

# Korespondensi untuk artkek IJI

## IJI article contribution

Kotak Masuk x



**Heri Retnawati** <retnawati.heriuny1@gmail.com> Sen, 9 Jan 2017 09.30

ke International

Dear Editors of IJI,

I have tried to send an article contributions to IJI via online submissions.

But I'm so sorry, cause I failed to send the article caused by The reCAPTCHA.

There is a message that The reCAPTCHA wasn't entered correctly.

I've tried many times.

I'm sorry I send the file manually. Looking forward hearing from you about the submission.

Thanks a lot.

Best Regard,  
Heri Retnawati  
2 Lampiran



**International Journal of Instruction** <iji@ogu.edu.tr> Sel, 10 Jan 2017 17.13

ke saya

Terjemahkan pesan

Nonaktifkan untuk: Inggris

Dear Heri Retnawati,

We received your article. Thank you very much for your interest in IJI.

But, the number of the pages of the article must not exceed 15, including abstract and reference list. Could you please shorten the number of pages?

Sincerely yours,  
International Journal of Instruction

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International Journal of Instruction  
<http://www.e-iji.net>

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**From:** "Heri Retnawati" <[retnawati.heriuny1@gmail.com](mailto:retnawati.heriuny1@gmail.com)>  
**To:** "International Journal of Instruction" <[iji@ogu.edu.tr](mailto:iji@ogu.edu.tr)>  
**Sent:** Monday, January 9, 2017 3:30:47 AM  
**Subject:** IJI article contribution

Dear Editors of IJI,  
I have tried to send an article contributions to IJI via online submissions.  
But I'm so sorry, cause I failed to send the article caused by The reCAPTCHA.

There is a message that The reCAPTCHA wasn't entered correctly.

I've tried many times.

I'm sorry I send the file manually. Looking forward hearing from you about the submission.

Thanks a lot.

Best Regard,  
Heri Retnawati

## Revision Article of IJI (15 pages)

Kotak Masuk x



**Heri Retnawati** <retnawati.heriuny1@gmail.com> Kam, 12 Jan 2017 15.27

ke International

Dear Editor of IJI,  
Thanks for feedback for the article.  
Attached, I send article revision (15 pages).

Warm Regard,

Heri Retnawati  
Area lampiran



**International Journal of Instruction** <iji@ogu.edu.tr> Sel, 17 Jan 2017 17.06

ke saya

Terjemahkan pesan  
Nonaktifkan untuk: Inggris  
Dear Dr. Heri,

We received your article and sent it to reviewers. Thank you very much for your interest in IJI.

Sincerely yours,  
Asim  
Editor

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International Journal of Instruction  
<http://www.e-iji.net>

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**From:** "Heri Retnawati" <[retnawati.heriuny1@gmail.com](mailto:retnawati.heriuny1@gmail.com)>  
**To:** "International Journal of Instruction" <[iji@ogu.edu.tr](mailto:iji@ogu.edu.tr)>  
**Sent:** Thursday, January 12, 2017 9:27:34 AM  
**Subject:** Revision Article of IJI (15 pages)

Dear Editor of IJI,  
Thanks for feedback for the article.  
Attached, I send article revision (15 pages).

Warm Regard,

Heri Retnawati

Dear author,

You have amendments from reviewers. Please, could you amend on attached file and send back your revised article as soon as possible?

Note: Please could you confirm the receipt of this e-mail?

Sincerely yours,  
Editorial  
International Journal of Instruction

## Revision of Article

Kotak Masuk x



**Heri Retnawati** <retnawati.heriuny1@gmail.com> Sen, 10 Apr 2017 21.20

ke International

Dear Editor of IJI,

Alhamdulillah, I have finished revising my article, entitle "Why are the National Examination Items Difficult and What Is Teachers' Strategy to Overcome It?".  
I have revised base on feedback of three reviewers and feedback of proof-reader from native speaker.

If there is any more revision, please, don't mind to let me know.

Thank you.

Best regards,

Heri Retnawati  
Area lampiran



**International Journal of Instruction** <iji@ogu.edu.tr> Rab, 12 Apr 2017 00.34

ke saya

Terjemahkan pesan  
Nonaktifkan untuk: Inggris  
Dear Heri,

We received your revised article and sent it to reviewers. Thanks.  
Walaikumselam

Sincerely yours,  
Editorial  
International Journal of Instruction

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International Journal of Instruction  
<http://www.e-iji.net>

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## Amendments

Kotak Masuk x



**International Journal of Instruction** <iji@ogu.edu.tr> Sel, 18 Apr 2017 17.45

ke saya, heri\_retnawati

Terjemahkan pesan  
Nonaktifkan untuk: Inggris

Dear author,

You have amendments from reviewer. Please, could you amend on attached file and send back your revised article as soon as possible?

Note: Please could you confirm the receipt of this e-mail?

Sincerely yours,  
Editorial  
International Journal of Instruction

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International Journal of Instruction  
<http://www.e-iji.net>

2 Lampiran



**Heri Retnawati** <[retnawati.heriuny1@gmail.com](mailto:retnawati.heriuny1@gmail.com)> Rab, 19 Apr 2017 10.53

ke International

Dear Editor of IJI,  
thanks for the amendments. Inshaallah, I will revise the article, and send it back to Editor of IJI.

Best Regards,

Heri Retnawati



**Heri Retnawati** <[retnawati.heriuny1@gmail.com](mailto:retnawati.heriuny1@gmail.com)> Min, 14 Mei 2017 23.02

ke International

Dear Editor of IJI,  
Assalamu'alaikum warohmatullahi wabarakath.  
Alhamdulillah, I have revised my article.  
Thanks for all.

Wasalam,

Heri Retnawati

2 Lampiran



**International Journal of Instruction** <iji@ogu.edu.tr> Sel, 16 Mei 2017 23.55

ke saya

Terjemahkan pesan  
Nonaktifkan untuk: Inggris  
Dear Dr. Heri Retnawati,

Walaikumsalam Wr Wb

We received your revised article and sent it to reviewer. Thanks.

Wassalamualaikum

Sincerely yours,  
Editorial  
International Journal of Instruction

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International Journal of Instruction  
<http://www.e-iji.net>

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**From:** "Heri Retnawati" <[retnawati.heriuny1@gmail.com](mailto:retnawati.heriuny1@gmail.com)>  
**To:** "International Journal of Instruction" <iji@ogu.edu.tr>  
**Sent:** Sunday, May 14, 2017 6:02:23 PM  
**Subject:** Re: Amendments



Noted with thanks.  
Thanks a lot.  
Thank you.

## the reviewing process

Kotak Masuk x



**International Journal of Instruction** <iji@ogu.edu.tr> Rab, 17 Mei 2017 23.02

ke saya, heri\_retnawati

Terjemahkan pesan  
Nonaktifkan untuk: Inggris

Dear Dr. Heri Retnawati,

This article has completed the reviewing process and has been accepted for publication.

At our last executive meeting, Executive Committee has decided to ask for author share of production cost from 2017 on. The authors of the articles that are accepted for publication should pay a fee of 130 EUR as an author share of production costs. Articles will be published after payment. If it is acceptable for you, let us know and then we will send you our account informations.

Sincerely yours,  
Editorial  
International Journal of Instruction

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International Journal of Instruction  
<http://www.e-iji.net>



**Heri Retnawati** <retnawati.heriuny1@gmail.com> Kam, 18 Mei 2017 15.06

ke International

Dear Editor of IJI,  
Asslamualaikum warohmatullahi wabarakatuh.  
Alhamdulillah, thanks very much for the good news: our article accepted in IJI.  
Inshaallah, we agree to pay 130 EUR as an author share of production costs. Please let us know the account information of IJI, in order we can transfer it as soon as possible.  
Thank you.

Wassalamualaikum warohmatullahi wabarakatuh.

Best Regards,  
Heri Retnawati







## International Journal of Instruction Article Evaluation Form

Mr. /Mrs.

It is to acknowledge you that the Executive Committee of *International Journal of Instruction* has decided that the article mentioned below would be reviewed by you. Thank you very much for your contributions.

January 16, 2017

Asim ARI

Editor of International Journal of Instruction

**Name of the article:** Why are the National Examination Items Difficult and What Is Teachers' Strategy to Overcome It?

After reviewing the attached article, please read each item carefully and select the response that best reflects your opinion. To register your response, please **mark** or **type in** the appropriate block.

	Yes	Partially	No
Do you think the title is appropriate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Does the abstract summarize the article clearly and effectively?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the objectives set clearly?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the issue stated clearly?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the literature review adequate?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Is the design of the research appropriate, and the exemplary, if any, suitable?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Is the methodology consistent with the practice?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the findings expressed clearly?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Is the presentation of the findings adequate and consistent?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the tables, if any, arranged well?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the conclusions and generalizations based on the findings?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Are the suggestions meaningful, valid, and based on the findings?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Are the references adequate?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Is the language clear and understandable?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is cohesion achieved throughout the article?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the work contributing to the field?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Evaluation:**
- The article can be published as it is.
  - The article can be published after some revision.
  - The article cannot be published.

Would you like to see the revised article if you have suggested any revisions?  Yes  No

**Please write your report either on the this paper or on a spare paper.**

### REPORT

1. The discussion is poorly supported by strong theory and relevant research results
2. In-text citation is not suitable with guide for author or APA
3. Some of list references are not cited in manuscript
4. Some of in-text citations are not written in references list



## International Journal of Instruction Article Evaluation Form

Mr. /Mrs.

It is to acknowledge you that the Executive Committee of *International Journal of Instruction* has decided that the article mentioned below would be reviewed by you. Thank you very much for your contributions.

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- Evaluation:**
- The article can be published as it is.
  - The article can be published after some revision.
  - The article cannot be published.

Would you like to see the revised article if you have suggested any revisions?  Yes  No

**Please write your report either on the this paper or on a spare paper.**

**REPORT**





## International Journal of Instruction Article Evaluation Form

Mr. /Mrs.

It is to acknowledge you that the Executive Committee of *International Journal of Instruction* has decided that the article mentioned below would be reviewed by you. Thank you very much for your contributions.

February 19, 2017

Asim ARI

Editor of International Journal of Instruction

**Name of the article:** Why are the National Examination Items Difficult and What Is Teachers' Strategy to Overcome It?

After reviewing the attached article, please read each item carefully and select the response that best reflects your opinion. To register your response, please **mark** or **type in** the appropriate block.

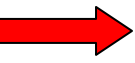
	Yes	Partially	No
Do you think the title is appropriate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Is the work contributing to the field?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Evaluation:**
- The article can be published as it is.
  - The article can be published after some revision.
  - The article cannot be published.

Would you like to see the revised article if you have suggested any revisions?  Yes  No

Please write your report either on the this paper or on a spare paper.

### REPORT



Data Analysis process is not enough defined.  
Research importance is not defined well.

## Comments to the Author

I enjoyed reading this manuscript. However, there are several problems with the article:

1. **The English in the paper is very poor.** I advise the authors to find a native English speaker to proofread the manuscript or to use a proofreading service.
2. The **Abstract** is confusing. The “*students’ difficulties*” reported in the Abstract differs from the difficulties reported in **Conclusion**.
3. The **Introduction** is also confusing, it is very hard to follow. The problem is not stated in an understandable way. In addition to that, there are several vague statements such as:  
“*The results of educational assessment have multiple advantages...*”. The advantages are not described.  
“*...the teachers or other related parties might...*”. Who are the other parties?  
“*...there are several indicators that have not been...*”. Which indicators?

There are also sentences with no meaning, such as:

- “...the students’ weak fundamental capacity in mathematics...”. What do the authors mean by that?
4. There are also problems in the **Methods** section. In **Design section** the authors said the researcher implemented “*qualitative test item*”. Are the authors referring to qualitative research approach, the focus group activities? It is not clear.
  5. There is no **Result** section! The authors presented the part of the data (the quantitative data, the table 1) in the **Findings** section. The authors mixed **Results** with **Findings**, this is big problem. In addition to that, **the authors do not present the results obtained from qualitative analysis**, the recurrent themes that emerged from the focus group activities. This failure compromises the **Discussion** section. The authors present some results at same time they do the discussion. It is very confusing.
  6. Suggestion: the authors may read the article several times before submit it. For example, see how the authors show the right way of calculating the length of the rope. Based on what they wrote, the length should be zero...
  7. The articles should follow the IMRAD format (Introduction, Methods, Results and Discussion). The findings are usually within the Discussion. The authors create a **Discussion** section after the **Findings**. It is wrong.
  8. In the **Discussion** section, the authors present several factors (Factors of School, Factors of Parents, etc..). How these factors are connected to the **Results** of the qualitative study? There is no connection.
  9. The **Conclusions** are not well connected to the **Discussion** or with the **Findings**.
  10. I recommend the authors to read the following books:  
-How to write and publish a scientific paper- Robert Day and Barbara Gastel  
-Qualitative Research from Start to Finish-Robert Yin  
And also watch the videos from Leslie Curry ( Yale) “Fundamentals of qualitative research methods”, six modules, available on Youtube  
[https://www.youtube.com/results?search\\_query=Fundamentals+of+Qualitative+Research+Methods%3A+What+is+Qualitative+Research+%28Module+1%29+Yale+University++Yale+University](https://www.youtube.com/results?search_query=Fundamentals+of+Qualitative+Research+Methods%3A+What+is+Qualitative+Research+%28Module+1%29+Yale+University++Yale+University)



**Why are the Mathematics National Examination Items Difficult and What Is Teachers' Strategy to Overcome It?**

The quality of national examination items plays an enormous role in identifying students' competencies mastery and their difficulties. This study aims to identify the difficult items in the Junior High School Mathematics National Examination, to find the factors that cause students' difficulty and to reveal the strategies that the teachers and the students might implement in order to overcome them. The study is phenomenological research with the mixed methods. The data were collected using documentation of students' responses and focus group discussion (FGD) of teachers. The data analysis was conducted using Milles & Hubberman steps. The results of the study showed that there were 4 difficult items of the 40 test items for the students. The students' difficulties were the lack of concept understanding, difficulties in calculating, difficulties in selecting information, being deceived by the distractors, being unaccustomed to completing complex and non-integers test items, and completing contextual test items that have been presented in the form of figures or narrative texts. The strategies for the teachers are integrating the complex test items into problem solving methods within the learning process, pursuing in-depth understanding of the concepts so that the students will complete various test items, and exercising multiple problem solving methods so that the students will be accustomed to the complex items and problem related to solve test items, increasing students' motivation, conducting teaching and learning effectively, and increasing the school and parents' supports.

Keywords: difficult items, influencing factors, teachers' strategy

**INTRODUCTION**

In education, assessment is an important matter in order to identify an educational success. The results of educational assessment have a major function that will be useful in further educational processes. Two major functions are to measure the students' achievements and to motivate and direct students' learning (Ebel and Frisbie, 1991). In mathematics education, one of the major functions is to identify how far the students have possessed the ability in certain subjects such as mathematics. In addition, to identify the students' ability or understanding, the assessment results also provide certain concepts such as the concepts of mathematics that the students have not mastered. Through the assessment results, the teachers or school might improve the learning process and students can change their strategy for studying.

The results of educational assessment in Indonesia, especially in mathematics, have not satisfied many parties over years. It can be seen in the situation that might be found both by means of students' average score in the Mathematics National Examination and the results provided by the international studies. Based on the results of the national examination, the students' achievements have not been satisfying (Balitbang

**Commented [a1]:** Dear Reviewers of IJL, Thanks a lot for all your kindness giving me some advises to make my article better than before. Alhamdulillah, I have revised and fixed the problem of my article--your feedback from number 1-8. About the title, I'm so sorry. There are two focus of my article, they are factors influenced the difficulties of mathematics national examination and teachers strategy to overcome it. So, in statement, title of article is "Factors influenced the difficulties of mathematics national examination and teachers' strategy to overcome it." I have read many articles of journals about qualitative research and there are many titles stated in questions, in order to the title of an article become more interesting. That was my reason, why I chose the title "Why the Mathematics National Examination Items Difficult and What are Teachers' Strategy to Overcome It?" In the RESULTS, I wrote the ONLY result of focus group discussion. To know the difficulties, in FGD, the participants discussed the process to solve the difficult items. From the steps in solving the items, the FGD participants could determine the students' difficulties. So, in every difficult item, I wrote what teachers stated about the steps to solve and the students' difficulties in the steps. All of RESULTS are the true results, NOT my interpretations. About no 9 of your feedback, T1, T2, ...etc are teachers, I have stated in Participants (METHOD).

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Kemendiknas, 2011, 2012, 2013). These results show that there have been many students who still have difficulties in certain items in the mathematics test of the National Examination. Meanwhile, the results of the international studies also show similar results, based on the results of an international assessment using PISA (Program for International Student Assessment) (OECD, 2014) or TIMSS (Trends in International Mathematics and Science Study) (Mullis *et al.*, 2012).

The 2014 National Examination used 20 battery set packages in order to maintain the reliability of the students' national examination results. With the 20 set packages, it had been expected that the schools might minimize cheating during the administration of the national examination which had run for years. Unfortunately, the varied test packages caused new difficulties among the students although these test packages had been designed under the same blueprint and indicators. The students might have more difficulties since the item difficulty of the test would be elevated. The quality improvement was apparent from the addition of TIMSS or PISA test items, which have the international quality, into the national examination battery set package. As a result, the students had difficulties in completing these test items, especially those who were not familiar with the internationally standardized test items.

The difficulties in completing the national examination test items become a matter of reflection both for the teachers and students. The teachers and students should learn from the students' difficulties in order to identify the parts or the indicators that the students consider to be difficult. A similar situation has been stated by Meese (Tambychik and Meerah, 2010, p.145) as follows: "Teachers need to understand students' potential, problems and learning difficulties in order to implement effective teaching strategies and to produce meaningful learning among students." After the teachers find the difficult indicators, they might create new learning strategies that will be meaningful for providing the students' conceptual understanding towards the students regarding the difficult indicators. Multiple learning strategies might be applied in the learning process by adjusting the students' conditions, the materials or the indicators that will be studied and the drawbacks each student. Mundia (2010, p.152) states, "Each teaching technique has its own strengths and weaknesses and there are several other factors that need to be taken into consideration for teaching to be effective with special needs of students." Thereby, there should be an appropriate selection and a consideration before the teachers apply the learning strategies or techniques within the learning process in the classroom according to the students' needs.

The difficulties that the students have in completing the overall national examination test items can be identified by implementing the classical test theory and the item-response theory. The indicators that have been considered to be difficult by the students will be reflected from the students' scores or results. The students' scores for each item will be analyzed by performing the classical test theory utilizing the proportion of the students' correct answers. The proportion of correct answers in the classical test theory will reflect which items are difficult for the students. Each test item describes each indicator so that the proportion of correct answers will describe the indicators that the students consider to

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be difficult as well. The higher the score or the proportion of the correct answer, the easier the test items will be for the students. On the other hand, the lower the score or the proportion of the correct answer, the more difficult the test items will be for the students.

The test items become difficult for the students for several reasons. One of the reasons is the numbers in the test items are not integers or the students have not understood the materials or the concepts in the completion of the test. The test items require complex completion steps or they should be completed through several phases. According to Yusha'u (2013), several matters that cause the students' difficulties in learning mathematics are the students' unpreparedness in the learning process; the students' low self-confidence in completing the mathematical problems; the low motivation of students, the teachers, the parents, and the relatives; and the students' weak fundamental ability in mathematics. In addition, mathematics also demands several skills that the students should master. Based on a study by Tambychik and Meerah (2010), there are five types of mathematics skills: number fact skills (proficiency of number facts, tables and mathematics principal); arithmetic skills (accuracy and logarithm in computational and mathematical working-procedure); information skills (expertise to connect information to a concept, operational, and experience as well as the expertise to transfer information and transform problems into mathematical sentence); language skills (proficiency of terms and relevance of arithmetical information); visual spatial skills (skill to visualize mathematical concepts, and manipulate geometrical shape and space meaningfully). According to Gooding (2009, p.33), the forms of students' difficulties in completing mathematics test items are

*“....reading and comprehension; decoding words in a word-problem; understanding the meaning of the words and sentences; reading and understanding all of the information; distracting information; imagining the context; writing a number sentence; carrying out the calculation; lack of accurate methods for calculating; making a mistake when calculating; interpreting the answer in the context of the question; giving an answer that is possible or likely; and transferring an answer into the required format”.*

The multiple mathematical skills that should be mastered in solving the mathematical problems make several students unable to master the overall skills and the situation affects the results of the Mathematics National Examination, which has been considered to be difficult. The situation will be worse if the students are not accustomed to solve the mathematical problems that involve the overall mathematical skills. In order to overcome the situation, the teachers may pursue combinations of the mathematical skills by administering the mathematical problems that combine several mathematical concepts. The quite complex mathematical problems might be derived from the combination between of multiple mathematical concepts and problem solving strategies and such mathematical problems might be difficult for the students. The reason for pursuing such a combination is that the students will have a higher cognitive load. According to Tambychik and Meerah (2010), difficulties in mathematic problem solving are due to the incompetency in acquiring many mathematical skills and the lack of cognitive learning

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abilities. However, the students' mathematical difficulties are not from the students' factors themselves. As having been explained by Yusha'u (2013), the teacher's problems in contributing to students' low performance include teachers' content knowledge of mathematics, strategy, method of presentation, and method of evaluations. Therefore, the teachers should also be aware of improving their self-quality within the mathematics teaching. As a result, there should be a study that will identify why the Mathematics National Examination test items become difficult for the students.

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### The Purpose of Study

The purposes of the present study are two-fold. The first is to identify the difficult test items for the junior high school mathematics national examination. The second is to find the factors that contribute to the difficult test items and the strategies that teachers and the students can implement in order to overcome the difficult test items.

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### METHOD

#### Design

The study used the mixed method approach. The researcher implemented the quantitative approach first, in order to identify the difficult items based on the data of the students' responses toward the national examination test items. Then, the researcher implemented the qualitative approach to identify the factors that caused the difficulties for the students along with the strategies that may be suggested toward the teachers and students so that they master the difficult test items.

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#### Data

The data in the study were the Mathematics National Examination test item sets and their responses. The test item sets that had been implemented in the national examination were 20 battery set of test packages. The term equal in the study meant that each test item within the 20 battery set of test packages had been developed from the same blueprint. Each item measured the same indicator, so the difference would only be in the numbers. The sets along with the responses of the test participants were gathered using a documentation technique.

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The factors that caused the students' difficulties in completing the difficult test items along with the strategies that the teachers and students may implement in order to overcome the difficulties were identified by way of focus group discussion (FGD). The FGD involved 15 mathematics teachers of junior high schools from 12 provinces in Indonesia and 4 mathematics experts.

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#### Participants

The test participants who responded to the national examination were 46,313 students. These participants, or respondents, were all students of the junior high school in the Province of Yogyakarta Special Region, Indonesia, which according to the Centre of

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Educational Assessment, Indonesia, has had a good credibility index in the national examination administration. The data from the documentation of the test participants' responses toward the national examination test items were attained from the Centre of Education Assessment Indonesia. The FGD participants were 15 mathematics teachers (T1-T15) of the junior high school from 12 provinces in Indonesia, consisting of 8 teachers from the Western Indonesian Region, 3 teachers from the Central Indonesian Region and 4 teachers from the Eastern Indonesian Region along with 4 mathematics experts (E1-E4) from the university. The composition of the participants was 11 male participants and 8 female participants. The qualifications of the teachers attended the FGD were mathematics teachers who had been teaching in junior high schools for approximately 10 years and who had earned the undergraduate degree from the mathematics education study program.

**Data Analyses**

The data of the students' responses toward the test item sets were analyzed by means of the classical test theory in order to identify the difficulty level. The difficulty level was estimated by calculating the proportion of the correct answers. The items would be considered difficult if the proportion of the correct answer for the item was lower than 37.5% of the overall students. The difficult items were identified and the researcher found the tendency for each package. Next, the researcher rewrote the test items and would turned them into the FGD. Afterwards, the teachers concluded find the reasons why the test items had been difficult for the students.

Before performing the FGD, the FGD participants were asked to complete the test items first. Then, the teachers discussed the reasons why these items were difficult. In addition, the researcher and the participants discussed the strategies that the teachers might implement in the teaching strategies that might decrease or eliminate the difficulties for the students. Meanwhile, the results of the FGD were analyzed by means of the qualitative analysis model of Miles and Hubberman (1994). The stages of the analysis were data reduction, data presentation, data verification and conclusion.

**RESULTS**

The data were analyzed based on the proportion of the correct answers. The mean of item's difficulty indexes is presented in Table 1. The difficulty level was reflected from the low mean in the proportion of correct answers. From the 20 national examination test item packages, four test items that had been most difficult for the students were the item numbers 3, 13, 17, and 21. The mean of the proportion of the correct answer was lower than 37.5%. Later, the finding was subjected to the FGD to determine the problems that the students encountered and what the teacher can do in the teaching of difficult items.

Table 1.  
Mean of Difficulty Level

Items	Proportion Correct	Items	Proportion Correct	Items	Proportion Correct	Items	Proportion Correct

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1	68.6	11	56.7	21	16.0	31	56.5
2	56.8	12	52.7	22	61.8	32	81.7
3	5.4	13	31.9	23	60.3	33	56.6
4	58.8	14	52.0	24	50.1	34	49.8
5	66.6	15	57.4	25	40.8	35	47.3
6	56.9	16	39.9	26	47.9	36	68.7
7	67.8	17	37.0	27	56.9	37	40.4
8	57.8	18	44.2	28	70.5	38	61.2
9	62.6	19	46.2	29	44.4	39	75.0
10	57.7	20	61.9	30	57.9	40	62.6

## Item 3

The result of  $4^{\frac{3}{2}}$  is ...

- A.  $\frac{1}{3}$  B.  $\frac{1}{2}$  C. 2 D. 8

The percentage of the students who responded correctly to test items similar to Item 3 above was only around 5.40%. In order to respond to Item 3 correctly, a testee need to first perform the manipulation of changing  $4 = 2^2$  into  $2^{2(\frac{3}{2})} = 2^3 = 8$ .

From the FGD, the teachers stated that in order to complete the stage  $2^{2(\frac{3}{2})} = 2^3$ , the students should understand first the characteristics of the exponential number operation and it was this concept that had caused the students' difficulties in answering this item. According to the teachers, several matters might cause the students' difficulties in answering this item type. The first reason was that the students had not been able to manipulate the exponential form of number 2 ( $4 = 2^2$ ). Then, the second reason was that the students had lacked mastery of the characteristics of the exponential integer operation and, as a result, they were confused when they got to  $2^{2(\frac{3}{2})}$ . The third reason was that the students had difficulties in performing the exponential integer operation with fraction, such operation involved multiplication.

According to the FGD participants, in order to overcome these difficulties, one of the strategies that the teachers might implement in the learning process was strengthening the students' understanding main numbers and the exponents so that they would easily (intuitively) identify that  $4 = 2^2$ ,  $16 = 2^4$ ,  $81 = 3^4$ ,  $125 = 5^3$  and so on. The strengthening might be pursued by providing examples and exponential tables. Then, in order to overcome the second and the third reason, the teachers should emphasize the characteristics of exponential integer operations in which the exponents were in fractions. Meanwhile, in order to improve the students' ability in strengthening their understanding of main numbers, exponents, and operations of fractional-exponent integer operations, the teachers should provide exercises that contained these three aspects.

## Item 13

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It is set  $P = \{b, a, t, i, k\}$ . The number of subset P is ...  
 A. 32 B. 25 C.10 D. 5

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The percentage of the students who responded correctly to the above item was around 31.90%. In order to answer the test item, a testee needs to understand the definition of a subset of a set. The subsets of  $P = \{b, a, t, i, k\}$  are  $\{ \}$ ,  $\{b\}$ ,  $\{a\}$ ,  $\{t\}$ ,  $\{i\}$ ,  $\{k\}$ ,  $\{b,a\}$ ,  $\{b,t\}$ ,  $\{b,i\}$ ,  $\{b,k\}$ ,  $\{a,t\}$ ,  $\{a,i\}$ ,  $\{a,k\}$ ,  $\{t,i\}$ ,  $\{t,k\}$ ,  $\{i,k\}$ ,  $\{b,a,t\}$ ,  $\{b,a,i\}$ ,  $\{b,a,k\}$ ,  $\{b,t,i\}$ ,  $\{b,i,k\}$ ,  $\{a,t,i\}$ ,  $\{a,i,k\}$ ,  $\{a,t,k\}$ ,  $\{t,i,k\}$ ,  $\{b,a,t,i\}$ ,  $\{b,t,i,k\}$ ,  $\{a,t,i,k\}$ ,  $\{b,a,t,k\}$ ,  $\{b,a,i,k\}$ ,  $\{b,a,t,i,k\}$  so that the number of the member in the set P was 32. After the students found the pattern and the number of the set P, they could track the subset of P using the Formula  $2^n$ , in which  $n$  was the number of the set member. The number of P member was 5, so the number of the subset P was  $2^5 = 32$ . According to the teachers, the students' difficulties in completing the test item were the weak understanding of the concept of subset. Most of the students were confused to choose the concept between the members of a set and the members of a subset; as a result, they were tricked and they chose option D as the correct answer in which they found the member of a set instead of a subset.

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According to the teachers in the FGD, the students' errors in responding to the test item might be minimized by strengthening their understanding about the number of a set member and the number of a subset member. The definition of each concept should be understood well along with students' association. The relationship between the set member and the subset member resulted in the formula that the members of a subset should be equal to ... in which  $n$  was the number of subset members. The formula might be a further stepping point for emphasizing the differences between the two concepts.

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Item 17

The line equation that will be parallel to the line that passes the coordinate point (2,5) and (-1,-4) is ...  
 A.  $y = -3x + 14$  B.  $y = -(1/3)x + 6$   
 C.  $y = (1/3)x + 4$  D.  $y = 3x - 4$

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The percentage of the students who responded correctly to test item similar to the test Item 17 above was around 37.00%. The FGD participants agreed that in order to answer the test item, the students should understand that two lines would be considered parallel if they had the same slope. Therefore, the students should understand the procedure of locating the slope of a line if they knew two coordinate points that would be passed. For example, if the two coordinate points were  $(x_a, y_a)$  and  $(x_b, y_b)$  then the slope ( $m_{ab}$ ) would be  $\frac{y_a - y_b}{x_a - x_b}$ . In the test item, the slope of the line that would pass (2, 5) and (-1,-4) were  $\frac{5+4}{2+1} = 3$ . The general straight line equation has been  $y = mx+c$  in which  $m$  is the slope and  $c$  is the constant; as a result, the general straight line equation with the gradient 3 would be  $y = 3x + c$ . Therefore, there will not be any line that is parallel with  $y = 3x + c$ . The line variation depends on the selection of  $c$  so that one of the lines that would be parallel to the line passing through (2, 5) and (-1, -4) would be  $y = 3x -4$ . According to

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the teachers, there are several reasons why the percentage of the students who responded correctly had been low. First, the students forgot the procedure, of finding the slope. Second, they had not understood well the concept of two parallel lines and, thereby, it was highly possible that there had been some confusions between the concept of a perpendicular line and parallel lines.

Based on the teachers' opinions, in order to minimize the students' errors in answering similar test items, the teachers should provide the students with more in-depth understanding towards the concept of a straight line and a slope. There have been multiple procedures that might be implemented in finding the gradient value of a line, depending on the initial information found. In Item 17, the initial information that has been found was the two coordinate points that would be passed by the line. However, in other cases it is quite possible if the initial information that had been found was the line equations in the form of  $y=ax$ ,  $y=ax+c$  or  $ax+by+c=0$ . In order to understand all of the equations, the students should be provided with various experiences in observing a lot of cases. Then, the next aspect that should be emphasized would be the understanding towards the concept of two parallel lines and two perpendicular lines. The students should understand the characteristics of both concepts so that they would definitely notice the differences. The emphasis on the differences between both concepts is the response to the case in which the students often mismatch the application of both concepts.

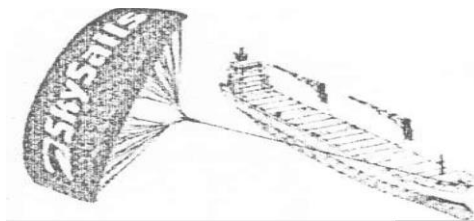
#### Item 21

Pay attention to the sailboat!

About 95% of the world's trading commodities have been sent through the sea transportation that involves 50,000 tankers, shipping boats and giant freights. Most of these ships make use of the diesel oil.

The engineers have planned to build the supporting power by harnessing the wind for these ships. Their idea is to install the kite sail to these ships and to use the wind power in order to decrease the diesel oil consumption and the impact of the diesel oil towards the environment.

Based on the description, how long will the rope from the kite sail to the ship be in order that the kite sail draws the ship on the  $45^\circ$  angle and the 150 m height as shown in the picture?



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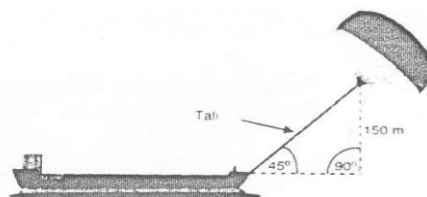
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- A. 175 m
- B. 212 m
- C. 285 m
- D. 300 m



The percentage of the students who responded correctly to the Mathematics National Examination test item similar to the test item number 21 above was around 16.00%. According to the teachers, the students might answer the test items by understanding triangle characteristics in which the total amount of a triangle's degree should be equal to  $180^\circ$ . Thereby, the students might conclude the other angles that might be formed from the  $45^\circ$  angle; in other words, the triangle should be the isosceles right triangle. Then, the second material that the students should understand was the application of Pythagoras theorem in determining the necessary minimum length of the rope. The length of the rope is  $(\sqrt{150^2 + 150^2})\text{m}$ , then the students would find that the length of the rope would be equal to 212.1320344 m. The teachers explained that such complexity had been the cause of the low percentage of the students who responded to the test item correctly. The test item was considered too long by the students and, as a result, they felt that such test items were difficult, tough, and complicated. The situation led to the students' decreasing interest in answering the test item. The low interest also became the main factor that caused the students' low efforts. In other words, it was possible that the students who had a low interest could not answer the test items well. The number that had been used was so big, that it caused the calculation difficulties. In addition, the students were also confused because the number was not part of integers (212.1320344). In general, within the completion process, the students did not always focus on the calculation; instead, they focused on the commonality of the calculation results and the consideration with the appropriate alternatives and their own perception. Such calculation results would cause the students to doubt the answer and to perform re-calculation or to be confused and to give up. Last but not the least; the students were not accustomed to attaining information in the form of a contextual figure. The impact would be that the students were confused in interpreting the information and the direction within the test items.

The teachers stated that in order to minimize the errors in answering similar test items, there should be some short ways in strengthening the concept of a triangle and the application of the Pythagoras theorem. The students should master the triangle characteristics so that they might have access to the information related to triangles intuitively and immediately. In addition, the students should be provided with test items related to the application of the Pythagoras theorem, especially the calculation part. The students should also perform the calculation well although the calculation involved big numbers. Another strategy would be habituating the students to attain and to solve the contextual problems that had been stated in the form of a narrative text or figure.

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Increasing the students' ability in understanding test items in the form of a narrative text or a figure might not be done instantly; as a result, there should be periodical exercises in order to make the students get accustomed to the Pythagoras theorem calculation.

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Based on the results of the focus group discussion, the students' difficulties can be summarized. Then the participants of FGD describe the causes, as well as strategies that can be implemented to improve them. The results are presented in Table 2 below.

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Table 2. The Result of Focus Group Discussion

The Students' Difficulties	The Cause of Students' Difficulties	Teachers' Strategies to Overcome Students' Difficulties
The lack of conceptual understanding, Difficulties in calculating, Difficulties in selecting information, Being deceived by the distractors, Being unaccustomed to completing complex and non-integers test items	Factors of the mathematics nature: The lack of fundamental understanding of mathematics, mathematical properties that are complex.  Factors of students: Lack of motivation to complete the mathematics test items	Strengthening the students' understanding, providing the students with the problem models especially the ones related to the real context, providing them with various exercises with big numbers and non-integers, habituating them to answer contextual test items presented in the form of figures and narrative texts, habituating them to answer test items through several steps of completion instead of operating the steps directly through basic concepts, and habituating them to complete test items whose alternatives are in narrative texts (not only involving numbers).  Raising students' motivation to study mathematics.
Completing contextual test items that have been presented in the form of figures or narrative texts.	Factors of teachers: The mathematics teaching and learning was not effective  Factors of school: The lack of support from school  Factors of parents: Not all parents remind students to practice and learn math	Conducting mathematics teaching and learning effectively: preparing a long-term planning, structured preparation, and well-designed strategy to improve quality of learning.  Optimizing the school and parents' support

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The difficulties presented in Table 2 were caused by several factors namely, the nature of mathematics, students, teachers, schools, and parents. These are as follows.

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From the perspective of f, the factor v of a learning content, the concepts established in mathematics are the basic concepts s of the other sciences. Mathematics has various concepts, symbols and formulas that can be used to solve all of the mathematical problems. When students are answering items, they should link concepts, symbols, and formulas then combine them to solve problems. These, causes s students' difficulties to appear, including making a mathematical model from narrative items. This is confirmed by teachers' statements as follows.

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*"Students understood the concepts partially, or knew how to utilize formula. But when they combined them, they found many troubles."(T1, T9)*

*"Students could understand the narrative items, but the difficulty was how to make the problem into a mathematical model to be solved later."(T10)*

Besides containing having various concepts and symbols, the mathematics national examination test items are considered difficult by the students since they have almost similar characteristics, namely demanding several steps of completion in order to obtain the correct answer. The combination of several steps in completion demands very high understanding of basic mathematical concepts which help the students in answering the national examination questions.

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From the students' factor, the cause of the students' difficulty to answer items that require manipulation of numbers, relate to real-life contexts, require many steps, solve problems in the form of a story, and have, a lack of exercises in deepening the mathematical concepts after being learnt. This is stated by teachers as follows.

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*"Students did not use to practice problem solving to strengthen the understanding of mathematical concepts."(T2, T11)*

*"Students were reluctant to answer problems that include many steps. Similarly, were confused to determine what information was used to answer the questions in narrative items."(T11)*

The third factor v was the teacher factor. When viewed from the teacher factor, the difficulties caused by the ineffectiveness of mathematics teaching and learning lessons which conducted by teachers. This is evident from the statement of teachers about teaching and learning as follows.

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*"The teaching and learning seems less effective. During the teaching, we further pursue the coverage of content, so the students couldn't get deep understanding. Students also didn't do enough exercises.... "(T5)*

"There were a lot of teaching contents that should be learnt by students, we have less time to teach until students' understanding was deep, including the addition of problem solving exercises for the students."(T6)

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Ideally, the school fully supports the implementation and improvement of the quality of teaching and learning, including mathematics teaching. However, not all schools provide full support, because of various limitations, such as funding and time. It was stated by the teachers as follows.

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"Our school supports improvement of learning, but when we implemented a new teaching approach that required specific tools, teachers should supply them by themselves, it is caused by the limitation of funding."(T2)

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"We are allowed to do professional development such as training to improve quality of teaching, but it should not bother teaching activities."(T12)

The lack of parental support is also a factor that causes students' difficulties in answering items. Based on information from teachers, it was found that not all parents reminded students to practice mathematics exercises at home. Not all parents who supported their children understood the contents of the materials studied by students. It was stated by the teacher as follows.

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"Not all parents reminded their children to study mathematics or practice mathematics exercises at home."(T10)

"... if students have difficulties in mathematics, not all parents could help explaining it."(T9)

The various difficulties could be overcome by looking at the causes. Difficulties which are associated with the nature of mathematics could be overcome by deepening the concept understanding of the students. One of the strategies to overcome these difficulties is by implementing meaningful mathematics teaching and learning. In order to obtain the meaningful learning, teachers could integrate the understanding of the concept utilizing real contexts which students are familiar. This opinion was expressed by teachers as follows.

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"In my experience, understanding of the concept could be strengthened by integrating the concept of learning in the context and daily life faced by students."(T11)

Overcoming the students' difficulties caused by students and teachers factors can be done by increasing the effectiveness of teaching. The lack of motivation from students to strengthen the concept understanding and to resolve complex and narrative problems can be handled through improvement of teaching. Another tactic is by awarding the students who are successful in solving test problems. It was stated by the teacher as follows.

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"Increasing the students' motivation could be done with the improvement of learning quality, using contemporary learning approaches, such as project

based learning or problem-based learning. This learning approach makes students motivated to learn."(T10)

"Awarding students was also a way to motivate students, I have done it. If the student has successfully solved the math problem, I gave a special praise. Students would be happy and be motivated to learn..."(T10)

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In addition, to increase motivation, learning improvement can also optimize learning outcomes and reduce the students' difficulty. In order to implement learning effectively, teachers need to formulate clear learning outcomes, prepare lesson plans well, choose the appropriate learning strategy and content being studied, and conduct an assessment in accordance with the learning outcomes that have been formulated. Teachers should also use learning strategies in accordance with the students' needs, for example using peer tutorial approach. This is based on the following statement from teachers.

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"We prepared lesson plans, implement teaching to ensure the objectives were achieved, develop appropriate worksheet, assess and utilize the assessment results to improve learning."(T5)

"If necessary, we asked students who already understood the material to explain to their friends, and also provide tutorials for students in need."(T15)

The strategy to complement the efforts to reduce the students' difficulties in doing the national exam was the school support to the implementation of mathematics learning and the parental support of student learning. To obtain the support from the school, teachers suggested something needed to do together with other teachers. The school support could be in the form of monitoring and evaluating of the teaching and learning. The monitoring and evaluating were implemented to make sure the teaching and learning were conducted effectively. Meanwhile, to obtain support from parents, teachers involved the parents to sign students' homework or outcomes of assessment. The strategies to improve both supports were expressed by the teacher as follows.

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"If we needed the school support for the implementation and enhancement of learning, we should hold a small meeting with other teachers, and proposed it to the school."(T10)

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"... The school should monitor and evaluate the mathematics teaching and learning, to make sure that they have done it effectively."(E1)

"In order to monitor the development of students' achievement, homework and assessment results must be signed by parents. The parents could monitor and understand the development of their children."(T9)

## DISCUSSIONS

Based on the research results, it can be stated that students had difficulties in answering the four difficult items of the mathematics national exam. The difficulties are the lack of

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conceptual understanding, calculating, selecting information, being misled by the distracters, being unaccustomed to answering complex and non-integers test items and answering the contextual test items that have been presented in the form of figures or narrative texts. The research result about the students' lack of understanding in fundamental mathematics concepts was in line with research from Gooding (2009), Ismail, Shahrill and Mundia (2015) and Maarif (2016).

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To overcome the students' difficulties associated with the nature of mathematics can be done by strengthening the students' mathematical understanding of the mathematical concepts. Concept understanding can be achieved through learning utilizing the contexts that students face every day. These are supported by the research results in which concept understanding was done by providing exercise to the students through activities and real things that exist around the students (Ali, 2011) and to make connections between everyday problem solving with experiences (Antony and Walshaw, 2009). The result was in line with the statement of Bradley *et al.* (2008) about the need to connect the concepts and symbols with things that had been known by the students.

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Further understanding about the real factor causing difficulties from students themselves was the lack of students' motivation. The students' lack of motivation made them less understand the mathematics concepts and then they had difficulties when answering mathematics problems. These results are consistent with the results of research on the lack of students' motivation in resolving mathematics problem (Yusha'u, 2013; Ismail, Shahrill and Mundia, 2015) and the reluctance of students to work on problems that are complex and that contain many steps (Jailani and Heri Retnawati, 2015).

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Based on this study, increasing the motivation of learning can be enhanced through improvements of mathematics teaching and learning in the classroom. Efforts to increase the students' motivation utilizing improvement of learning quality were in line with Sorensen (2006) and Ali (2012), while giving awards to students was according to the results of research of Middleton and Spanias (1999). Furthermore, giving awards as one of the various ways to express the students' understanding which can be done using the portfolios was the result research of Furner and Gonzales-Dehasa (2011).

In addition, to increase motivation, improving the quality of learning can enhance students' understanding of mathematical concepts. The learning activities can be followed by providing the students with problem models especially the ones related to the real context, providing them with various exercises with big numbers and non-integers, habituating them to solve contextual test items presented in the form of figures and narrative texts, and habituating them to answer test items through several steps of completion instead of operating the steps directly through basic concepts. The mathematics teaching and learning could be directed to habituate students to complete problem solving in which the alternatives are in narrative texts. The efforts were consistent with the research results to optimize learning to improve students' understanding and math skills (Aisyah and Retnawati, 2014; Sulistyani and Retnawati, 2015; Trisnawati and Wutsqa, 2015; Jailani and Retnawati, 2015) and also the preparation

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of learning well, a well-executed teaching, a support of curriculum and appropriate learning strategies (Ismail *et al.*, 2015).

Mathematics teachers in a school have a variety of tasks, such as developing lesson plans, implementing teaching and learning in many parallel classes, and conducting assessments and improving the learning using the assessment results. These heavy tasks were burdening mathematics teachers. The burden of teachers caused the low effectiveness of teaching and learning implementation, which led to poor understanding of the students' mathematical concepts. The lack of understanding of students led to difficulties in problem solving, especially for items that require algebraic manipulations, many steps of completion, related to the context or presented in narrative text. From the previous research, the teachers' burden was causing less optimal learning (Retnawati, 2015; Jailani and Retnawati (2015), also teacher learning behaviors affect student achievement (Pimta *et al.*, 2009).

In addition, students and learning factors, an other factor that caused difficulties was the lack of support from the school and parents. This difficulty can be improved through effective communication, from teachers to schools and from teachers to parents. With the support of the school, the teaching and learning that would be implemented by mathematics teachers become more effective. The research about the influence of school support for the implementation of effective learning has been done by previous researchers. To implement effective learning, the schools should have the availability in supporting the learning sources and teaching equipment (Ismail *et al.*, 2015), the school should conduct the monitoring of curriculum implementation (Retnawati, *et al.*, 2016), as well as supported the use of ICT (Ayub and Bakar, 2012). Research on the parental support showed that there was a positive effect on students' mathematics achievement (Bempechat, 1982; Vucovic *et al.*, 2013).

## CONCLUSION

From the 20 National Examination test packages, the items that the students consider to be difficult are items 3, 13, 17, and 21. The students' difficulties in answering these items are the lack of concept understanding, difficulties in calculating, difficulties in selecting information, being tricked by the distracters, being unaccustomed to working with complex and non-integer test items, and answering contextual test items that are presented in the form of figures or narrative texts. In addition, another cause of students' difficulties is the inaccuracy of students' calculation.

Some suggestions that the teachers might give to overcome the students' difficulties in answering items include the need for strengthening the students' understanding, providing the students with problem models especially the ones related to the real context, providing them with various exercises with big numbers and non-integers, habituating them to complete contextual test items presented in the form of figures and narrative texts, habituating them to complete test items through several steps of completion instead of operating the steps directly through basic concepts, and habituating them to complete test items in which the alternatives are in narrative texts (not only involving numbers).

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Other factors that contribute to overcome students' difficulties in answering the mathematics National Examination test items or in paying attention to the mathematics learning processes in general are the factors in mathematics themselves. Mathematics has a lot of concepts students should understand so that they can associate these concepts with the real matters around them through songs or other media that make them easily remember or understand. In addition, schools should prepare a long-term planning; make structure of preparation and a well-designed strategy in order to overcome the problems such as the teachers' incapability to perform the in-depth mathematics teaching process. Furthermore, schools should also provide teachers with freedom in designing the syllabus and in preparing tests or examinations. Last but not least, parents constitute the main factor in monitoring the students' academic development that affects students' condition in the mathematics learning processes.

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## International Journal of Instruction Article Evaluation Form

Mr. /Mrs.

It is to acknowledge you that the Executive Committee of *International Journal of Instruction* has decided that the article mentioned below would be reviewed by you. Thank you very much for your contributions.

April 11, 2017

Asim ARI

Editor of International Journal of Instruction

**Name of the article:** Why are the National Examination Items Difficult and What Is Teachers' Strategy to Overcome It?

After reviewing the attached article, please read each item carefully and select the response that best reflects your opinion. To register your response, please **mark** or **type in** the appropriate block.

	Yes	Partially	No
Do you think the title is appropriate?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Does the abstract summarize the article clearly and effectively?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are the objectives set clearly?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the issue stated clearly?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the literature review adequate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the design of the research appropriate, and the exemplary, if any, suitable?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the methodology consistent with the practice?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Are the findings expressed clearly?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Is the presentation of the findings adequate and consistent?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Are the tables, if any, arranged well?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Are the conclusions and generalizations based on the findings?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Are the suggestions meaningful, valid, and based on the findings?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Are the references adequate?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Is the language clear and understandable?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is cohesion achieved throughout the article?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Is the work contributing to the field?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- Evaluation:**
- The article can be published as it is.
  - The article can be published after some revision.
  - The article cannot be published.

Would you like to see the revised article if you have suggested any revisions?  Yes  No

Please write your report either on the this paper or on a spare paper.

### REPORT

Report attached.

## Comments to the Author

I enjoyed reading this manuscript. However, there are several problems with the article:

1. **The English in the paper is very poor.** I advise the authors to find a native English speaker to proofread the manuscript or to use a proofreading service.
2. The **Abstract** is confusing. The “*students’ difficulties*” reported in the Abstract differs from the difficulties reported in **Conclusion**.
3. The **Introduction** is also confusing, it is very hard to follow. The problem is not stated in an understandable way. In addition to that, there are several vague statements such as:  
“*The results of educational assessment have multiple advantages...*”. The advantages are not described.  
“*...the teachers or other related parties might...*”. Who are the other parties?  
“*...there are several indicators that have not been...*”. Which indicators?

There are also sentences with no meaning, such as:

- “...the students’ weak fundamental capacity in mathematics...”. What do the authors mean by that?
4. There are also problems in the **Methods** section. In **Design section** the authors said the researcher implemented “*qualitative test item*”. Are the authors referring to qualitative research approach, the focus group activities? It is not clear.
  5. There is no **Result** section! The authors presented the part of the data (the quantitative data, the table 1) in the **Findings** section. The authors mixed **Results** with **Findings**, this is big problem. In addition to that, **the authors do not present the results obtained from qualitative analysis**, the recurrent themes that emerged from the focus group activities. This failure compromises the **Discussion** section. The authors present some results at same time they do the discussion. It is very confusing.
  6. Suggestion: the authors may read the article several times before submit it. For example, see how the authors show the right way of calculating the length of the rope. Based on what they wrote, the length should be zero...
  7. The articles should follow the IMRAD format (Introduction, Methods, Results and Discussion). The findings are usually within the Discussion. The authors create a **Discussion** section after the **Findings**. It is wrong.
  8. In the **Discussion** section, the authors present several factors (Factors of School, Factors of Parents, etc..). How these factors are connected to the **Results** of the qualitative study? There is no connection.
  9. The **Conclusions** are not well connected to the **Discussion** or with the **Findings**.
  10. I recommend the authors to read the following books:  
-How to write and publish a scientific paper- Robert Day and Barbara Gastel  
-Qualitative Research from Start to Finish-Robert Yin  
And also watch the videos from Leslie Curry ( Yale) “Fundamentals of qualitative research methods”, six modules, available on Youtube  
[https://www.youtube.com/results?search\\_query=Fundamentals+of+Qualitative+Research+Methods%3A+What+is+Qualitative+Research+%28Module+1%29+Yale+University++Yale+University](https://www.youtube.com/results?search_query=Fundamentals+of+Qualitative+Research+Methods%3A+What+is+Qualitative+Research+%28Module+1%29+Yale+University++Yale+University)



## Report:

The article is better, but still needs to be improved, it needs a major revision. The title also should be improved. It is confusing, it has two questions. It should be stated in a simpler way such as:

**“The teachers’ strategies to overcome to improve the students’ performance in national exams” (something like this, I guess)**

It is necessary to do professional proof-reading. The article appears to be translated directly from a foreign language to English using a software like Google translator. The text is very difficult to follow, there is a lot of repetition.

There is still a lack of cohesion throughout the article. The RESULTS section must bring ONLY the results, only that. It is confusing, it brings a lot of analysis. All analysis should be DISCUSSION section. I still recommend the authors to read -How to write and publish a scientific paper- Robert Day and Barbara Gastel

### Problems that authors must fix:

**1. In direct quotations, the authors did not put the page numbers.**

#### **Example:**

(Tambychik and Meerah, 2010, p.??) as follows: “Teachers need to understand students’ potential, problems and learning difficulties in order to implement effective teaching strategy and to produce meaningful learning among students.”

**The same problem happens in the following quotation:**

Mundia (2010, p.??) states, “Each teaching technique has its own strengths and weaknesses and there are several other factors that need to be taken into consideration for teaching to be effective with special needs students.”

**Later in the text, there is the same problem again:**

According to Gooding (2009, p.??), the forms of students’ difficulties in completing the mathematics test items are

*“.....reading and comprehension; decoding words in a word-problem; understanding the meaning of the words and sentences; reading and understanding all of the information; distracting information; imagining the context; writing a number sentence; carrying out the calculation; lack of accurate methods for calculating; making a mistake when calculating; interpreting the answer in the context of the question; giving an answer that is possible or likely; and transferring an answer into the required format”.*

**2. In addition to that there are problems of indenting the text. The aforementioned text should be placed like this:**

*“.....reading and comprehension; decoding words in a word-problem; understanding the meaning of the words and sentences; reading and understanding all of the information; distracting information; imagining the context; writing a number sentence; carrying out the calculation; lack of accurate methods for calculating; making a mistake when calculating; interpreting the answer in the context of the question; giving an answer that is possible or likely; and transferring an answer into the required format”.*

**3. Later in the text, the problem with the equation still remains.**

The length of the rope is  $(\sqrt{150^2 - 150^2})m$ ,

It should be  $(\sqrt{150^2 + 150^2})m$

**4. The text describing table 2 (below) should be put before table 2, not after it.**

Based on the results of focus group discussion about the students' difficulties in answering every item in national examination, it can be summarized the students' difficulties. Then the participants of FGD describe the causes, as well as strategies that can be implemented to improve them. The results are presented in Table 2.

**5. Table 2 is difficult to understand, there is a misalignment between the lines.**

**6. There are still sentences difficult to understand like the following one. I would suggest another proof-reading review. For example, the following sentence is difficult to understand:**

Based on the results of focus group discussion about the students' difficulties in answering every item in national examination, it can be summarized the students' difficulties.

**7. There are also problems related to indirect quotations. For example:**

(Ali, 2011: 56-57) should be (Ali,2011)

Furner and Gonzales-Dehasa (2011: 236), should be Furner and Gonzales-Dehasa (2011).

**8. The authors should do a better proof-reading review. I am not English native speaker, however, there are many sentences that sound weird. For example:**

Mathematics teachers in a school have a variety of tasks, arrange lesson plans, implement teaching and learning in many parallel classes, conduct assessments and improve the learning using the assessment results.

**Maybe(?) the authors wanted to say:**

Mathematics teachers in a school have a variety of tasks, such as creating(?) lesson plans, implementing teaching and learning in many parallel classes, conducting assessments and improving the learning using the assessment results.

**9. What are T1, T9, T10, T 11? The professors from focus group activities?**

## Why are the National Examination Items Difficult and What Is Teachers' Strategy to Overcome It?

The quality of national examination items plays an enormous role in identifying students' competencies mastery and their difficulties. This study aims to identify the difficult items in the Junior High School Mathematics National Examination, to find the factors that caused students' difficulty and to reveal the strategies that the teachers, and the students might implement in order to overcome it. The study is phenomenological research with the mixed methods. The data were collected using documentation of students' responses and focus group discussion (FGD) of teachers. The data analysis was conducted using Milles & Hubberman steps. The results of the study showed that there were 4 difficult items of the 40 test items for the students. The students' difficulties were the lack of concept understanding, difficulties in calculating, difficulties in selecting information, being deceived by the distractors, being unaccustomed to completing complex and non-integers test items and completing the contextual test items that have been presented in the form of figures or narrative texts. The strategies for the teachers are integrating the complex test items into problem solving methods within the learning process, pursuing in-depth understanding of the concepts so that the students might complete various test items, and exercising multiple problem solving methods so that the students would be accustomed to the complex and problem related to solve test items, increasing students' motivation, conducting teaching and learning effectively, and increasing the school and parents supports.

Keywords: difficult items, influenced factors, teachers' strategy

### INTRODUCTION

In education, assessment is an important matter in order to identify the educational success. The results of educational assessment have major function that might be useful in further educational processes. The major functions are measure the students' achievements and motivate and direct students' learning (Ebel and Frisbie, 1991). In mathematics education, one of the major functions is to identify how far the students have possessed the ability in certain subjects such as mathematics. In addition, to identify the students' ability or understanding, the assessment results might also provide certain concepts such as the concepts of mathematics that the students have not mastered. Through the assessment results, the teachers or school might improve the learning process and students can change their strategy for studying.

The results of educational assessment in Indonesia, especially in mathematics, have not satisfied many parties over years. It can be seen in the situation that might be found both by means of students' average score in the Mathematics National Examination and the results provided by the international studies. Based on the results of national examination, the students' achievements had not been satisfying (Balitbang Kemendiknas, 2011, 2012,

**Commented [a1]:** Dear reviewers, thank you so much for all feedbacks for my article. I have made many revisions in green colour (completing the qualitative data from FGD, revising discussions, and adding the new references from journal articles). The revisions based on native speaker-proof reader's feedbacks were in red colour.

**Commented [a2]:** I have change the results, in line with suggestion of reviewer C.

2013). These results show that there have been many students who still have difficulties in certain items in the mathematics test of the National Examination. Meanwhile, the results of the international studies also show similar results, based on the results of an international assessment using PISA (Program for International Student Assessment) (OECD, 2014) or TIMSS (Trends in International Mathematics and Science Study) (Mullis et al., 2012).

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**Revised**

The 2014 National Examination made use of 20 test packages in order to maintain the reliability of the students' national examination results. With the 20 test packages, it had been expected that the schools might minimize cheating during the administration of the national examination which has run for years. Unfortunately, the various test packages caused the new difficulties among the students although these test packages had been designed under the same blueprint and indicators. The students might have more difficulties since the item difficulty of test would be improved. The quality improvement was apparent from the addition of TIMSS or PISA test items, which have the international quality, into the national examination test items. As a result, the students had difficulties in completing these test items, especially those who were not familiar with the internationally standardized test items.

**Commented [SM4]:** pay particular attention to the writing of reference according to APA)  
(Mullis et al, 2012)

**Revised**

The difficulties in completing the national examination test items become a matter of reflection both for the teachers and the students. The teachers and the students should learn from the students' difficulties in order to identify the parts or the indicators that the students consider to be difficult. A similar situation has been stated by Meese (Tambychik and Meerah, 2010) as follows: "Teachers need to understand students' potential, problems and learning difficulties in order to implement effective teaching strategy and to produce meaningful learning among students." After the teachers find the difficult indicators, they might create new learning strategies that will be meaningful for providing the students' conceptual understanding towards the students regarding the difficult indicators. Multiple learning strategies might be applied in the learning process by adjusting the students' conditions, the materials or the indicators that will be studied and the drawbacks of each student. Mundia (2010) states, "Each teaching technique has its own strengths and weaknesses and there are several other factors that need to be taken into consideration for teaching to be effective with special needs students." Thereby, there should be an appropriate selection and a consideration before the teachers apply the learning strategies or techniques within the learning process in the classroom according to the students' needs.

The difficulties that the students have in completing the overall national examination test items might be identified by implementing the classical test theory and the item-response theory. The indicators that have been considered to be difficult by the students will be reflected from the students' scores or results. The students' scores for each item will be analyzed by performing the classical test theory utilizing the proportion of the students' correct answers. The proportion of correct answers in the classical test theory will reflect which items are difficult for the students. Each test item describes each indicator so that the proportion of correct answers will describe the indicators that the students consider to

be difficult as well. The higher the score or the proportion of the correct answer, the easier the test items will be for the students. On the other hand, the lower the score or the proportion of the correct answer, the more difficult the test items will be for the students.

The test items become difficult for the students for several reasons. One of the reasons is the numbers in the test items are not integers or the students have not understood the materials or the concepts in the completion of national examination test items. The test items have complex completion steps or they should be completed through several phases. According to Yusha'u (2013), several matters that cause the students' difficulties in learning mathematics are the students' unpreparedness in the learning process, the students' self-confidence in completing the mathematical problems, the students' motivation, the teachers' low motivation, the parents' low motivation, the relatives' low motivation and the students' weak fundamental ability in mathematics. In addition, mathematics also demands several skills that the students should master. Based on a study by Tambychik and Meerah (2010), there are five types of mathematics skills: number fact skill (proficiency of number facts, tables and mathematics principal); arithmetic skill (accuracy and logarithm in computational and mathematical working-procedure); information skill (expertise to connect information to a concept, operational, and experience as well as the expertise to transfer information and transform problems into mathematical sentence); language skill (proficiency of terms and relevance of arithmetical information); visual spatial skill (skill to visualize mathematical concepts, manipulate geometrical shape and space meaningfully). According to Gooding (2009), the forms of students' difficulties in completing the mathematics test items are

*“.....reading and comprehension; decoding words in a word-problem; understanding the meaning of the words and sentences; reading and understanding all of the information; distracting information; imagining the context; writing a number sentence; carrying out the calculation; lack of accurate methods for calculating; making a mistake when calculating; interpreting the answer in the context of the question; giving an answer that is possible or likely; and transferring an answer into the required format”.*

The multiple mathematical skills that should be mastered in solving the mathematical problems make several students unable to master the overall skills and the situation affects the results of the Mathematics National Examination, which has been considered to be difficult. The situation will be worse if the students are not accustomed to solve the mathematical problems that involve the overall mathematical skills. In order to overcome the situation, the teachers might pursue the combination of the mathematical skills by administering the mathematical problems that combine several mathematical concepts. The quite complex mathematical problems might be derived from the combination between of multiple mathematical concepts and problem solving strategies and such mathematical problems might be difficult for the students. The reason for pursuing such a combination is that the students should have higher cognitive load. According to Tambychik and Meerah (2010), difficulties in mathematic problem solving are due to the incompetency in acquiring many mathematical skills and the lacking of cognitive learning abilities. However, the students' mathematical difficulties are not from the students'



factors themselves. As having been explained by Yusha'u (2013), the teacher's **problem in contributing** factor in students' low performance **includes** teachers' content knowledge of mathematics, strategy, method of presentation as well as method of evaluations. Therefore, the teachers should also be aware of improving their self-quality within the mathematics teaching. As a result, there should be a study that will identify why the Mathematics National Examination test items become difficult for the students.

### The Purpose of Study

The purposes of the present study are to identify the difficult test items for the junior high school mathematics national examination **and** to find the factors that contribute to the difficult test items and the strategies that teachers and the students might implement in order to overcome the difficult test items.

## METHODS

### Design

The study **used** the mixed methods approach. The researcher implemented the quantitative approach first, in order to identify the difficult items based on the data of the students' responses toward the national examination test items. Then, the researcher implemented the qualitative **approach** to identify the factors that caused the difficulties for the students along with the strategies that might be suggested toward the teachers and the students **so** that they master the difficult test items.

### Data

The data in the study were the Mathematics National Examination test item sets and their responses. The test item sets that had been implemented in the national examination were 20 equal test packages. The term equal in the study meant that each test item within the 20 test packages had been developed from the same blueprint. Each item measured the same indicator, so the difference would only be in the numbers. The sets along with the responses of the test participants were gathered using documentation technique.

The factors that caused the students' difficulties in completing the difficult test items along with the strategies that the teachers and the students might implement in order to overcome the difficulties were identified in the focus group discussion (FGD). The FGD involved 15 mathematics **teachers** of junior high school from 12 provinces in Indonesia and 4 mathematics experts.

### Participants

The test participants who responded to the national examination were 46,313 students. These participants, or respondents, were all students of junior high school in the Province of Yogyakarta Special Region, Indonesia, which according to The Centre of Educational Assessment, Indonesia has had **a** good credibility index in national examination administration. The data from the documentation of the test participants' responses

toward the national examination test items were attained from the Centre of Education Assessment Indonesia. The FGD participants were 15 mathematics teachers (T1-T15) of junior high school from 12 provinces in Indonesia, consisting of 8 teachers from the Western Indonesian Region, 3 teachers from the Central Indonesian Region and 4 teachers from the Eastern Indonesian Region along with 4 mathematics experts (E1-E4) from the universities. The composition of the participants was 11 male participants and 8 female participants. The qualifications of the teachers who had been invited to attend the FGD were the mathematics teachers who had been teaching in junior high schools for approximately 10 years and who had earned the undergraduate degree from the mathematics education study program.

#### Data Analysis

The data of the students' responses toward the test item sets were analyzed by means of the classical test theory in order to identify the difficulty level. The difficulty level was estimated by calculating the proportion of correct answers. The items would be considered difficult if the proportion of the correct answer for the item was less than 37.5% from the overall students. The difficult items were identified and the researcher found the tendency for each package. Next, the researcher would rewrite the test items and would turn them into the FGD discussion matters for the mathematics for junior high school teachers. Afterwards, the teachers would find the reasons why the test items had been difficult for the students.

Before performing the FGD, the FGD participants were asked to complete the test items first. Then, the teachers would discuss the reasons why these items were difficult. In addition, the researcher and the participants would also discuss the strategies that the teachers might implement in the teaching strategies that might decrease and avoid the difficulties for the students. The results of the FGD were then analyzed by means of qualitative analysis model of Miles and Hubberman (1994). The stages of analysis then were, namely, data reduction, data presentation, data verification and conclusion.

#### RESULT

The data from the results of Mathematics National Examination for the junior high school students in the Province of Yogyakarta Special Region consisting of 20 test packages were analyzed based on the proportion of correct answers. The mean of each item's difficulty level is presented in Table 1.

Based on Table 1, the test items were difficult for the students. The difficulty was reflected from the low mean in the proportion of correct answers attained from the 20 national examination test item packages. From the 20 national examination test item packages, four test items that had been most difficult for the students were the item number 3, 13, 17, and 21. The mean in the proportion of correct answer for the difficult test items were not more than 37.5%. Based on the results, the researcher took a follow-up action by holding the FGD in order to analyze the problems that the students encountered. The difficult items were discussed in the FGD one by one so that the FGD

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participants would have the descriptions of what the teacher should have done in teaching the difficult indicators. The results of the FGD that described the students' difficulties, according to the teachers' perspective in the FGD, are explained as follows, item by item.

Table 1.  
Mean of Difficulty Level

Items	Proportion Correct	Items	Proportion Correct	Items	Proportion Correct	Items	Proportion Correct
1	68.6	11	56.7	21	16.0	31	56.5
2	56.8	12	52.7	22	61.8	32	81.7
3	5.4	13	31.9	23	60.3	33	56.6
4	58.8	14	52.0	24	50.1	34	49.8
5	66.6	15	57.4	25	40.8	35	47.3
6	56.9	16	39.9	26	47.9	36	68.7
7	67.8	17	37.0	27	56.9	37	40.4
8	57.8	18	44.2	28	70.5	38	61.2
9	62.6	19	46.2	29	44.4	39	75.0
10	57.7	20	61.9	30	57.9	40	62.6

### Item 3

The results of  $4^{\frac{3}{2}}$  is ... .

- A.  $\frac{1}{3}$  B.  $\frac{1}{2}$  C. 2 D. 8

The percentage of the students who responded correctly to the Mathematics National Examination test items similar to Item 3 above was only around 5.40%. In order to respond Item 3 correctly, the test participants or the students should perform the manipulation first by changing  $4 = 2^2$  into  $2^{2(\frac{3}{2})} = 2^3 = 8$ .

In order to complete the stage  $2^{2(\frac{3}{2})} = 2^3$ , the students should understand first the characteristics of exponential number operation and it was this concept that had caused the students' difficulties in **answering** Item 3. According to the teachers, several matters might cause the students' difficulties in **answering** Item 3. The first matter was that the students had not been able to manipulate the exponential form of number 2 ( $4 = 2^2$ ). Then, the second matter was that the students had lacked mastery of the characteristics of exponential integer operation and, as a result, they were confused when they got into  $2^{2(\frac{3}{2})}$ . The third or the last matter was that the students had difficulties in performing the exponential integer operation with fraction and in this case such operation involved multiplication.

In order to overcome these difficulties, one of the strategies that the teachers might implement in the learning process was strengthening the students' understanding **towards** the main number and the exponents so that they would easily (intuitively) identify that

$4 = 2^2$ ,  $16 = 2^4$ ,  $81 = 3^4$ ,  $125 = 5^3$  and so on. The strengthening might be pursued by providing examples and exponential tables. Then, in order to overcome the second and the third problem, the teachers should emphasize the characteristics of exponential integer operation in which the exponents were in fractions. Last but not the least, in order to improve the students' ability in strengthening their understanding of the main numbers, the exponents and operation of fractional-exponent integer operation, the teachers should provide exercises that contained the three aspects.

## Item 13

It is found  $P = \{b, a, t, i, k\}$ . The number of subset P is ...

- A. 32 B. 25 C.10 D. 5

The percentage of the students who responded correctly to the above item was around 31.90%. In order to answer the test item, the students should understand what had been defined as the subset of a set. The subsets of  $P = \{b, a, t, i, k\}$  are  $\{ \}$ ,  $\{b\}$ ,  $\{a\}$ ,  $\{t\}$ ,  $\{i\}$ ,  $\{k\}$ ,  $\{b,a\}$ ,  $\{b,t\}$ ,  $\{b,i\}$ ,  $\{b,k\}$ ,  $\{a,t\}$ ,  $\{a,i\}$ ,  $\{a,k\}$ ,  $\{t,i\}$ ,  $\{t,k\}$ ,  $\{i,k\}$ ,  $\{b,a,t\}$ ,  $\{b,a,i\}$ ,  $\{b,a,k\}$ ,  $\{b,t,i\}$ ,  $\{b,i,k\}$ ,  $\{a,t,i\}$ ,  $\{a,i,k\}$ ,  $\{a,t,k\}$ ,  $\{t,i,k\}$ ,  $\{b,a,t,i\}$ ,  $\{b,t,i,k\}$ ,  $\{a,t,i,k\}$ ,  $\{b,a,t,k\}$ ,  $\{b,a,i,k\}$ ,  $\{b,a,t,i,k\}$  so that the number of the members in the set P was 32. After the students found the pattern and the number of the set P, they could track the subset of P using the Formula  $2^n$ , in which  $n$  was the number of the set member. The number of P member was 5, so the number of the subset P was  $2^5 = 32$ . According to the teachers, the students' difficulties in completing the test item were the weak understanding of the concept of subset. Most of the students were confused to choose concept between the member of a set and the member of a subset; as a result, they were tricked and they chose option D as the correct answer in which they found the member of a set instead of a subset.

According to the teachers, the students' errors in responding to the test item might be minimized by strengthening their understanding about the number of a set member and the number of a subset member. The definition of each concept should be understood well along with their association. The relationship between the set member and the subset member resulted in the formula that the members of a subset should be equal to ... in which  $n$  was the number of subset members. The formula might be a further stepping point for emphasizing the differences between the two concepts.

## Item 17

The line equation that will be parallel to the line that passes the coordinate point (2,5) and (-1,-4) is ...

- A.  $y = -3x + 14$  B.  $y = -(1/3)x + 6$   
C.  $y = (1/3)x + 4$  D.  $y = 3x - 4$

The percentage of the students who responded correctly to the Mathematics National Examination test item similar to the test Item 17 above was around 37.00%. In order to answer the test item, the students should understand that two lines would be considered

parallel if they had the same slopes. Therefore, the student should understand the procedures of locating the slope of a line if they knew two coordinate points that would be passed. For example, if the two coordinate points were  $(x_a, y_a)$  and  $(x_b, y_b)$  then the slope ( $m_{ab}$ ) would be  $\frac{y_a - y_b}{x_a - x_b}$ . In the test item, the slope of the line that would pass  $(2, 5)$  and  $(-1, -4)$  were  $\frac{5+4}{2+1} = 3$ . The general straight line equation has been  $y = mx + c$  in which  $m$  is the slope and  $c$  is the constant; as a result, the general straight line equation with the gradient 3 would be  $y = 3x + c$ . Therefore, there would not be any line that might be parallel with  $y = 3x + c$ . The line variation would depend on the selection of  $c$  so that one of the lines that would be parallel to the line passing through  $(2, 5)$  and  $(-1, -4)$  would be  $y = 3x - 4$ . According to the teachers, there are several reasons why the percentage of the students who responded correctly had been low. First, the students forgot the procedures of looking for the gradient. Second, they had not understood well the concept of two parallel lines and, thereby, it was very possible that there had been some confusions between the concept of a perpendicular line and the parallel lines.

Based on the teachers' opinion, in order to minimize the students' errors in answering the similar test items, the teachers should provide the students with more in-depth understanding towards the concept of a straight line and a slope. There have been multiple procedures that might be implemented in finding the gradient value of a line, depend on the initial information found. In the Item 17, the initial information that has been found was the two coordinate points that would be passed by the line. However, in other cases it might be very possible if the initial information that had been found were the line equations in the form of  $y = ax$ ,  $y = ax + c$  or  $ax + by + c = 0$ . In order to understand all of the equations, the students should be provided with various experiences in observing of a lot of cases. Then, the next aspect that should be emphasized would be the understanding towards the concept of two parallel lines and two perpendicular lines. The students should understand the characteristics of both concepts so that they would definitely notice the differences. The emphasis on the differences between both concepts is the response to the case in which the students often mismatch the application of both concepts.

#### Item 21

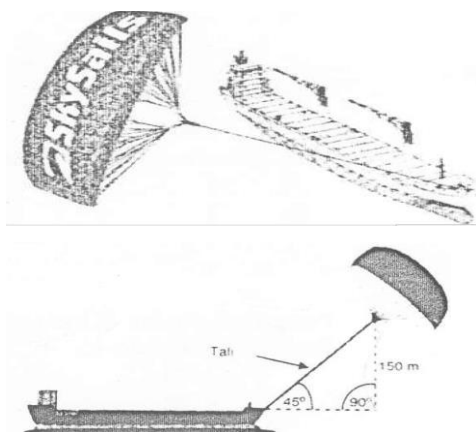
Pay attention to the sailboat!

About 95% of the world's trading commodities have been sent through the sea transportation that involves 50,000 tankers, shipping boats and giant freights. Most of these ships make use of the diesel oil.

The engineers have planned to build the supporting power by harnessing the wind for these ships. Their idea is to install the kite sail to these ships and to use the wind power in order to decrease the diesel oil consumption and the impact of the diesel oil towards the environment.

Based on the description, how long will the rope from the kite sail to the ship be in order that the kite sail draws the ship on the  $45^\circ$  angle and the 150 m height as shown in the picture?

- A. 175 m
- B. 212 m
- C. 285 m
- D. 300 m



The percentage of the students who responded correctly to the Mathematics National Examination test item similar to the test item number 21 above was around 16.00%. The students might **answer** the test items by understanding triangle characteristics in which the total amount of a triangle's degree should be equal to  $180^\circ$ . Thereby, the students might conclude the other angles that might be formed from the  $45^\circ$  angle, in other words, the triangle should be the isosceles right triangle. Then, the second material that the students should understand was the application of Pythagoras theorem in determining the necessary minimum length of the rope. The length of the rope is  $(\sqrt{150^2 - 150^2})\text{m}$ , then the students would find that the length of the rope would be equal to 212.1320344 m. The teachers explained that such complexity had been the cause of the low percentage of the students who responded to the test item correctly. The test item was considered too long by the students and, as a result, they felt that such test items were difficult, tough and complicated. The situation led to the students' decreasing interest in **answering** the test item. The low interest also became the main factor that caused the students' low efforts. In other words, it was very possible that the students who had a low interest could not **answer** the test items well. The number that had been used was so big, that it caused the calculation difficulties. In addition, the students were also confused because the number was not part of integers (212.1320344). In general, within the completion process the students did not always focus on the calculation; instead, they focused on the commonality of the calculation results and the consideration with the appropriate alternatives and their own perception. Such calculation results would cause the students to doubt **the answer** and to perform re-calculation or to be **confused** and to give up. Last but not the least; the students were not accustomed to attaining information in the form of contextual figure. The impact would be that the students had been confused in interpreting the information and the direction within the test items.

The teachers stated that in order to minimize the errors in answering the similar test items, there should be some sort ways in strengthening the concept of a triangle and the application of the Pythagoras theorem. The students should master the triangle characteristics so that they might have access to the information related to triangles intuitively and immediately. In addition, the students should be provided with test items related to the application of the Pythagoras theorem especially the calculation part. The students should also perform the calculation well although the calculation involved big numbers. Another strategy would be habituating the students to attain and to solve the contextual problems that had been stated in the form of narrative text or figure. Increasing the students' ability in understanding the test items in the form of a narrative text or a figure might not be done instantly; as a result, there should be periodical exercises in order to make the students get accustomed to the Pythagoras theorem calculation.

Table 2. The Result of Focus Group Discussion

The Students' Difficulties	The Cause of Students' Difficulties	Teachers' Strategy to Overcome Students' Difficulties
The lack of concept understanding,	Factor of the mathematics nature: The lack of fundamental understanding of mathematics,	Strengthening the students' understanding, providing the students with the problem models especially the ones related to the real context, providing them with the various exercises with big number and non-integers, habituating them to answer contextual test items presented in the form of figures and narrative texts, habituating them to answer test items through several steps of completion instead of operating the steps directly through basic concepts, and habituating them to complete test items whose alternatives are in narrative texts (not only involving numbers).
Difficulties in calculating,	mathematical properties that are complex.	
Difficulties in selecting information,	Factors of students: Lack of motivation to complete the mathematics test items	Raising students' motivation to study mathematics.
Being deceived by the distracters,	Factors of teachers: The mathematics teaching and learning was not effective	
Being unaccustomed to completing complex and non-integers test items	Factors of school: The lack of support from school	Conducting mathematics teaching and learning effectively: prepare a long-term planning, structured preparation and the well-designed strategy to improve quality of learning.
Completing the contextual test items that have been presented in the form of figures or narrative texts.	Factors of parents: Not all parents remind students to practice and learn math	
		Optimizing the school and parents support.

Based on the results of focus group discussion about the students' difficulties in answering every item in national examination, it can be summarized the students' difficulties. Then the participants of FGD describe the causes, as well as strategies that can be implemented to improve them. The results are presented in Table 2. The

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difficulties **which** were caused by several factors that are the nature of mathematics, students, teachers, schools and parents will be discussed as follows.

From the perspective on the factors of **a** learning content, the concepts that were established in mathematics **are** the basic concept of the other science. Mathematics **has** various concepts, symbols and formulas that **can** be **used** to solve all of the mathematical problems. When students were **answering** items, they should link concepts, symbols, and formulas **then combine them** to solve problems. **It** caused students' difficulties **to appear**, including making a mathematical model from narrative items. This was confirmed by teachers' statements as follows.

*"Students understood the concepts partially, or know **how** to utilize formula. But when they combined **them**, **they found** many troubles."(T1, T9)*

*"Students could understand the narrative items, **but** the difficulty was how to make the problem into a mathematical model and to be solved later."(T10)*

**Besides** having various concepts and symbols, the mathematics national examination test items considered difficult by the students **since they** have almost similar characteristics, namely demanding several steps of completion in order to attain the correct answer. The combination of several steps **in** completion demands **very** high understanding of basic mathematical concepts **which help** the students **in answering** the national examination questions.

From the **students'** factor, the cause of the students' difficulty to **answer** items that require manipulation of numbers, **relate** to real-life contexts, **require** many steps, solve problems in the form of a story, was a lack of students' exercises **in** deepening the mathematical concepts after **being learnt**. It was stated by the teacher as follows.

*"Students did not use to practice problem solving to strengthen the understanding of mathematical concepts."(T2, T11)*

*"Students were reluctant to **answering** the problems that include many steps. Similarly, the students would be confused to determine what information is used to answer the questions in narrative items."(T11)*

The third factor of causation of the difficulties was the teacher factor. When viewed from the teacher factor, the difficulties caused **by the ineffectiveness of mathematics teaching and learning lessons which conducted by teachers**. This is evidenced by the statement of the teacher about teaching and learning as follows.

*"The teaching and learning seems less effective. During the teaching, we further pursue the achievement of content, so the students couldn't get deep understanding. Students also didn't do enough exercises.... "(T5)*

*"There were a lot of teaching contents that should be learnt by students, we have less time to teach until **students' understanding getting deep, including add** problem solving exercises for the students."(T6)*



Ideally, the school fully supports the implementation and improvement of the quality of teaching and learning, including mathematics teaching. However, not all schools provided full support, because of various limitations, such as funding and time. It was stated **by** the teacher as follows.

*"Our school support for improvement of learning, but when we implemented a new teaching approach that requires specific tools, teachers should supply **them by themselves, it is** caused by the limitation of funding."*(T2)

*"We are allowed to do professional development such as training to improve quality of teaching, but it should not bother teaching activities."*(T12)

The lack of parental support **is** also a factor **that causes** students' difficulties **in answering** items in national math exam. Based on information from teachers, it was found that not all parents reminded students to practice mathematics exercises at home. Not all parents who supported their children **understood** the content of the materials studied by students in junior high school. It was stated by the teacher as follows.

*"Not all parents reminded their children to study mathematics or practice mathematics exercises at home."*(T10)

*"... if students have difficulties in mathematics, not all parents could help **explaining** it."*(T9)

The various difficulties could be overcome by looking at its causes. Difficulties **which** associated with the nature of mathematics could be overcome by deepening the understanding of the students' concept. **One of the strategies to overcome these difficulties is implementing meaningful mathematics teaching and learning.** In order to obtain the meaningful learning, **teachers could** integrate the understanding of the concept utilizing real context **which students are familiar with.** This opinion was expressed by teachers as follows.

*"In my experience, understanding of the concept could be strengthened by integrating the concept of learning in the context and daily life faced by students."*(T11)

**Overcoming** the students' difficulties caused by students and teachers factors can be done by increasing the effectiveness of teaching. The lack of motivation **from** students to strengthen the concept understanding and to resolve complex and narrative problems can be uncovered through improvement of teaching, and also **teachers could** award the students when they succeed in mathematics. It was stated **by** the teacher as follows.

*"Increasing the students' motivation could be done with the improvement of learning quality, using contemporary learning approaches, such as project based learning or problem-based learning. This learning approach makes students motivated to learn."*(T10)

*"The award to students was also a way to motivate students, I have done **it**. If the student has successfully solved the math problem, I gave a special praise. Students would be happy and be motivated to learn.... "*(T10)

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In addition, to **increase** motivation, learning improvement can also optimize learning outcomes and reduce the students' difficulty. In order to implement learning effectively, teachers need to formulate clear learning outcomes, **prepare** lesson plans well, choose the appropriate learning approach with the content being studied, **and conduct** an assessment in accordance with the learning outcomes that have been formulated. Teachers should **also** use learning approaches in accordance with the students' **needs**, for example using peer tutorial approach. This is **based on** the following statement from teachers.

*"We prepared lesson plans, implement teaching to ensure the objectives were achieved, develop appropriate worksheet, assess and utilize the assessment results to improve learning."*(T5)

*"If necessary, we asked students who already understood the material to explain to their friends, and also provide tutorials for students in need."*(T15)

The strategy to complement the efforts to reduce the students' difficulties in **answering** the national exam was the school support to the implementation of mathematics learning and the parental support of student learning. To obtain the support from the school, teachers suggested something needed to do together with other teachers. The school support could be in the form of monitoring and evaluating the teaching and learning. The monitoring and evaluating were implemented to make sure the teaching and learning were conducting effectively. Meanwhile, to obtain support from parents, teachers involved the parents to sign students' homework or outcomes of assessment. The strategies to improve both supports were expressed by the teacher as follows.

*"If we needed the school support for the implementation and enhancement of learning, we should held a small meeting with other teachers, and proposed it to the school."*(T10)

*"... The school should monitor and evaluate the mathematics teaching and learning, to make sure that they have done effectively."*(E1)

*"In order to monitor the development of students' achievement, homework and assessment results must be signed by parents. The parents could monitor and understand the development of their children."*(T9)

## DISCUSSIONS

Based on the research results, it can be obtained that students had difficulties in **answering** the 4 difficult items of mathematics national exam. The difficulties are the lack of conceptual understanding, calculating, selecting information, being deceived by the distracters, being unaccustomed to **answering** complex and non-integers test items and **answering** the contextual test items that have been presented in the form of figures or narrative texts. The research result about the students' lack understanding in fundamental mathematics concepts was in line with research from Gooding (2009), Ismail, Shahrill and Mundia (2015) and Maarif (2016).

To overcome the students' difficulties associated with the nature of mathematics, it can be done by strengthening the students' mathematical understanding of the mathematical concepts. The concept understanding can be achieved through learning utilizing the context that students face every day. These are supported by the research results on the concept understanding was done by providing exercise to the students through activities and real things that exist around the student (Ali, 2011: 56-57) and to make connections between everyday problem solving with **experiences** (Antony and Walshaw, 2009). The result was in line with the statement of Bradley et al. (2008) about it is needed to connect the concepts and symbols with things that had known by the students.

**Further understanding about the real factor causing difficulties from students themselves was the lack of students' motivation.** The students' lack of motivation made them **less understands the** mathematics concepts and then they had difficulties when **answering** mathematics problems. These results are consistent with the results of research on the lack of student motivation in resolving mathematics problem (Yusha'u, 2013; Ismail, Shahrill and Mundia, 2015) and the reluctance of students to work on complex problems and contains many steps (Jailani and Heri Retnawati, 2015).

Based on this study, increasing the motivation of learning can be enhanced through improvements of mathematics teaching and learning in classroom. Efforts to increase the students' motivation utilizing improvement of learning quality **were** in line with Sorensen (2006) and Ali (2012), while giving awards to students was according to the results of research Middleton and Spanias (1999). Furthermore, giving award **as one** of the various ways to express the students understanding which can **be** done using the portfolio was the result research of Furner and Gonzales-Dehasa (2011: 236).

In addition, to **increase** motivation, improving the quality of learning can enhance students' understanding of mathematical concepts. The learning activities can be followed by providing the students with the problem models especially the ones related to the real context, providing them with the various exercises with big number and non-integers, habituating them to **solve** contextual test items presented in the form of figures and narrative texts, habituating them to **answer** test items through several steps of completion instead of operating the steps directly through basic concepts. The mathematics teaching and learning could be directed to habituate students to complete problem solving **in which the** alternatives are in narrative texts. The efforts were consistent with the research results to optimize learning to improve students' understanding and math skills (Jailani and Retnawati, 2015) and also the preparation of learning well, **a** well-executed teaching, **a** support **of** curriculum and appropriate learning strategies (Ismail et al., 2015).

Mathematics teachers in a school have a variety of tasks, **arrange** lesson plans, implement teaching and learning in many parallel classes, conduct assessments and improve the learning using the assessment results. **These** heavy tasks were burdening mathematics teachers. The burden of teachers caused the less effectiveness of teaching and learning implementation, which led to poor understanding of the students' mathematical concepts. The lack of understanding of students led to difficulties in problem solving, especially for items that require algebraic manipulations, many steps **of** completion, related to the

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context or presented in narrative text. From the previous research, the teachers' burden was causing less optimal learning (Retnawati, 2015; Jailani and Retnawati (2015), also teacher learning behaviors affect student achievement (Pimta et al., 2009).

Beside students and learning factors, other factors that caused difficulties were the lack of support from the school and parents. This difficulty can be improved through effective communication, from teachers to schools and from teachers to parents. With the support of the school, the teaching and learning that would be implemented by mathematics teachers become more effective. The research about the influence of school support for the implementation of effective learning has been done by previous researchers. To implement effective learning, the schools should have availability in supporting the learning sources and teaching equipment (Ismail et al., 2015), the school should conduct the monitoring of curriculum implementation (Retnawati, et al. 2016), as well as supported the use of ICT (Ayub and Bakar, 2012). Research on the parental support showed that there was a positive effect on students' mathematics achievement (Bempechat, 1982; Vucovic et al. 2013).

## CONCLUSIONS

From the 20 National Examination test packages, the items that the students consider to be difficult are items 3, 13, 17, and 21. The students' difficulties in answering these items are the lack of concept understanding, difficulties in calculating, difficulties in selecting information, being deceived by the distracters, being unaccustomed to working with complex and non-integers test items and answering the contextual test items that have been presented in the form of figures or narrative texts. In addition, another cause of students' difficulties is the inaccuracy of students' calculation.

Some suggestions that the teachers might give to overcome the students' difficulties in answering items include the need for strengthening the students' understanding, providing the students with the problem models especially the ones related to the real context, providing them with the various exercises with big number and non-integers, habituating them to complete contextual test items presented in the form of figures and narrative texts, habituating them to complete test items through several steps of completion instead of operating the steps directly through basic concepts and habituating them to complete test items in which the alternatives are in narrative texts (not only involving numbers).

Other factors that contribute to overcome the students' difficulties in answering the mathematics National Examination test items or in paying attention to the mathematics learning processes in general are the factors in mathematics themselves. Mathematics has a lot of concepts that the students should understand so that they can associate these concepts to the real matters around them through songs or other media that make them easily remember or understand. In addition, schools should prepare a long-term planning: make structure of preparation and a well-designed strategy in order to overcome the problems such as the teachers' incapability to perform the in-depth mathematics teaching process. Furthermore, schools should also provide teachers with freedom in designing the

syllabus and in preparing tests or examinations. Last but not least, parents are the main factors in monitoring the students' academic development that affect their condition in the mathematics learning processes.

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### **Why are the National Examination Items Difficult and What Is Teachers' Strategy to Overcome It?**

The quality of national examination test items plays an enormous role in identifying students' competencies mastery and their difficulties. This study is to identify the difficult items in the Junior High School Mathematics National Examination, to find the factors that caused it and to reveal the strategies that the teachers, and the students might implement in order to overcome it. The study was phenomenological research with the mixed methods. The data were collected using documentation of students' responses and focus group discussion (FGD) of teacher. The data analysis was conducted using Milles & Hubberman steps. The results of the study showed that there were 4 difficult items of the 40 test items for the students. The students' difficulties were caused by the complexity of the test item completion that demanded two completion steps or more and the narrative form of test items. The strategies for the teachers are integrating the complex test items into problem solving methods within the learning process, pursuing in-depth understanding of the concepts so that the students might complete various test items, and exercising multiple problem solving methods so that the students would be accustomed to the complex and problem related to solve test items.

Keywords: difficult items, influenced factors, teachers' strategy

#### **INTRODUCTION**

In education, assessment is an important matter in order to identify the educational success. The results of educational assessment have multiple advantages that might be useful in further educational processes. One of the advantages is to identify how far the students have possessed the capacity in certain subjects such as mathematics. In addition to identifying the students' capacity or understanding, the assessment results might also provide certain concepts such as the concepts of mathematics that the students have not mastered. Through the assessment results, the teachers or other related parties might improve the learning process within the school.

The results of educational assessment in Indonesia, especially in mathematics, have not satisfied many parties over years. This can be seen in the situation might be found both by means of students' average score in the Mathematics National Examination and the results provided by the international studies. Based on the results of national examination, there are several indicators that have not been satisfying (Balitbang Kemendiknas, 2011, 2012, 2013). These results show that there have been many students who still have difficulties in certain items of the mathematics test of the National Examination. Meanwhile, the results of international studies also show similar results, based on the results of an international assessment using PISA (Program for

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International Student Assessment) (OECD, 2014) or TIMSS (Trends in International Mathematics and Science Study) (Mullis, Martin, Foy, & Arora, 2012).

The 2014 National Examination made use of 20 test packages in order to maintain the reliability of the students' national examination results. With the 20 test packages, it had been expected that the schools might minimize any fraud during the administration of the national examination which has run for years. Unfortunately, the various test packages caused the new difficulties among the students although these test packages had been designed under the same guidelines and indicators. The students might have more difficulties since the item difficulty of test would be improved. The quality improvement was apparent from the addition of TIMSS or PISA test items, which have the international quality, into the national examination test items. As a result, the students had difficulties in completing these test items, especially those who were not familiar with the internationally standardized test items.

The difficulties in completing the national examination test items become a matter of reflection both for the teachers and the students. The teachers and the students should learn from the students' difficulties in order to identify the parts or the indicators that the students consider to be difficult. A similar situation has been stated by Meese (Tambychik & Meerah, 2010) as follows: "Teachers need to understand students' potential, problems and learning difficulties in order to implement effective teaching strategy and to produce meaningful learning among students." After the teachers find the difficult indicators, they might create new learning strategies that will be meaningful for providing the students' concept understanding toward the students regarding the difficult indicators. Multiple learning strategies might be applied in the learning process by adjusting the students' conditions, the materials or the indicators that will be studied and the drawbacks of each student. Mundia (2010) states, "Each teaching technique has its own strengths and weaknesses and there are several other factors that need to be taken into consideration for teaching to be effective with special needs students." Thereby, there should be appropriate selection and consideration before the teachers apply the learning strategies or techniques within the learning process in the classroom according to the students' needs.

The difficulties that the students have in completing the overall national examination test items might be identified by implementing the classical test theory and the item-response theory. The indicators that have been considered to be difficult by the students will be reflected from the students' scores or results. The students' scores for each item will be analysed by performing the classical test theory under the proportion of the students' correct answers. The proportion of correct answers in the classical test theory will reflect which items are difficult for the students. Each test item describes each indicator so that the proportion of correct answers will describe the indicators that the students have considered to be difficult as well. The higher the score or the proportion of the correct answer, the easier the test items will be for the students. On the other hand, the lower the score or the proportion of the correct answer, the more difficult the test items will be for the students.

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The test items become difficult for the students for several reasons. One of the reasons is that the numbers in the test items are not integers or the students have not understood the materials or the concepts in the completion of national examination test items. The test items have complex completion steps or they should be completed through several phases. According to Yusha'u (2013), several matters that cause the students' difficulties in learning mathematics are the students' unpreparedness in the learning process, the students' self-confidence in completing the mathematical problems, the students' motivation, the teachers' low motivation, the parents' low motivation, the relatives' low motivation and the students' weak fundamental capacity in mathematics. In addition, mathematics also demands several skills that the students should master. Based on a study by Tambychik and Meerah (2010), there are five types of mathematics skills: number fact skill (proficiency of number facts, tables and mathematics principal); arithmetic skill (accuracy and logarithm in computational and mathematical working-procedure); information skill (expertise to connect information to a concept, operational, and experience as well as the expertise to transfer information and transform problems into mathematical sentence); language skill (proficiency of terms and relevance of arithmetical information); visual spatial skill (skill to visualize mathematical concepts, manipulate geometrical shape and space meaningfully).

According to Gooding (2009), the forms of students' difficulties in completing the mathematics test items are "reading and comprehension; decoding words in a word-problem; understanding the meaning of the words and sentences; reading and understanding all of the information; distracting information; imagining the context; writing a number sentence; carrying out the calculation; lack of accurate methods for calculating; making a mistake when calculating; interpreting the answer in the context of the question; giving an answer that is possible or likely; and transferring an answer into the required format".

The multiple mathematical skills that should be mastered in solving the mathematical problems make several students unable to master the overall skills and the situation affects the results of the Mathematics National Examination, which has been considered to be difficult. The situation will be worse if the students are not accustomed to solve the mathematical problems that involve the overall mathematical skills. In order to overcome the situation, the teachers might pursue the combination of the mathematical skills by administering the mathematical problems that combine several mathematical concepts. The quite complex mathematical problems might be derived from the combination between of multiple mathematical concepts and problem solving strategies and such mathematical problems might be difficult for the students. The reason for pursuing such a combination is that the students should have higher cognitive load. According to Tambychik and Meerah (2010), difficulties in mathematic problem solving are due to the incompetency in acquiring many mathematical skills and the lacking of cognitive learning abilities. However, the students' mathematical difficulties are not from the students' factors themselves. As having been explained by Yusha'u (2013), the teacher's problem being in contributing factor in students' low performance include teachers' content knowledge of mathematics, strategy, method of presentation as

well as method of evaluations. Therefore, the teachers should also be aware of improving their self-quality within the mathematics teaching. As a result, there should be a study that will identify why the Mathematics National Examination test items become difficult for the students. The study then is to identify the difficult test items for the junior high school mathematics national examination, to find the factors that contribute to the difficult test items and the strategies that teachers and the students might implement in order to overcome the difficult test items.

## **METHODS**

### **Design**

The study made use of the mixed methods approach. The researcher implemented the quantitative approach first in order to identify the difficult items based on the data of the students' responses toward the national examination test items. Then, the researcher implemented the qualitative test item in order to identify the factors that caused the difficulties for the students along with the strategies that might be suggested toward the teachers and the students in order that they master the difficult test items.

### **Data**

The data in the study were the Mathematics National Examination test item sets and their responses. The test item sets that had been implemented in the national examination were 20 equal test packages. The term equal in the study meant that each test item within the 20 test packages had been developed from the same guidelines. Each item measured the same indicator, so the difference would only be in the numbers. The sets along with the responses of the test participants were gathered by means of documentation.

The factors that caused the students' difficulties in completing the difficult test items along with the strategies that the teachers and the students might implement in order to overcome the difficulties were identified in the focus group discussion (FGD). The FGD involved 15 mathematics teacher of junior high school from 12 provinces in Indonesia and 4 mathematics experts.

### **Participants**

The test participants who responded to the national examination were 46,313 students. These participants, or respondents, were all students of junior high school in the Province of Yogyakarta Special Region, Indonesia, which according to The Centre of Educational Assessment, Indonesia has had good credibility index in national examination administration. The data from the documentation of the test participants' responses toward the national examination test items were attained from the Centre of Education Assessment Indonesia. The FGD participants were 15 mathematics teacher of junior high school from 12 provinces in Indonesia, consisting of 8 teachers from the Western Indonesian Region, 3 teachers from the Central Indonesian Region and 4 teachers from the Eastern Indonesian Region along with 4 Mathematics experts from the

universities. The composition of the participants was 11 male participants and 8 female participants. The qualification of the teachers who had been invited to attend the FGD were the mathematics teacher who had been teaching in junior high schools for approximately 10 years and who had earned the undergraduate degree from the mathematics education study program.

#### **Data Analysis**

The data of the students' responses toward the test item sets were analysed by means of the classical test theory in order to identify the difficulty level. The difficulty level was estimated by calculating the proportion of correct answers. The items would be considered difficult if the proportion of the correct answer for the item was less than 37.5% from the overall students. The difficult items were identified and the researcher found the tendency for each package. Next, the researcher would rewrite the test items and would turn them into the FGD discussion matters for the mathematics for junior high school teachers. Afterwards, the teachers would find the reasons why the test items had been difficult for the students.

Before performing the FGD, the FGD participants were asked to complete the test items first. Then, the teachers would discuss the reasons why these items were difficult. In addition, the researcher and the participants would also discuss the strategies that the teachers might implement in the teaching strategies that might decrease and avoid the difficulties for the students. The results of the FGD were then analysed by means of qualitative analysis model of Miles & Hubberman (1994). The stages of analysis then were, namely, data reduction, data presentation, data verification and conclusion.

#### **FINDINGS**

The data from the results of Mathematics National Examination for the junior high school students in the Province of Yogyakarta Special Region consisting of 20 test packages were analysed based on the proportion of correct answers. The mean of each item's difficulty level is presented in Table 1.

Based on Table 1, the test items were found difficult for the students. The difficulty was reflected from the low mean in the proportion of correct answers attained from the 20 national examination test item packages. From the 20 national examination test item packages, the 5-test items that had been most difficult for the students were the item number 3, 13, 17, and 21. The mean in the proportion of correct answer for the difficult test items were not more than 37.5%. Based on the results, the researcher took a follow-up action by holding the FGD in order to analyse the problems that the students encountered. The difficult items were discussed in the FGD one by one so that the FGD participants would have the descriptions of what the teacher should have done in teaching the difficult indicators. The results of the FGD that described the students' difficulties, according to the teachers' perspective in the FGD, are explained as follows, item by item.

Table 1.

Mean of Difficulty Level

Items	Proportion Correct	Items	Proportion Correct	Items	Proportion Correct	Items	Proportion Correct
1	68.6	11	56.7	21	16.0	31	56.5
2	56.8	12	52.7	22	61.8	32	81.7
3	5.4	13	31.9	23	60.3	33	56.6
4	58.8	14	52	24	50.1	34	49.8
5	66.6	15	57.4	25	40.8	35	47.3
6	56.9	16	39.9	26	47.9	36	68.7
7	67.8	17	37	27	56.9	37	40.4
8	57.8	18	44.2	28	70.5	38	61.2
9	62.6	19	46.2	29	44.4	39	75
10	57.7	20	61.9	30	57.9	40	62.6

## Item 3

The results of  $4^{\frac{3}{2}}$  is ... .

- A.  $\frac{1}{3}$  B.  $\frac{1}{2}$  C. 2 D. 8

The percentage of the students who responded correctly to the Mathematics National Examination test items similar to Item 3 above was only around 5.00%. In order to respond Item 3 correctly, the test participants or the students should perform the manipulation first by changing  $4 = 2^2$  into  $2^{2(\frac{3}{2})} = 2^3 = 8$ .

In order to complete the stage  $2^{2(\frac{3}{2})} = 2^3$ , the students should understand first the characteristics of exponential number operation and it was this concept that had caused the students' difficulties in completing Item 3. According to the teachers, several matters might cause the students' difficulties in completing Item 3. The first matter was that the students had not been able to manipulate the exponential form of number 2 ( $4 = 2^2$ ). Then, the second matter was that the students had lacked mastery of the characteristics of exponential integer operation and, as a result, they were confused when they got into  $2^{2(\frac{3}{2})}$ . The third or the last matter was that the students had difficulties in performing the exponential integer operation with fraction and in this case such operation involved multiplication.

In order to overcome these difficulties, one of the strategies that the teachers might implement in the learning process was strengthening the students' understanding toward the main number and the exponents so that they would easily (intuitively) identify that  $4 = 2^2$ ,  $16 = 2^4$ ,  $81 = 3^4$ ,  $125 = 5^3$  and alike. The strengthening might be pursued by providing examples and exponential tables. Then, in order to overcome the

second and the third problem, the teachers should emphasize the characteristics of exponential integer operation in which the exponents were in fractions. Last but not the least, in order to improve the students' capacity in strengthening their understanding of the main numbers, the exponents and operation of fractional-exponent integer operation, the teachers should provide exercises that contained the three aspects.

## Item 13

It is found  $P = \{b, a, t, i, k\}$ . The number of subset P is ... .  
A.32 B. 25 C.10 D. 5

The percentage of the students who responded correctly to the above item was around 31.90%. In order to complete the test item, the students should understand what had been defined as the subset of a set. The subsets of  $P = \{b, a, t, i, k\}$  are  $\{\}, \{b\}, \{a\}, \{t\}, \{i\}, \{k\}, \{b,a\}, \{b,t\}, \{b,i\}, \{b,k\}, \{a,t\}, \{a,i\}, \{a,k\}, \{t,i\}, \{t,k\}, \{i,k\}, \{b,a,t\}, \{b,a,i\}, \{b,a,k\}, \{b,t,i\}, \{b,i,k\}, \{a,t,i\}, \{a,i,k\}, \{a,t,k\}, \{t,i,k\}, \{b,a,t,i\}, \{b,t,i,k\}, \{a,t,i,k\}, \{b,a,t,k\}, \{b,a,i,k\}, \{b,a,t,i,k\}$  so that the number of the members in the set P was 32. After the students found the pattern and the number of the set P, they could track the subset of P by using Formula  $2^n$ , in which  $n$  was the number of the set member. The number of the set P member was 5, so the number of the subset P was  $2^5 = 32$ . According to the teachers, the students' difficulties in completing the test item were the weak understanding of the concept of subset. Most of the students were confused to choose concept between the member of a set and the member of a subset; as a result, they were tricked and they choose option D as the answer in which they found the member of a set instead of a subset.

According to the teachers, the students' errors in responding to the test item might be minimized by strengthening their understanding of the number of a set member and the number of a subset member. The definition of each concept should be understood well along with their association. The relationship between the set member and the subset member resulted in the formula that the members of a subset should be equal to ... in which  $n$  was the number of subset members. The formula might be further stepping point for emphasizing the differences between the two concepts.

## Item 17

The line equation that will be parallel to the line that passes the coordinate point (2,5) and (-1,-4) is ... .  
A.  $y = -3x + 14$                       B.  $y = -(1/3)x + 6$   
C.  $y = (1/3)x + 4$                       D.  $y = 3x - 4$

The percentage of the students who responded correctly to the Mathematics National Examination test item similar to the test Item 17 above was around 37.00%. In order to complete the test item, the students should understand that two lines would be considered parallel if they had the same slopes. Therefore, the student should understand the procedures of locating the slope of a line if they knew two coordinate points that

would be passed. For example, if the two coordinate points were  $(x_a, y_a)$  and  $(x_b, y_b)$  then the slope ( $m_{ab}$ ) would be  $\frac{y_a - y_b}{x_a - x_b}$ . In the test item, the slope of the line that would pass (2, 5) and (-1, -4) were  $\frac{5+4}{2+1} = 3$ . The general straight line equation has been  $y = mx+c$  in which  $m$  is the slope and  $c$  is the constant; as a result, the general straight line equation with the gradient 3 would be  $y = 3x + c$ . Therefore, there would not be any line that might be parallel with  $y = 3x + c$ . The line variation would depend on the selection of  $c$  so that one of the lines that would be parallel to the line that would pass (2, 5) and (-1, -4) would be  $y = 3x - 4$ . According to the teachers, there are several reasons why the percentage of the students who responded correctly had been low. First, the students forgot the procedures of looking for the gradient. Second, they had not understood well the concept of two parallel lines and, thereby, it was very possible that there had been some of confusion between the concept of perpendicular line and that of parallel lines.

According to the teachers, in order to minimize the students' errors in completing the similar test items, the teachers should provide the students with more in-depth understanding toward the concept of straight line and slope. There have been multiple procedures that might be implemented in looking for the gradient value of a line, depending on the initial information found. In the Item 17, the initial information that have been found was the two coordinate points that would be passed by the line. However, in other cases it might be very possible if the initial information that had been found were the line equations in the form of  $y=ax$ ,  $y=ax+c$  or  $ax+by+c=0$ . In order to understand all of the equations, the students should be provided with multiple experiences in observing of various cases. Then, the next aspect that should be emphasized would be the understanding toward the concept of two parallel lines and two perpendicular lines. The students should understand the characteristics of both concepts so that they would definitely notice the differences. The emphasis on the differences between both concepts had been the response to the case in which the students often mismatched the application of both concepts.

#### Item 21

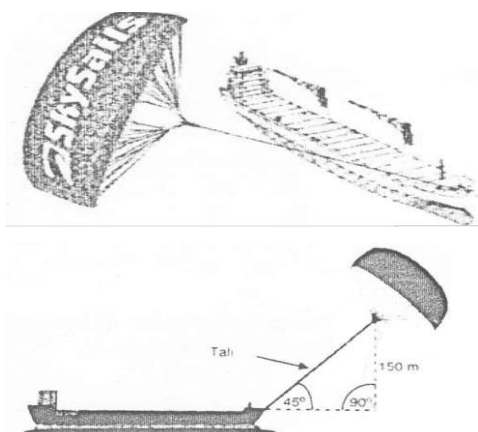
Pay attention to the sailboat!

About 95% of the world's trading commodities have been sent through the sea transportation that involves 50,000 tankers, shipping boats and giant freights. Most of these ships make use of the diesel oil.

The engineers have planned to build the supporting power by harnessing the wind for these ships. Their idea is to install the kite sail to these ships and to use the wind power in order to decrease the diesel oil consumption and the impact of the diesel oil toward the environment.

Based on the description, how long will the rope from the kite sail to the ship be in order that the kite sail draws the ship on the  $45^\circ$  angle and the 150 m height as shown in the picture?

- A. 175 m
- B. 212 m
- C. 285 m
- D. 300 m



The percentage of the students who responded correctly to the Mathematics National Examination test item similar to the test item number 21 above was around 16.00%. The students might complete the test items by understanding triangle characteristics in which the total amount of a triangle's degree should be equal to  $180^\circ$ . Thereby, the students might conclude the other angles that might be formed from the  $45^\circ$  angle and, in other words, the triangle should be the isosceles right triangle. Then, the second material that the students should understand was the application of Pythagoras theorem in determining the necessary minimum length of the rope. The length of the rope is  $(\sqrt{150^2 + 150^2})\text{m}$ , then the students would find that the length of the rope would be equal to 212.1320344 m. The teachers explained that such complexity had been the cause of the low percentage of the students who responded to the test item correctly. The test item was considered too long by the students and, as a result, they felt that such test items were difficult, tough and complicated. The situation led to the students' decreasing interest in completing the test item. The low interest also became the main factor that caused the students' low efforts. In other words, it was very possible that the students who had a low interest could not complete the test items well. The number that had been used was so big, that it caused the calculation difficulties. In addition, the students were also confused because the number was not part of integers (212.1320344). In general, within the completion process the students did not always focus on the calculation; instead, they focused on the commonality of the calculation results and the consideration with the appropriate alternatives and their own perception. Such calculation results would cause the students to doubt and to perform re-calculation or to be doubt and to give up. Last but not the least, the students were not accustomed to attaining information in the form of contextual figure. The impact would be that the

students had been confused in interpreting the information and the direction within the test items.

According to the teachers, in order to minimize the errors in completing the similar test items there should be some sort of strengthening the concept of triangle and the application of Pythagoras theorem. The students should master the triangle characteristics so that they might have access to the information related to triangles intuitively and immediately. In addition, the students should be provided with test items related to the application of Pythagoras theorem especially the calculation part. The students should also perform the calculation well although the calculation involved big numbers. Another strategy would be habituating the students to attain and to solve the contextual problems that had been stated in the form of narrative text or figure. Increasing the students' capacity in understanding the test items in the form of a narrative text or figure might not be done instantly; as a result, there should be periodical exercises in order to make the students get accustomed to the Pythagoras theorem calculation.

## DISCUSSIONS

There are many test items considered difficult by the students not only because of the factors of the students themselves but other factors that influenced the students' learning environment. According to Ali (2011), several aspects that influence the creation of enjoyable mathematics learning environment for the students' in-depth learning process are the teacher and the school. Other factors that might cause the national examination test items to be difficult are the contents of mathematics, the factors of teachers, the factors of school, and the factors of parents.

### The Factors of Mathematics

From the perspective on the factors of learning material, the concepts that were established in mathematics have been the basic concept of the other science. Mathematics had various concepts, symbols and formulas that might be implemented to solve all of the mathematical problems. According to Bradley, Notar, Herring et al. (2008), "Mathematics is a totally different language for children to learn. Symbols represent operations. Operations are performed in different ways for different formulas. Symbols can be interchangeable and require different operations in different situations." In order to deal with the abundant concepts and symbols within mathematics, the students might associate the concepts and symbols to the actual aspects around them by means of songs or other forms that might be easily remembered or understood by each student. The statement supported by Bradley, Notar, Herring et al. (2008) who state, "Building mathematical concepts by making connections of abstract symbols to concrete materials with the use of manipulative, music and drama are vital ways to engage tactile, auditory and kinesthetic activity in learning." However, the statement might be very different from one student to another based on their respective level of understanding.

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In addition to having various concepts and symbols, the mathematics National Examination test items considered difficult by the students have almost similar characteristics, namely demanding several steps of completion in order to attain the correct answer. The combination of several steps of completion demands so high understanding of basic mathematical concepts that the students will not be confused when they answer the national examination questions.

#### **The Factors of Students**

Not all students had difficulties when they were completing mathematics National Examination test items. However, based on the data that had been attained it was apparent that some students had difficulties when they were completing these items and the difficulties at least involved 5 test items, namely items 3, 13, 16, 17, and 21. The difficulties were reflected from the proportion of the students who responded to the test items correctly, less than 40.00%. According to Maarif (2016), one of the aspects that influenced the students' mathematical capacity was the low students' mathematical reasoning capacity. Based on the results of the FGD session, there were several aspects that became the causes of the students' difficulties in completing mathematics National Examination test items and these aspects were the students' lack of concept understanding, difficulties in calculating, difficulties in selecting information, tendency to be deceived by the distractors, and being unaccustomed to completing the complex test items, the non-integers test items and the contextual test items presented in the form of figures or narrative texts. In addition, another aspect that caused the students' difficulties was the students' inaccuracy in calculating.

#### **The Factors of Teachers**

Teachers play an important role in the teaching and learning process within a classroom. Teachers guide the students within the learning process. Based on the results of FGD session, the teacher knew several aspects that they should perform in order to overcome the students' difficulties in completing the mathematics national examination test items, namely the provision of understanding strengthening, the provision of problem models especially in the real context, the provision of various exercise items, the provision of many non-integer exercise items once in a while, the habituation of completing the contextual test items presented in the form of figures or narrative texts, the habituation of completing the mathematics test items through several steps instead and not through the fundamental concept toward the students and the habituation of completing the mathematics test items whose alternatives are in the form of narrative texts and not purely in the form of numbers.

The teachers' abundant tasks in overcoming the students' difficulties as they were completing the mathematics National Examination test items make the level of teachers' understanding of mathematics learning materials that they should teach with regards to the pedagogic competencies become a very important aspect that should be mastered and that should be improved continually. This is in line with the ever increasing period, method and learning technique that the teachers might harness in the classroom for the

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sake of creating the effective teaching process. According to Joseph & McLaren (Ali, 2011), the teachers might implement multiple techniques and activities in the learning process such as discussion, storytelling, singing, role-playing, visual illustration pattern-recognizing, real world role modelling, analogy and explanation in order to establish the prerequisite knowledge and to establish the relationship between what the students have understood regarding the concept and what the students should understand. The statement is supported by an opinion from Ali (2011), "Teachers need to make instructional selections from among an array of choices comprising teaching methods and models, teaching acts and instructional strategies." Although not all of the techniques and the learning methods might be applied toward all of the students and toward all of the learning materials, the teachers are expected to be able to select and to implement appropriate learning techniques or methods by considering their respective strengths and weaknesses.

Providing students with strong and fundamental experiences toward the students had not been an easy task. Therefore, Ali (2011) states that in the period of internalizing the concepts into the students, the teachers should provide the students with the exercise items through the actual matters and activities around them. In addition to improving the students' understanding, associating the learning materials to the real life might also increase the students' motivations. The students' unstable motivation also provides a peculiar challenge for the teachers. The decreasing students' motivation would lead to the decreasing students' efforts in completing mathematics test items. Still according to Ali (2012), the teachers should use the motivational techniques in order to increase the students' interest, self-confidence and competence. Similarly, Sorence (2006) states, "To motivate students effectively teachers need to stay positive and creative in their methods of teachings."

The decreasing students' motivation in learning mathematics might be caused by several factors. Middleton & Spanias (1999) state that the students who are rewarded when they were able to complete the mathematics test items would like mathematics more than the students who have not received any rewards. In addition, the students' mathematical anxiety becomes another factor in the decrease of students' motivation. The students' anxiety toward mathematics might be caused by the teaching process in the classroom. According to Oberlin (Furner & Gonzales-DeHaas, 2011), several learning techniques that might cause mathematical anxiety among the students are: giving the same assignments for each student, giving the assignments or the mathematical problems over and over, giving the written assignment every day, only accepting one step in completing a mathematics test item, and giving mathematics test items as the penalty upon misbehaviours. One of the suggestions that the teachers might perform in order to decrease the mathematical anxiety among the students is providing alternative assessment, such as portfolio, so that the students might express their mathematical understanding of multiple manners (Furner & Gonzales-DeHaas, 2011). The statement has been included in the Curriculum 2013 and has been one of the curriculum's strengths in comparison to previous curriculums.

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In addition to teaching, the strong fundamental understanding toward the students and to increasing the students' motivation in completing mathematical test items or problems, the teachers should also teach the possible combination of mathematical concepts in the learning materials. The possible combination of mathematical concepts might include the combination of two different geometries or more, the combination of fraction and exponential number and the other combinations that might possibly appear in national examination test items.

#### **The Factors of School**

Schools should provide other facilities that might support the students' successful learning process especially in mathematics. According to Mundia (2010), "Schools need to have adequate counselling and psychotherapy resources to help students with personal and academic problems such as high support needs in mathematics." Other facilities that Mundia propose are the guidance and counselling services that might support the students psychologically in order to support or to provide the solutions to their academic problems. In addition, Ali (2011) propose that the school should provide long-term planning, structured preparation and a well-designed strategy in order to overcome the problems such as the teachers' incapability to give in-depth mathematics learning processes to the students. Furthermore, the schools should also provide the freedom for the teachers in designing the syllabus and the test or examination.

**Commented [SM7]:** theoretical and empirical support need to be added about the influence of school factors toward math difficulties

#### **The Factors of Parents**

The factors that also cause to the difficulties of mathematics National Examination test items are students' parents. Although parents do not directly contribute to the learning process in schools, they are quite influential in monitoring the students' academic development and especially the students' condition in mathematics learning processes. In addition, according to Vukovic, Robert & Wright (2013), "Parents influence children's mathematics achievement by reducing mathematics anxiety, particularly for more difficult kinds of mathematics." Similarly, Sorensen (2006) states that the students' perception of mathematics is determined by the parents' perception of the subject. Therefore, parents have an important role in encouraging the students when they are at home. However, parents' influence in manifesting the students' success in the Mathematics should also be given attention. Vukovic, Robert & Wright (2013:446) states, "Parent should receive training, resources and support on culturally appropriate ways to create home learning environments that foster high expectations for children's success in mathematics." The training that might be given to parents might come from multiple sources such as textbooks or various media.

**Commented [SM8]:** Theoretical and empirical support need to be added about the influence factor of parents toward math difficulties. The author just wrote an opinion from Vukovic to support its discussion

**Commented [SM9]:** Vukovic et al, (2013)

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#### **CONCLUSIONS**

From the 20 National Examination test packages, the items that the students consider to be difficult are items 3, 13, 17, and 21. The students' difficulties in completing these items are the lack of concept understanding, difficulties in calculating, difficulties in selecting information, being deceived by the distractors, being unaccustomed to

completing complex and non-integers test items and completing the contextual test items that have been presented in the form of figures or narrative texts. In addition, another cause of students' difficulties is the students' inaccuracy calculating.

Some suggestions that the teachers might give for overcoming the students' difficulties in completing items include the need for strengthening the students' understanding, providing the students with the problem models especially the ones related to the real context, providing them with the various exercises with big number and non-integers, habituating them to complete contextual test items presented in the form of figures and narrative texts, habituating them to complete test items through several steps of completion instead of operating the steps directly through basic concepts and habituating them to complete test items whose alternatives are in narrative texts (not only involving numbers).

Other factors that contribute to overcoming the students' difficulties in completing the mathematics National Examination test items or in paying attention to the mathematics learning processes in general are the factors in mathematics themselves. Mathematics has multiple concepts that the students should understand so that they can associate these concepts to the real matters around them through songs or other media that they can easily remember or understand. In addition, schools should prepare a long-term planning, structured preparation and the well-designed strategy in order to overcome the problems such as the teachers' incapability to perform the in-depth mathematics teaching process. Furthermore, schools should also provide teacher with freedom in designing the syllabus and in preparing tests or examinations. Last but not least, parents are the main factors in monitoring the students' academic development that affect their condition in the mathematics learning processes.

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