genap kecil dari 20 !</p> 	<p>Hitunglah kemungkinan volume balok pada gambar dibawah jika panjang sisi AB , lebar sisi BC dan tinggi sisi CG berturut-turut jika nilainya adalah bilangan genap kecil dari 20 !</p> 
2	<p>Adi memiliki bak mandi berbentuk balok dengan tingginya dalam cm kel lebarnya kelipatan 4 dan panjangnya kelipatan 5. Bak tersebut akan diisi air banyak air dalam satuan liter yang dibutuhkan untuk mengisi 2/3 bagian b Adi?</p> 	 <p>Dirumah Adi memiliki bak mandi berbentuk balok seperti gambar diatas dengan tingginya kelipatan 4 cm, lebarnya kelipatan 3 cm dan panjangnya kelipatan 5 cm. Bak tersebut akan diisi air sebanyak 2/3 bagian berapa banyak air dalam satuan liter yang dibutuhkan?</p>
3	<p>Zian ingin membeli bak sampah dari kayu berbentuk balok. Ia mengingui bak sampah tersebut ukurannya sama dengan bilangan genap kurang da dengan panjang 3/2 kali lebarnya dan tinggi bak sampah 4 lebarnya dari uk Berapakah volume bak sampah yang akan dibuat Zian?</p>	<p>Zian ingin membeli tempat sampah berbentuk balok. Ia menginginkan lebar bak sampah tersebut ukurannya sama dengan bilangan genap kurang dari 30 cm, dengan panjang 3/2 kali lebarnya dan tinggi bak sampah 4 lebarnya dari ukuran lebar. Berapakah volume bak sampah yang akan dibeli Zian?</p>

4. Bu Asih membuat agar-agar untuk disajikan pada acara ulang tahun anaknya. Agar-agar tersebut dicetak menggunakan cetakan yang berbentuk balok. Cetakan memiliki panjang 5 cm, lebar kelipatan dari panjang, dan tingginya 2 lebarnya. Agar-agar yang dibuat Bu Asih adalah 100 cetakan. Berapakah seluruh agar-agar yang di buat oleh Bu Asih?

Sebuah bak air berbentuk balok mempunyai panjang ... meter, lebar ... kedalamannya ... cm. Berapa nilai panjang, lebar dan tinggi kolam ter volumenya 1800 cm^3 ?

8. Tentukan ukuran sisi-sisinya, jika volume kubus
9. Sebuah kubus memiliki volume 120 cm^3 . Tentukan sisi-sisi kubus
10. Sebuah kubus panjang rusuknya kelipatan 4 cm, tentukan volume kubus

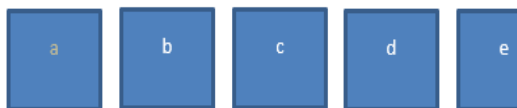
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5. Disebuah rumah terdapat kolam berbentuk balok. Berapakah panjang (m), lebar (m), dan tinggi (m) kolam tersebut jika diketahui volume kolam itu 1800 cm^3 ?

8. Sebuah kubus mempunyai panjang rusuk kelipatan 4 cm, tentukan kemungkinan volume kubus tersebut!

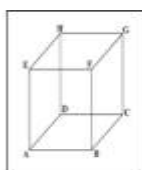
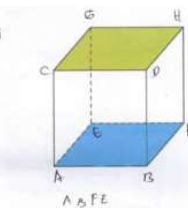
9. Diketahui ukuran sisi-sisi suatu kubus adalah kelipatan dari 2 cm, tentukan kemungkinan volume kubus tersebut!

10. Sebuah kubus dengan panjang setiap sisinya adalah adalah sama yaitu bilangan genap. Tentukan cara penyelesaiannya jika ukuran kubus itu diperbesar 2 kali lipat dari ukuran awal!



7. Susunlah Kotak- Kotak Tersebut Sehingga Menjadi Sebuah

1. Dari persegi berikut, buatlah persegi di bawah ini Menjadi bentuk kubus di samping!

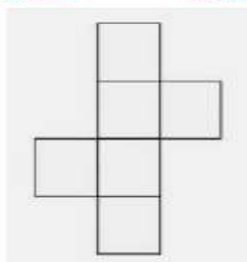


5. Jika Gambar Balok Tersebut dibuka satu persatu bagiannya, ada berapa jani Balok yang bisa di bentuk?

2. Dari balok disamping, rentangkanlah sehingga menghasilkan sebuah jaring-jaring!



Susunlah gambar jaring-jaring kubus dibawah ini sehingga berbent. Tentukan mana alas dan tutup dari jaring-jaring kubus tersebut!



Dari gambar disamping, berapa banyak carakah Kamu dapat membentuk balok?



Table 3. Expert Validation Results for Statistics Materials

No	Before Revision	After Revision																																														
1	<p>Tabel di bawah ini adalah data tinggi badan siswa kelas V SD</p> <table border="1"> <thead> <tr> <th>Tinggi Badan</th> <th>Banyak Siswa</th> </tr> </thead> <tbody> <tr><td>145</td><td>3</td></tr> <tr><td>146</td><td>10</td></tr> <tr><td>147</td><td>8</td></tr> <tr><td>148</td><td>4</td></tr> <tr><td>149</td><td>5</td></tr> </tbody> </table> <p>Nyatakan data di atas dalam bentuk diagram!</p>	Tinggi Badan	Banyak Siswa	145	3	146	10	147	8	148	4	149	5	<p>Tabel di bawah ini adalah data tinggi badan siswa kelas V SD</p> <table border="1"> <thead> <tr> <th>Tinggi Badan</th> <th>Banyak Siswa</th> </tr> </thead> <tbody> <tr><td>145</td><td>3</td></tr> <tr><td>146</td><td>10</td></tr> <tr><td>147</td><td>8</td></tr> <tr><td>148</td><td>4</td></tr> <tr><td>149</td><td>5</td></tr> </tbody> </table> <p>Nyatakan data di atas dalam bentuk diagram yang anda ketahui!</p>	Tinggi Badan	Banyak Siswa	145	3	146	10	147	8	148	4	149	5																						
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2	<p>Data jumlah penduduk Kecamatan Salo 2009-2017</p> <table border="1"> <thead> <tr> <th>Tahun</th> <th>Jumlah Penduduk</th> </tr> </thead> <tbody> <tr><td>2009</td><td>1570</td></tr> <tr><td>2010</td><td>1900</td></tr> <tr><td>2011</td><td>1950</td></tr> <tr><td>2012</td><td>1800</td></tr> <tr><td>2013</td><td>1750</td></tr> <tr><td>2014</td><td>1800</td></tr> <tr><td>2015</td><td>2000</td></tr> <tr><td>2016</td><td>1850</td></tr> <tr><td>2017</td><td>2520</td></tr> </tbody> </table> <p>Nyatakan data di atas dalam bentuk diagram!</p>	Tahun	Jumlah Penduduk	2009	1570	2010	1900	2011	1950	2012	1800	2013	1750	2014	1800	2015	2000	2016	1850	2017	2520	<p>Data jumlah penduduk Kecamatan Bangkinang 2009-2017</p> <table border="1"> <thead> <tr> <th>Tahun</th> <th>Jumlah Penduduk</th> </tr> </thead> <tbody> <tr><td>2009</td><td>1570</td></tr> <tr><td>2010</td><td>1900</td></tr> <tr><td>2011</td><td>1950</td></tr> <tr><td>2012</td><td>1800</td></tr> <tr><td>2013</td><td>1750</td></tr> <tr><td>2014</td><td>1800</td></tr> <tr><td>2015</td><td>2000</td></tr> <tr><td>2016</td><td>1850</td></tr> <tr><td>2017</td><td>2520</td></tr> </tbody> </table> <p>Nyatakan data di atas dalam bentuk diagram yang anda ketahui!</p>	Tahun	Jumlah Penduduk	2009	1570	2010	1900	2011	1950	2012	1800	2013	1750	2014	1800	2015	2000	2016	1850	2017	2520						
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There is improvement through the suggestions from the validator such as improvement of sentences that direct students to provide the possibility of varied answers. Improvement of sentence questions is not conducted only to ease students to understand the questions given, but also to improve the pictures that confuse students. Based on the suggestions from the validator related to the validity of open-ended questions based on cube and cuboid material, as well as statistics, a revision or improvement is carried out in order to obtain a prototype 2.

3.1.2.3 Individual Evaluation Results

Prototype 2 which was produced based on an expert review then tested through a one-to-one test on 3 students who had studied cube and cuboid material, and 3 students who had studied statistical material. It was conducted because of limited time. Each student has various abilities ranging from

high, medium, and low[6]. This is done to find out whether the question is valid if it is given to students with diverse abilities. Based on one-to-one trials, it was obtained some information such as the time students are doing the test as follows:



Figure 2. Questions for Cube and Cuboid Materials

Students with high ability make some cube forms, but they are not arranged according to the available squares with codes A, B, C, D, E, F, G, and H. When conducting question and answer with these students, they don't think that the formed should be arranged based on available square with code so that they will make cube A, B, C, D, E, F, G and H as shown in Figure 3.

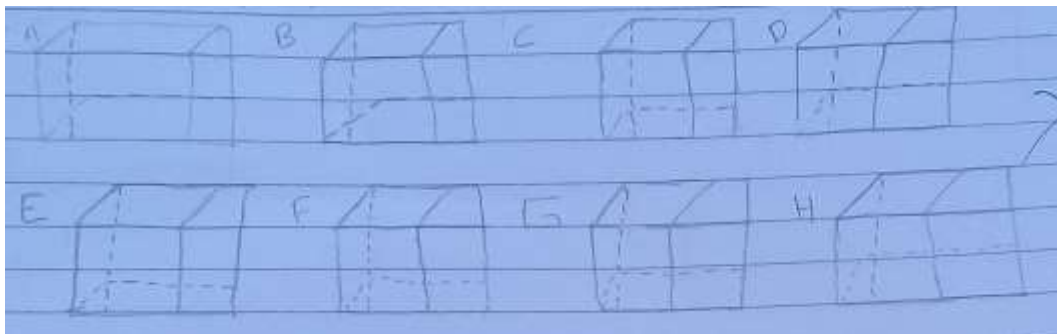


Figure 3. Snapshot of Students' Answers with High Ability

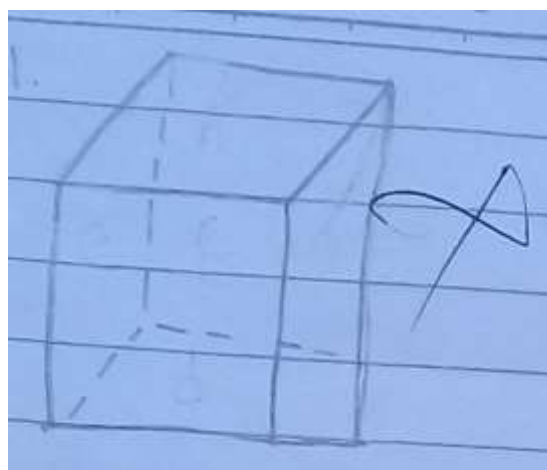


Figure 4. Snapshot of Students' Answers with Medium Ability

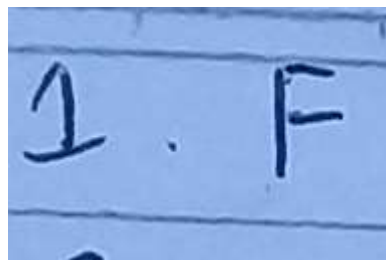


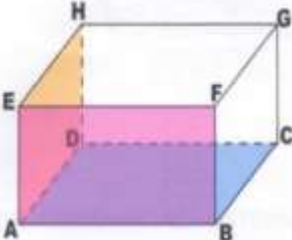
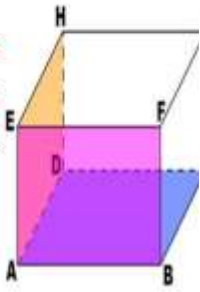
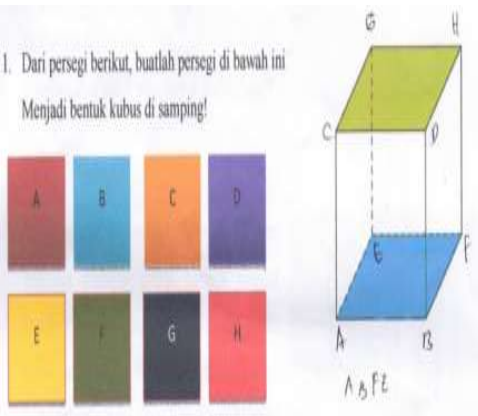
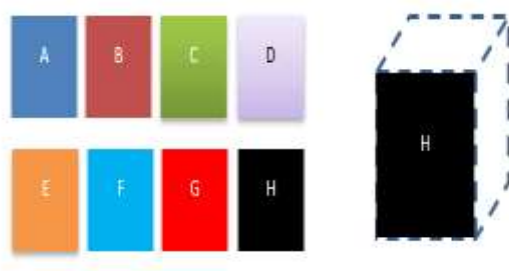
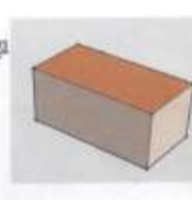



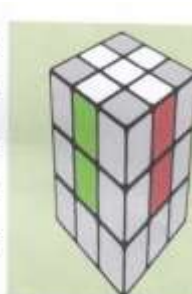
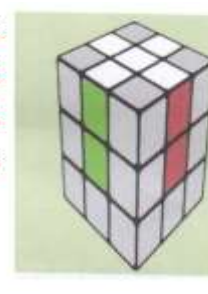


Figure 5. Snapshot of Students' Answers with Low Ability

In Figures 4 and 5 are the answers of students with medium and low abilities. Learners assume that the question is directed to make a cube. Improvements made to prototype 2 after being tested one-to-one are as follows.

Table 4. Revision Results Based on One-to-one Test

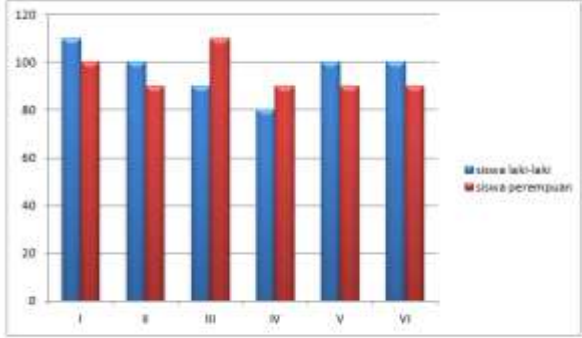
No	Before Revision	After Revision
1	Sebuah kubus mempunyai panjang rusuk kelipatan 4 cm, tentukan kemungkinan volume kubus tersebut!	1. Sebuah kubus mempunyai rusuk kelipatan 4 cm. Tentukan kemungkinan volume kubus tersebut!
2	Sebuah kubus dengan panjang setiap sisinya adalah adalah sama yaitu bilangan genap. Tentukan cara penyelesaiannya jika ukuran kubus itu diperbesar 2 kali lipat dari ukuran awal!	2. Terdapat sebuah kubus dengan rusuknya adalah bilangan genap kubus dengan rusuk bilangan genap tersebut diperbesar dua kali ukuran awal. Tentukanlah volume kubus tersebut!
3	 <p>Dirumah Adi memiliki bak mandi berbentuk balok seperti gambar diatas dengan tingginya kelipatan 4 cm, lebarnya kelipatan 3 cm dan panjangnya kelipatan 5 cm. Bak tersebut akan diisi air sebanyak $\frac{2}{3}$ bagian berapa banyak air dalam satuan liter yang dibutuhkan?</p>	<p>3. Adi memiliki bak mandi berbentuk balok seperti gambar di atas dengan tinggi dari balok adalah kelipatan 4 cm, lebarnya kelipatan 3 cm, dan panjangnya kelipatan 5 cm. Bak tersebut akan diisi air sebanyak $\frac{2}{3}$ bagian berapa banyak air dalam satuan liter yang dibutuhkan?</p> 
4	<p>Hitunglah kemungkinan volume balok pada gambar dibawah jika panjang sisi AB, lebar sisi BC, dan tinggi sisi CG berturut-turut jika nilainya adalah bilangan genap kecil dari 20!</p> 	<p>4. Hitunglah volume balok dibawah ini jika panjang sisi AB, lebar sisi BC, dan tinggi sisi CG berturut-turut nilainya adalah bilangan genap kecil dari 20!</p> 

5. Dari persegi berikut, buatlah persegi di bawah ini menjadi bentuk kubus di samping!
- 
5. Susunlah persegi A, B, C, D, E, F, G, atau H di bawah ini menjadi beberapa bentuk Kubus mungkin! (Kode pada persegi yang digunakan tetap dituliskan pada kubus)
- 
6. Dari balok disamping, rentangkanlah sehingga menghasilkan sebuah jaring-jaring!
- 
6. Rentangkanlah balok di bawah ini sehingga menghasilkan jaring-jaring!
- 
7. Dari gambar disamping, berapa banyak cara yang dapat kamu lakukan untuk membentuk balok?
- 
7. Dari gambar di samping, berapa banyak cara yang dapat dilakukan untuk membentuk sebuah balok?
- 
8. Pedagang mainan membeli Kubus rubik yang rusuknya bilangan genap. Mainan tersebut ke dalam kardus besar yang berbentuk kubus berukuran panjang 50 cm. Berapakah jumlah mainan kubus rubik yang bisa dimasukkan ke dalam kardus tersebut?
- 
8. Pedagang mainan membeli kubus rubik yang rusuknya adalah bilangan genap (dalam satuan cm). Kumpulan rubik tersebut akan dimasukkan ke dalam kardus besar berbentuk kubus dengan rusuk 50 cm. Berapakah jumlah mainan kubus rubik yang bisa dimasukkan ke dalam kardus tersebut?
- 

3.1.2.4 Field Test Results

Field tests were conducted in classes that have studied Cubes and Cuboids, as well as Statistics. The test was given to grade V students of Elementary School. This field test was conducted to determine the effectiveness of prototype 3 obtained from the results of improvements based on a one-to-one test. The effectiveness of test results obtained through open-ended mathematical questions can provide a variety of ideas or concepts for students related to the open questions given. Based on the 24 students taken part in the Field Test, 15 of the 24 students received scores > 70 and 9 students received scores < 70 . Therefore, the researcher concludes that students have been able to use Open-Ended mathematical questions. What must be done in the future is that the teacher accustoms students to solve open questions so that students are able to provide ideas or solutions related to the problems given.

Table 5. Revision Results Based on Field Test

No	Before Revision	After Revision																								
1	<p>Data mata pelajaran yang diminati oleh siswa kelas V adalah:</p> <table border="1"> <thead> <tr> <th>Mata Pelajaran</th> <th>Banyak Siswa</th> </tr> </thead> <tbody> <tr> <td>PPKn</td> <td>2</td> </tr> <tr> <td>IPA</td> <td>8</td> </tr> <tr> <td>IPS</td> <td>5</td> </tr> <tr> <td>Bahasa Indonesia</td> <td>5</td> </tr> <tr> <td>Matematika</td> <td>10</td> </tr> </tbody> </table> <p>Informasi yang sesuai dengan tabel di atas adalah....</p>	Mata Pelajaran	Banyak Siswa	PPKn	2	IPA	8	IPS	5	Bahasa Indonesia	5	Matematika	10	<p>Data mata pelajaran yang diminati oleh siswa kelas V adalah:</p> <table border="1"> <thead> <tr> <th>Mata Pelajaran</th> <th>Banyak Siswa</th> </tr> </thead> <tbody> <tr> <td>PPKn</td> <td>2</td> </tr> <tr> <td>IPA</td> <td>8</td> </tr> <tr> <td>IPS</td> <td>5</td> </tr> <tr> <td>Bahasa Indonesia</td> <td>5</td> </tr> <tr> <td>Matematika</td> <td>10</td> </tr> </tbody> </table> <p>Ada informasi yang diberikan oleh tabel di atas?</p>	Mata Pelajaran	Banyak Siswa	PPKn	2	IPA	8	IPS	5	Bahasa Indonesia	5	Matematika	10
Mata Pelajaran	Banyak Siswa																									
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2	<p>Lakukan identifikasi terhadap data di atas!</p> <p>Tuliskan kesimpulan yang dapat kamu ambil dari diagram di atas!</p>	<p>4. Perhatikan diagram batang berikut ini:</p>  <table border="1"> <caption>Data for Bar Chart</caption> <thead> <tr> <th>Subject</th> <th>Male Students</th> <th>Female Students</th> </tr> </thead> <tbody> <tr> <td>I</td> <td>110</td> <td>100</td> </tr> <tr> <td>II</td> <td>100</td> <td>90</td> </tr> <tr> <td>III</td> <td>90</td> <td>110</td> </tr> <tr> <td>IV</td> <td>80</td> <td>90</td> </tr> <tr> <td>V</td> <td>100</td> <td>90</td> </tr> <tr> <td>VI</td> <td>100</td> <td>90</td> </tr> </tbody> </table> <p>Lakukan identifikasi terhadap data di atas! Tuliskan kesimpulan yang dapat kamu ambil dari diagram di atas!</p>	Subject	Male Students	Female Students	I	110	100	II	100	90	III	90	110	IV	80	90	V	100	90	VI	100	90			
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VI	100	90																								

3. 2 Discussion

3.2.1 Validity of Open-Ended Mathematical Questions

Through validation of open-ended math questions was obtained the characteristics of valid open-ended mathematical questions as follows (1) open-ended questions developed have several possible answers or have various ways of answering, (2) the resulting questions can measure the ability of high-level thinking like analyzing, evaluating, and creating and it can be seen when students provide various possible answers. (3) the material asked is in accordance with the school level, that is grade V of elementary school related to cube and cuboid material, as well as statistics, (4) the questions are related to daily life or imaginable for students, (5) pictures used are clear and useful, (6) there are clear instructions on the questions, (7) the items developed using sentences in accordance with enhanced spelling (EYD), (6) the sentence questions are suitable to the level of students' knowledge, (7) and it doesn't use expressions causing double interpretation.

3.2.2 The practicality of Open-Ended Mathematical Question

Based on the results of the development carried out, math questions based on open-ended for cube and cuboid, as well as statistics materials can be said to be practical because they can be done by students. This question can also be used by the teacher as an evaluation tool on the material.

4. Conclusion

Based on the results of the development, there were obtained 8 questions for cube and cuboid material and 8 questions for statistic material. Some characteristics of valid mathematical questions based on open-ended are (1) the questions developed have several possible answers or have various ways of answering, (2) the resulting questions can measure higher-order thinking abilities; analyzing, evaluating, and creating (3) the material asked is in accordance with the level of the school, which is grade V of elementary school related to cube and cuboid, and statistics materials, (4) the questions are related to the students' daily life. The characteristics of practical open-ended mathematical questions are that can be used by teachers as an evaluation tool. This question will also be easily obtained because it will be posted in a blog owned by researchers and fellow students. The teacher also can use

it to evaluate student's high-level thinking skills because similar with previous research open-ended questions can teach students to analyse, evaluate, and create.

Acknowledgment

We would like to express our sincere gratitude to Mr Dean of the education Faculty who had given permission to conduct this research. We also would like to say thank to principal of SDN Bangkinang Kota, the mathematics teacher, and the students who were willing to take the time to carry out this research, and also pupils of mathematics education department who helped the researchers to conduct this research.

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