International Journal of Instruction

International Journal of Instruction *July 2017 ● Vol.10, No.3*
e-ISSN: 1308-1470 ● www.e-iji.net *p-ISSN: 1694-609X*
pp. i-iv

Dear Readers,

We have seen increasing development of a number of emerging instructional strategies over the last few years that have captured the imagination of researchers, lecturers and teachers at national and international levels. Authors and editors are acquainted with many of these, but many have also been rephrased and redefined to capture their roles and functions in specific contexts. They range from blended learning, hybrid learning, group work, cooperative learning, teamwork, peer learning, flipped learning to virtual realities, digital learning, MOOCS, project and problem-based learning, automized learning, e-learning, and e-laboratories - and there are many more. In many cases, the contexts in which teaching and learning is taking place focus on classical and historical problem areas such as mathematics education, science education, as well as the teaching of English to second language learners. Many reports focus our attention on the social and environmental inequalities of our time, poorly and under-resourced learning environments, overcrowded classrooms, and poorly qualified educators. The support provided to teachers and learners to perform their tasks and functions has also seen significant changes in the past decade. Scholars have been doing a lot of research to better understand quality and quality assurance, thinking and teaching styles, and student support and performance.

The International Journal of Instruction (IJI) has reported comprehensively on many of these themes and topics over the years, and has shown its commitment to voicing the opinions of scholars as a benchmark of international quality and significance.

This issue deals with a number of contemporary teaching strategies ranging from group work, cooperative learning, scientific inquiry, concept mapping, communication, English essay writing, mathematics education to measuring student performance in mathematics, and reflective teaching. The researchers also address inclusive education, student satisfaction, performance enhancement, quality education, teacher qualifications, phenomenological analyses, disruptive behaviour, and bullying. One article concludes by pointing to past and contemporary trends in the reporting of educational research.

Cooperative learning as an instructional strategy and a form of classroom intervention still remains a popular research focus for many practitioners. Zedda, Bernardelli and Maron illustrate how groupwork (as a cooperative learning technique) influences student leaning positively, and explain how students' active participation during group work can be beneficial to both cognitive and social skills in terms of overall student satisfaction and performance enhancement. On the same topic, Inuwa, Abdullah and Hassan reiterate that cooperative learning could enhance the achievement of secondary school students. In a third article on cooperative learning, Seyoum and Basha explain how cooperative learning as an active andragogical strategy should be regarded as one of the most highly used and rated active learning method, as related to their specific study.

The work done by Kozikoğlu raises the importance of major work currently being done on teacher identities and the development of teacher identities in communities of practice globally. He acknowledged that teaching pedagogical skills, humaneness (joviality), and personal and professional values should be regarded as dominant categories of prospective teachers' cognitive constructs. He argues that these cognitive constructs play important roles in developing conceptual models of ideal teaching. The use of a qualitative phenomenological strategy on 'repertory grids' was also important in this study as it allowed the research to explore phenomena in their natural settings. This is a classical technique that was used in a form of data collection and research methodology that was first known as Rapid Rural Appraisal (RRA), which later became established as Participatory Reflection and Action (PRA).

The Anatolievnas, Murirovna, Kasimovna and Mirzayanovna report on the communication ability development of university students, and bring to our attention how a narrative approach can allow the pedagogical management of communication ability development as the process of creating conditions for successful social psychological adaptation and effective interaction with other people. They reiterate the importance of perceiving people, assessing them adequately, showing empathy and understanding, and keeping a steady state of the individual self.

Ertikanto, Herpratiwi, Yurarti and Saputra dealt with a classical phenomenon that has been dominating scientific teaching and learning for a few decades now. Whether it is called discovery learning, investigation or experimentation, or inquiry-based teaching and learning, it has been the focus of science educators for many years. The researchers explain how a teacher-training program, called the Model-Supported Scientific Inquiry Training Program (MSSITP), has been successfully developed to improve the inquiry skills of Indonesian elementary teachers. The programme impacted significantly on the inquiry skills of respondents.

To find an innovative approach to the teaching of history, Nair and Narayanasamy sought the value of concept maps in the teaching of history and claim that they found that the utilisation of the concept map method was significant in improving students' achievement and interest in history. One has to agree that the findings of this study support the theory of meaningful learning and the utilisation of concept maps. The authors also claim that the findings have strong pedagogical implications for innovative history teaching.

Gholami and Alinasab introduced a strategy of source-based writing tasks in their research approach, and explored how this approach could impact the writing practice of English First Language learners. They also followed and investigated the probable differences between those tasks and independent writing tasks in improving Iranian EFL learners' essay writing abilities. They found that participants with hybrid writing practices outperformed their counterparts in integrated essay tests.

The content and construct validation of the measuring instruments used in systemic evaluations such as TIMSS and PIRLS have been drawing the attention of edumetrists the past decade and more. It is against this background that seven colleagues from

Sultan Oaboos University and the Ministry of Education in Oman researched the development and validation of a scale for measuring mathematics education at primary school level. The three subscales that emerged from the investigation, showed strong internal consistency and sufficient evidence of construct validity and concurrent validity. They illustrated how these scales have potential uses for both educational and research purposes. Closely linked to this article is a report by Retnawi, who focused on the assessment of mathematics in the national examination where the competences mastered have to be identified by the examination. Students were found to lack basic and more complex functions necessary to master mathematics adequately.

The work of Khoshaim alerted us once again to the issue of high school readiness for tertiary education, and explored the challenges that students have to face when moving to higher education institutions.

Inclusive education is a major challenge that teachers have to face in regular classrooms. It follows the major global trend that special needs education is no longer regarded as an isolated practice, but as an inclusive requirement to fully integrate learners with impairments into everyday school settings. However, very few teachers are educated to cope with inclusivity. The findings of Padmadewi and Aritini once again focus on such challenges. They found that schools and teachers who participated in the study had very limited preparedness either in teaching skills or material development to meet the actual needs of inclusive students in general. Their study then aimed to investigate appropriate strategies for teaching English to a student with Autistic Spectrum Disorder (ASD) that had been included in a regular classroom. In their findings, it is especially of note how the Individual Education Plan (IEP), supported by visual media through co-teaching, differentiated instruction and also through a "buddy program", helped the student learn English as a foreign language. They thought that the strategies used were effective enough to be implemented in an inclusive classroom programme.

In another study, Purwati and Japar embraced the association between the education of parents and their children's disruptive behaviour. Interesting results emerged from the study showing some effects of parents' education and personality on children's disruptive behaviour, as well as some association between parents' aggressive personality and children's disruptive behaviour. Similarly, the article by Adegboyega, Okesina and Jacob examine the association between family relationships and bullying behaviour among secondary school students with disabilities. The most important finding of this study is that there is, in fact, such a relationship.

Eğmir, Erdem and Koçyiğit's findings are alarming, yet understood to some extent, as they claim that quantitative research designs appear to be the methodology of choice for researchers who reported their findings in the IJI. The value of such post-positivist applications to educational research and data analysis is appreciated, especially by colleagues performing secondary analyses on TIMSS and PIRLS data; yet a little concerning as researchers have relied more on descriptive analyses and not on more sophisticated inferential applications. Furthermore, there is ample evidence to believe that future trends in instruction and learning could rely heavily on qualitative interventions that are supposed to contribute to the professional development and

emancipation of staff and students. This might be one of the reasons why so much attention is currently being drawn to research-based teaching strategies such as traditional Participatory Action Research (PAR), and Participatory Reflection and Action (PRA). Both approaches rely heavily on reflection. This is further confirmed by the article by Ghanizadeh and Jahedizadeh, who emphasise the importance of reflection on the development of professional disciplinary practices. PAR and PRA depend on collaborative participation, allowing group work and cooperative learning to ground the interventions that have become the hallmark of these strategies. On the other hand, Sulaiman, Sulaiman and Abdul Rahim demonstrated the use of multiple data collection strategies very effectively as they attempted to discuss teachers' perceptions on the standard-based English language curriculum in Malaysian primary schools.

We also rely on qualitative research methodologists who, with their narrative, interpretative and discourse analytical skills - and 'way-with-words'-, to entertain us with innovative and creative instructional ideas. Theory-building remains however our major endeavour and most values professorial enterprise.

Sincerely,

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Abstracting / Indexing

Hits: 30018

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International Journal of Instruction
e-ISSN: 1308-1470 ● www.e-iji.net

July 2017 ● Vol.10, No.3
p-ISSN: 1694-609X
pp. 257-276

Received: 16/01/2017
Revision: 17/05/2017
Accepted: 22/05/2017

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

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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.

Keywords: difficult items, influencing factors, teachers' strategy, examination, mathematics

INTRODUCTION

In education, assessment is an important matter in order to identify an educational success. The results of the 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

Citation: Retnawati, H., Kartowagiran, B., Arlinwibowo, J. & Sulistyaningsih, E. (2017). Why are the Mathematics National Examination Items Difficult and What Is Teachers' Strategy to Overcome It? *International Journal of Instruction*, 10(3), 257-276. https://doi.org/10.12973/iji.2017.10317a

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 the 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 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 was 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 of 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 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 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 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 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.

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.

METHOD

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.

Data

The data in the study were the Mathematics National Examination test item sets and their responses. The test item sets 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 were 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.

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 focus group discussion (FGD). The FGD involved 15 mathematics teachers of junior high schools 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 the 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 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 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.

FINDINGS

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, the most difficult four test items for the students were the item s of 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*
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, firstly a testee needed to 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 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 were not 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 of 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

It is set 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, 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.

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.

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 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 pas (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 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 confusion 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.

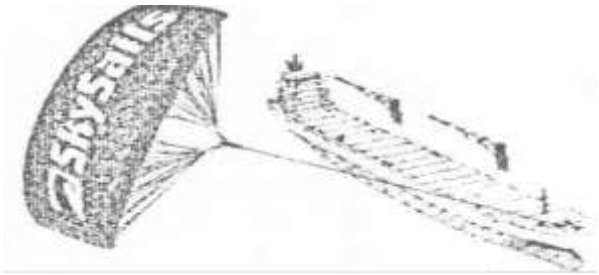
Item 21

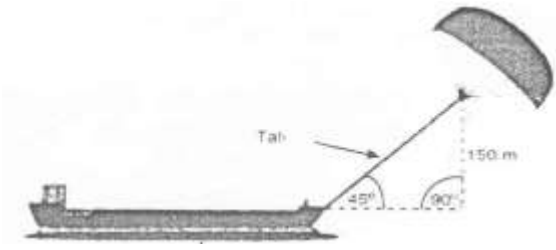
Pay attention to the sailboat!

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^{O} 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%. 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^{O}. Thereby, the students might conclude the other angles that might be formed from the 45^{O} 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 $(\sqrt{150^2 + 150^2})$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. 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.

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.

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,	Factors of the mathematics nature: The lack of fundamental understanding of mathematics, mathematical properties that are complex.	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).
Being unaccustomed to completing complex and non-integers test items	Factors of students: Lack of motivation to complete the mathematics test items	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	Conducting mathematics teaching and learning effectively: preparing a long-term planning, structured preparation, and well-designed strategy to improve quality of learning.
	Factors of school: The lack of support from school	Optimizing the school and parents' support
	Factors of parents: Not all parents remind students to practice and learn math	

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.

From the perspective of the factor of a learning content, the concepts established in mathematics are the basic concepts 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. This causes students' difficulties to

appear, including making a mathematical model from narrative items. This is confirmed by teachers' statements as follows.

> *"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.

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.

> *"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, students were confused to determine what information was used to answer the questions in narrative items."(T11)*

The third factor 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.

> *"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)*

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.

> *"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)*

> *"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 mathematic 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.

> *"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 overcomed 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.

> *"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 student and teacher 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.

> *"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)*

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.

> "*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 with other teachers together. 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 that 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.

> *"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)*
>
> *"… 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)*

DISCUSSION

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 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 mathematic 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 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.

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).

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 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, another 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).

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 that 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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Turkish Abstract
Ulusal Matematik Sınav Soruları Neden Zor ve Öğretmenlerin BununÜstesinden Gelmek İçin Stratejileri Neler?

Ulusal sınav sorularının kalitesi, öğrencilerin yetkinliklerinin ve zorlandıkları konuların belirlenmesinde büyük rol oynamaktadır. Bu çalışma, Ulusal Ortaokul Matematik Sınavının zor öğelerini belirlemeyi, öğrencilerin zorlanmalarına neden olan faktörleri bulmayı ve öğretmenlerin ve öğrencilerin uygulayabilecekleri stratejileri ortaya çıkarmayı amaçlamaktadır. Çalışma karma yöntemle yapılmış fenomenolojik bir araştırmadır. Veriler, öğrenci yanıtlarının dokümantasyonu ve öğretmenlerin odak grup görüşmesi (FGD) kullanılarak toplanmıştır. Verilerin analizi, Milles & Hubberman adımları kullanılarak gerçekleştirilmiştir. Çalışmanın sonuçları sınavın 40 test öğesinden 4'ünün öğrenciler için zor olduğunu göstermiştir.

Anahtar Kelimeler: zor öğeler, etkileyen faktörler, öğretmenlerin stratejileri, sınav, matematik

French Abstract
Pourquoi sont les Mathématiques Articles d'Examen nationaux Difficiles et Comment la Stratégie de Professeurs doit Le surmonter?

La qualité d'articles d'examen nationaux joue un énorme rôle dans l'identification de la maîtrise de compétences des étudiants et leurs difficultés. Cette étude a pour but d'identifier les articles difficiles dans les Mathématiques de Collège l'Examen national, trouver les facteurs qui causent la difficulté des étudiants et révéler les stratégies que les professeurs et les étudiants pourraient mettre en œuvre pour les surmonter. L'étude est la recherche phénoménologique avec les méthodes mixtes(mélangées). Les données ont été rassemblées utilisant la documentation des réponses des étudiants et la discussion de groupe de discussion (FGD) de professeurs. L'analyse de données a été conduite utilisant des Pas(Étapes) de Hubberman et des Moulins(Usines). Les résultats de l'étude ont montré qu'il y avait 4 articles difficiles des 40 articles de test pour les étudiants.

Mots Clés: articles difficiles, influençant facteurs, la stratégie de professeurs, examen, mathématiques

Arabic Abstract

لماذا تكون بنود امتحان الرياضيات الوطنية صعبة وما هي استراتيجية المعلمين للتغلب عليها؟

تلعب جودة مواد الفحص الوطنية دورا هائال في تحديد إتقان الكفاءات لدى الطلبة وصعوباتهم. تهدف هذه الدراسة إلى التعرف على العناصر الصعبة في الامتحان الوطني للرياضيات في المدارس الثانوية، لإيجاد العوامل التي تسبب صعوبة الطلاب والكشف عن الاستراتيجيات التي يمكن للمعلمين والطلاب تنفيذها من أجل التغلب عليها. الدراسة هي البحث الظواهر مع الطرق المختلطة. تم جمع البيانات باستخدام وثائق إجابات الطلاب ومناقشة مجموعة التركيز (FGD) للمعلمين. تم تحليل البيانات باستخدام خطوات ميلز و هوبرمان. وأظهرت نتائج الدراسة وجود 4 عناصر صعبة من أصل 40 مادة اختبار للطلاب.

الكلمات الرئيسية: العناصر الصعبة، العوامل المؤثرة، استراتيجية المعلمين، والفحص، والرياضيات

German Abstract
Warum sind die Mathematik-Nationalen Prüfungsgegenstände schwierig und was ist die Strategie der Lehrer zu überwinden?

Die Qualität der nationalen Prüfungsgegenstände spielt eine enorme Rolle bei der Ermittlung der Kompetenzen der Studierenden und ihrer Schwierigkeiten. Diese Studie zielt darauf ab, die schwierigen Punkte in der Junior High School Mathematics National Examination zu identifizieren, um die Faktoren zu finden, die die Schwierigkeiten der Schüler verursachen und die Strategien offenbaren, die die Lehrer und die Schüler umsetzen könnten, um sie zu überwinden. Die Studie ist phänomenologische Forschung mit den gemischten Methoden. Die Daten wurden unter Verwendung der Dokumentation der Schülerreaktionen und der Fokusgruppen-Diskussion (FGD) der Lehrer gesammelt. Die Datenanalyse wurde mit Milles & Hubberman-Schritten durchgeführt. Die Ergebnisse der Studie zeigten, dass es 4 schwierige Gegenstände der 40 Testartikel für die Schüler gab.

Schlüsselwörter: schwierige gegenstände, einflussfaktoren, lehrerstrategie, untersuchung, mathematik

Malaysian Abstract
Mengapa Item Peperiksaan Negara Matematik Sukar dan Apakah Strategi Guru Mengatasinya?

Kualiti item peperiksaan national memainkan peranan yang besar dalam mengenal pasti kecekapan pelajar dalam penguasaan dan kesukaran mereka. Kajian ini bertujuan untuk mengenal pasti perkara-perkara yang sukar dalam Ujian Nasional Junior High School Mathematics, untuk mencari faktor-faktor yang menyebabkan kesukaran pelajar dan mendedahkan strategi guru-guru dan pelajar-pelajar yang mungkin boleh dilaksanakan untuk mengatasinya. Kajian ini adalah kajian fenomenologi dengan kaedah campuran. Data yang telah dikumpulkan menggunakan dokumentasi jawapan pelajar dan perbincangan kumpulan fokus (FGD) guru. Analisis data dijalankan dengan menggunakan langkah Milles & Hubberman. Keputusan kajian menunjukkan bahawa terdapat 4 item sukar daripada 40 item ujian untuk pelajar.

Kata Kunci: item sukar, faktor yang mempengaruhi, strategi guru, peperiksaan, matematik

Russian Abstract
Почему Сложно Изучать Предметы Экзаменов по Математике и Что Стратегия Учителей Преодолевает?

Качество национальных экзаменационных предметов играет огромную роль в выявлении мастерства студентов и их трудностей. Это исследование направлено на выявление трудных вопросов в Национальном Экзамене По Математике для Младших Классов Средней Школы, найти факторы, которые вызывают трудности у учащихся, и выявить стратегии, которые могут реализовать учителя и студенты, чтобы преодолеть их. Исследование является феноменологическим исследованием со смешанными методами. Данные были собраны с использованием документации ответов студентов и фокус-групповой дискуссии учителей. Анализ данных проводился с использованием шагов Майлза и Губермана. Результаты исследования показали, что для студентов было 4 трудных предмета из 40 тестовых предметов.

Ключевые Слова: сложные предметы, влияющие факторы, стратегия учителей, экзамен, математика