MATHEMATICS MAKE STUDENTS CONFUSED AND ANXIOUS: A COMPARISONS BETWEEN AUSTRALIA, INDONESIA, AND SINGAPORE IN THE 2015 TIMSS

Safari
Center for Assessment and Learning, Ministry of Education and Culture
Jl. Gunung Sahari Raya no. 4, Jakarta, Indonesia.
E-mail: safari_puspendik@yahoo.com

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Abstract. The main purpose of this study is to find out the perceptions about Mathematics that confuse and anxious 2015 TIMSS participants in Australia, Indonesia, and Singapore. The data in this study is the 2015 TIMSS data that has been released to the public and has available for development purpose research. The research method used is quantitative method. The population of this study is students' perceptions of Mathematics subject that confuse and worry students aged 15 years in three countries who are studying in 2015, while the sample is 15-year-old students' perceptions in these countries. The data in this study were in the form of questionnaires which were answered by 16599 students from these three countries. Based on the results of the analysis of variance, there is a significant difference (P <0,000) on students' perceptions about mathematics subject that confuse and worry students in these three countries (Sig. 0,000). The reliability of students' abilities is the same, Australia = 0.74, Indonesia = 0.75; and Singapore = 0.75. The conclusion is most students in these three countries stated "disagree a lot" about mathematics make students confuse and worry.

Keywords: mathematics, confused, anxious, TIMSS.

INTRODUCTION

Indonesia participated in the international study of Trends in International Mathematics and Science Study (TIMSS) to see the achievements of mathematics learning outcomes at the junior high school level, the results up to the period of 2015 are always below the average international score, Table 1 (Mullis, et al. 2012). Mathematical problems in the TIMSS studies measure the level of students' abilities from knowing facts, procedures or concepts, to using them to solve simple problems to problems that require high reasoning (Wardhani & Rumiati, 2011).

Table 1. TIMSS Indonesia Results

| Year | Rank | Participants | Indonesian Scores Average | International Scores Average |
|------|------|--------------|----------------------------|------------------------------|
| 2003 | 35   | 46 Countries | 411                        | 467                          |
| 2007 | 36   | 49 Countries | 397                        | 500                          |
| 2011 | 38   | 42 Countries | 368                        | 500                          |
| 2015 | 44   | 49 Countries | 397                        | 500                          |

This condition of Indonesian students happens due to experience working on the TIMSS problem model that demands high reasoning. Based on Table 1, Indonesia already has 3 to 4 experiences following TIMSS but the results are still below the International average.
These results worse students perception that Mathematics is considered as a difficult subject. The students believe that mathematics makes students confused and anxious because it always relates to numbers, formulas, and calculations. The impact is the students refuse to learn it, unless required as the demands of learning. Such initial thinking will obviously affect the mastery of mathematics in individual students because previously there was a fear of not being able to understand mathematics. They were not interested in mathematics even before try it. Moreover, this condition is shown by seniors students who say that mathematics is difficult because it makes students confused and anxious. This affect the perception of other students. They assume that seniors have more experience in learning mathematics. As a result, there is a fear of inability to understand the material because there are unfavourable opinions from seniors who had studied these materials. These opinions last for generations to believe that mathematics is indeed a difficult subject.

Like desease, (students' perceptions about mathematics are difficult because it makes students confused and anxious), can such diseases be cured so they are not contagious? What is the perception of students in neighboring country of Indonesia, such as in Australia and Singapore? Do they also have the same perception as students in Indonesia. In 2015 (Mullis et al. 2015), the TIMSS scores of Australia and Singapore are above the international average (Mean 500). Australia is ranked 28 (Mean 517), while Singapore is ranked first (Mean 618). Therefore, this study will compare the percentage of students' perception of Mathematics to confuse and worry students in: Australia, Indonesia and Singapore. Based on 2015 TIMSS data in the form of a questionnaire (most agree, bit agree, less agree, most disagree) with questions: (1) math makes me confused and (2) math makes me nervous will be analyzed student perceptions in the three countries.

According to Mohamed and Tarmizi (2010) the issue "students' perceptions of mathematics are difficult because they make students confused and anxious" is a problem in developing countries, even a global problem. Until now there are still students who express negative feelings towards Mathematics (Jenkins, 2006). They do not realize that mathematics actually supports science, technology, economics and economic development for careers and the future, but Mathematics is always seen as a difficult subject (Mason, Stacey, and Burton, 2010).

Many factors affect students' perceptions about Mathematics that as a difficult subject because they make students confused and anxious, namely on aspects: social, cognitive, cultural, and emotional factors (Brown, et al., 2020). Confused and anxious mean "tense and unpleasant feelings that block the ability to deal with numbers or mathematics in various situations" (O'Leary, Fitzpatrick, & Hallett, 2017, p.1) and relate to: knowledge, skills, and attitude / character (García Santillán, Martinez-Rodriguez, & Santana, 2018). Finally, student learning is incomplete or in accordance with the target competency, so that feelings of worry and fear of failure appear (Mehdinezhad & Bamari, 2015). This condition has an impact on the effectivity and efficiency of mathematics learning in the classroom (Jácquez, 2018; JusticiaGaliano et al., 2016). For example the quality of mathematics learning in Bantaeng Regency, South Sulawesi is in the lowest category based on research findings from the South Sulawesi Education Quality Assurance Institute in 2011. It affects students not to be involved in the mathematics learning process (Tompong and Jailani, 2019).

Anxiety about Mathematics can also affect many things, namely: student performance in class, grade promotion, graduation exam, and even their decision about the career path to be followed (Maloney, Schaeffer, & Beilock, 2013). In addition, research by Calvo et al. (2017) have shown that students tend to be more anxious about mathematics, develop less self-confidence, have poor belief in their ability to cope with tasks, and feel less skilled (Calvo, Cascante, Valdés-Ayala, & Quesada, 2017). Students who have high levels of confusion and anxiety will have lower levels of mathematics achievement.
According to Stuart (2000), "lack of confidence when working in mathematical situations is a major cause of mathematics anxiety. Students who experience higher levels of anxiety will exhibit negative attitudes towards Mathematics (Tella, 2007). Although the type of student error in answering a math test is a misstatement to be a dominant error rather than a misunderstanding, calculation errors, and procedural errors. The dominant factor that causes students to make mistakes in answering mathematical tests is that most students do not understand how to solve the problem of inequality, determine the equation of quadratic factors, determine members of the set completion, problems about graphics, and problems that require the ability to interpret language into mathematical models (Shantika and Istiyono, 2019). However, according to Singh, Granville, and Dika (2002), motivation plays an important role to overcome mathematics anxiety. In learning mathematics, making students actively involved in learning is important in learning (Fahmi, 2020). This is proven even though there is a change in policy in Indonesia that the national exam (UN) does not determine student graduation, but this policy does not affect: (1) teacher motivation, (2) student motivation, (3) parent support, (4) school preparation, and (5) students' anxiety about UN 2019 (Safari, 2019). The fundamental implication of this finding is that there is a need for learning innovations to improve mathematics learning outcomes towards the 21st century (kusaeri and Ridho, 2019).

From the various descriptions above, the problem in this study is whether there are differences in students' perceptions of Mathematics that are confusing and anxious for students in Australia, Indonesia, and Singapore, who participate in 2015 TIMSS.

**RESEARCH METHOD**

The research method is quantitative method. The basis for using this method is adapted to the main purpose of this study, among others, is to obtain facts from the symptoms that exist and look for facts factually based on this research data. The data in this study use the 2015 TIMSS data that has been released to the public and has been permitted to be used for research development purposes. The study population was students' perceptions of Mathematics which confused and worried 15-year-old students in three countries (Australia, Indonesia, Singapore) who were studying in 2015, while the sample was students' perceptions of Mathematics which confused and worried. 15-year-old students in these three countries. The sample is students who are taking the TIMSS 2015 in these three countries. The data in this study were questionnaires in the form of questions (most agree, bit agree, less agree, most disagree) which were answered 16599 students from 3 countries. The topics asked in the questionnaire related to: (1) math makes me confused and (2) math makes me nervous. The complete data as in Table 1 below.

| Country     | Frequency | Percent | Valid Percent | Cumulative Percent |
|-------------|-----------|---------|---------------|--------------------|
| Australia   | 6057      | 36,5    | 36,5          | 36,5               |
| Indonesia   | 4025      | 24,2    | 24,2          | 60,7               |
| Singapore   | 6517      | 39,3    | 39,3          | 100,0              |
| Total       | 16599     | 100,0   | 100,0         |                    |

The analytical method used in this study is the analysis of variance. This analysis is used to calculate differences in the level of students' perception of mathematics making students confused and anxious. So that the results of the analysis of this study can be obtained accurately, then all data in this study are processed or analyzed using the SPSS 22.00 program. To find out the relationship between variables in the three countries and the ability of their students, the data were analyzed using the Mplus and Rasch Model (Winsteps).
RESEARCH RESULT

Based on the percentage of students who have filled out the questionnaire, 16,599 students from 3 countries is as follows.

| Country   | Total | AUSTRALIA | INDONESIA | SINGAPURA |
|-----------|-------|-----------|-----------|-----------|
| Agree a lot | Count | 1034 | 747 | 1302 | 3083 |
|           | % of Total | 6.3% | 4.5% | 7.9% | 18.6% |
| Agree a little | Count | 1429 | 1039 | 1737 | 4205 |
|            | % of Total | 8.6% | 6.3% | 10.5% | 25.4% |
| Disagree a little | Count | 1317 | 594 | 1426 | 3337 |
|            | % of Total | 8.0% | 3.6% | 8.6% | 20.2% |
| Disagree a lot | Count | 2127 | 1508 | 2032 | 5667 |
|            | % of Total | 12.9% | 9.1% | 12.3% | 34.3% |
| Omitted or invalid | Count | 102 | 134 | 16 | 252 |
|            | % of Total | 0.6% | 0.8% | 0.1% | 1.5% |
|            | Count | 6009 | 4022 | 6513 | 16544 |
|            | % of Total | 36.3% | 24.3% | 39.4% | 100.0% |

Tables 2 and 3 inform that students' perceptions of mathematics leave students confused and anxious that most students in three countries state Australia's "most disagree" 12.9% and 15.1%; Indonesia 9.1% and 10.1%; and Singapore 12.3% and 11.5%.

Table 4 informs that based on the results of the analysis of variance shows that there are differences in the perceptions of students in Math make students confused and nervous (P < 0.05). Highest to lowest perception order (Figure 1) is: Indonesia is almost the same as Australia, then Singapore.
DISCUSSION

The conclusion of this study is the difference in the level of students' perception of mathematics makes students confused and nervous is proven (P < 0.05). Most students in three countries (Australia, Indonesia, Singapore) stated "most disagree" about Mathematics making students confused and nervous.

Figure 2 below is the 2015 TIMSS data from three countries analyzed with the Mionion 8.2 program with the following as follows.

Based on Figure 2, students' perceptions about mathematics make students' confuse and nervous ranging from the most of the smallest are students from the country (1) Indonesia, lodging factor 0.037; (2) Australia, lodging a factor of 1.00; (3) Singapore, lodging a factor of 1.465. Students from all three countries have the same perception that is mathematics making students' confuse, loading factor is 1.00. The different thing is nervous perception, starting from the most up to the smallest are students from countries: (1) Indonesia, the loading factor is -0.313; (2) Singapore, the loading factor is -1.451; (3) Australia, loading factor 2.345. To determine the reliability of the person, this data was analyzed with the Rusch Model, the results of which are as in Table 5 below.
Table 5. Results of Rusch Model Analysis

| PERSON | AUSTRALIA | INDONESIA | SINGAPURA |
|--------|-----------|-----------|-----------|
| N      | 6008      | 4021      | 6512      |
| Mean   | 5.9       | 6.0       | 5.3       |
| SD     | 2.3       | 2.9       | 2.1       |
| RSME   | 1.22      | 1.26      | 1.43      |
| SEPARATION | 1.71 | 1.75 | 1.72 |
| Reliability | .74 | .75 | .75 |

The reliability of students' abilities in the three countries is the same, Australia = 0.74; Indonesia = 0.75; and Singapore = 0.75.

Based on the results of the Mplus Figure 2 analysis, the highest student confusion and anxiety were Indonesian (loading factor 0.037), Australia (loading factor 1.000), and Singapore (loading factor 1.465). These results are consistent with the 2015 TIMSS acquisition rank: Indonesia ranks 44 (Mean 397), Australia ranks 28 (Mean 517), while Singapore ranks first (Mean 618). These results are in line with the results of research by Ho et al. (2000) that students who have high levels of confusion and anxiety will have lower levels of mathematics achievement. Research by Calvo et al. (2017) also show the same thing that students who tend to be more anxious about mathematics, develop less self-confidence, have poor belief in their ability to handle assignments, and feel less skilled (Calvo, Cascante, Valdés-Ayala, & Quesada, 2017). Students who experience higher levels of anxiety will show negative attitudes towards Mathematics (Tella, 2007). So, the higher the student's ability to understand the subject matter, the lower the level of student anxiety about the subject matter (Safari, 2019). But international data can be biased. According to Rahmawati (2018) the sample bias should make caution in interpreting the ranking of PISA results because the length of study makes a difference. Countries that are dominated by 10-year students tend to benefit from countries where more students have only studied for 9 years. In all countries, students with a 10 year length of study are higher than students with a 9 year length of study, and apply to the results of the PISA 2003 to PISA 2015. Ironically the results of data analysis show the proportion of 10 year old students studying between countries is not the same, so it has the potential to be biased on the results of achievements. Nevertheless, there are some positive activities that can be followed in classroom learning. The teachers in countries which above the PISA average often provide feedback and provide better reading material to their students compared to teachers in countries below the PISA average. Because student learning dependency in countries above the PISA average is higher than students in countries below the PISA average, feedback frequencies are considered unnecessary (Safari, 2020). According to Rahdiani, et al. (2019) that students who are interested in other countries’ cultures have UNBK scores slightly higher compared to their peers. Based on the results of the 2011 TIMSS data analysis, (1) Indonesian students are less accustomed to working on questions in the application and reasoning of the cognitive realm, especially in questions that are constructed-response; (2) Indonesian students are less accustomed to working on questions that require more than one question completion process; (3) misconceptions among Indonesian students about arithmetic operations (+, -, x, :), which should be done first; and (4) Indonesian students have more difficulty in doing algebraic operations than numeric operations (Fahmi and Purwati, 2019). According to Rahmawati and Nizam (2018), the low number of Indonesian students in the TIMSS study, students were distracted and chose the same mathematics problem distractor. The students were distracted to point out the misconception of place values. Students are confused between place values, place numbers, and number values. It is recommended to use the context of everyday life for the topic of place values in textbooks so that students easily understand the correct concepts. These results indicate that academic integrity moderately affects the welfare of students in school. This assumes that personal factors such as academic integrity are needed in supporting the quality of effective learning, because learning outcomes depend on the
mental and psychological condition of the students themselves (Ramdani and Prakoso, 2019).

To overcome mathematics anxiety, according to Singh, Granville, and Dika (2002), the students concerned are given positive motivation continuously. Avoid phrases that can discourage students, such as "I hate mathematics", "Mathematics is a difficult subject", and "I will never understand mathematics" (Whyte & Anthony, 2012). Mathematical texts are very difficult at UN 2018 (Arsiah, 2018) Such statements can easily influence the perception of their peers and should be avoided, encouraging statements such as "I believe that I will succeed in mathematics" from peers can increase student confidence in mathematics (Usher & Pajares, 2009). Peer behavior in daily interactions can have an effect on students' mathematics anxiety (Garba et al., 2020). Newman et al. (2017) peers can positively or negatively influence student learning. Spaniol (2017) states that some students link mathematics anxiety with a lack of peers in mathematics, and as such, a lack of student success is one of the factors that is causing it even math anxiety. According to Yurt (2014), peer sharing of negative experiences about mathematics influences students' success and confidence in mathematics.

Ajeng prabandari's research results (2019) show that: (1) mathematics learning difficulties experienced by students due to students' negative perceptions of mathematics learning, (2) the factors that cause mathematics learning difficulties come from internal factors (lack of students having intelligence, learning motivation, and health body) and external factors (use of learning media and family situations), (3) solutions that can be used to reduce the difficulty of learning mathematics include changing students' negative perceptions of mathematics learning into positive, using learning media, increasing the practice of questions and establishing cooperation with parents.

The same study was conducted by Senjaya et al. (2017) about the difficulty of students in learning mathematics is (a) students' misconceptions about something that will be determined; (b) students' ignorance of concepts; (c) students who do not accurately write mathematical symbols (language); (d) student inaccuracies in mathematical calculations. Meanwhile, the factors that cause students to experience difficulty in learning lines and angles material are divided into two factors, namely internal and external factors. Internal factors (in students) that cause learning difficulties in the lines and angles of learning material are students not interested in learning mathematics and how / student learning habits. Meanwhile, external factors (outside of students) of students' learning difficulties in learning mathematics are seen through two aspects, namely factors of the school environment and family environment (home). (1) Difficulties experienced by students in learning the material lines and angles, namely: (a) Students' lack of understanding of the specific problem; (b) The subject's lack of understanding of the concept of lines and angles; (c) Subject inaccuracy in writing mathematical symbols (languages); (d) Inaccuracy of students in mathematical calculations. (2) Factors that cause students learning difficulties in learning material lines and angles are divided into two, namely internal and external factors. Internal factors (in students) that cause learning difficulties in learning lines and angles material that is the lack of student interest in learning mathematics and poor learning habits that lead to results that are not optimal.

Meanwhile, external factors (outside of students) students' learning difficulties in learning mathematics on the material lines and angles of SMPN 4 Sindang viewed through 2 aspects, namely factors of the school environment and family environment (home). Viewed from the school environment factors, several factors that can cause students difficulty learning mathematics on lines and angles, namely: (a) Less effective learning time; (b) Learning Media; (c) monotonous learning methods; (d) the relationship between teachers and students is classified as less harmonious; (e)
the relationship between students and students classified as less harmonious; (f) Students' excessive activities in organizations. Meanwhile, viewed from family environmental factors. Several factors can cause students to have difficulty learning mathematics in lines and angles, namely: (a) A low level of parent educational background; (b) lack of parents' attention to their children's learning activities at home; (c) low family economic situation; (d) the atmosphere of a busy or even creepy home for students.

Many factors must be addressed to overcome the level of mathematical anxiety. According to Brown et al. (2020) the factors that must be addressed are: (1) the factors that cause mathematical anxiety in daily interactions in class, (2) exploring interactions among peers, which can worsen and intensify anxiety or reduce anxiety toward mathematics, and (3) minimize math anxiety among students. Mathematics learning must be accompanied by interesting media, then the material and mathematical concepts taught must be adjusted to the abilities and thinking of students (Ismayani, 2010; Nikiforidou & Pange, 2010; Suryana, 2016). One of the mathematical abilities that can be developed in early childhood education is the ability to count (Ismayani, 2010; Susanto, 2011; Suyanto, 2008). Including readiness to attend primary school, which parents and teachers consider as academic readiness, so teachers and parents emphasize the importance of reading, writing and arithmetic skills (Nurhayati, 2018).

A lot of description problems are used, because the reliability of the mathematical description test can detect the level of student understanding of the subject matter concept, especially material from the central angle, arc length, sector area, which can only be answered correctly by 17.58% of students (Fahmi, 2020a). There is a significant difference between students who are used to and not accustomed in answering essay questions to the results of the 2018 National Examination (Sig. 0.000) (Safari, 2019b). Parents also need to be actively involved in this reinforcement, because parents who spend more time helping and checking their children's homework, have children who achieve higher scores on mathematics and science (Paramitha and Safari, 2019). This depends on the educational background and work of each student. The educational background (Safari, 2018) and the work background of students' parents have a significant influence on the results of the 2018 UN (Safari, 2019c). Many teachers and parents of students who use the assignment method through worksheets to be able to increase student activities in mathematics teaching and learning activities such as: student attendance, student activity in following the course of the lesson, student participation in asking questions, student activity in answering teacher questions, and student activity nature answers questions (Rumiyati, 2011: 425). Input for math problem books, questions should start from the easy, medium, and difficult. The question book should be arranged by grouping the chapters following the realm of material as in TIMSS, namely numbers, geometry, algebra, data, and opportunities. The question book for students does not need to be written about the realm of the material, main topic, and cognitive realm. Writing multiple choice questions is better not to use question sentences, but rather by making statements that contain points, both in the middle or at the end of the sentence (Rudhito and Prasetyo, 2016: 88-97).

**CONCLUSION**

Based on all the descriptions above, the results of the study can be concluded with the findings and suggestions as follows.

1) Students' perception of mathematics makes students confused and worried that the majority of students in three countries state Australia's "most disagree" 12.9% and 15.1%; Indonesia 9.1% and 10.1%; and Singapore 12.3% and 11.5%.

2) Based on the results of analysis of variance shows that there are differences in students' perceptions of mathematics making students confused and nervous (P <0.05). The highest order to the lowest perception of students is:
Indonesia is almost the same as Australia, then Singapore.

3) Based on the results of the analysis with Mplus shows that students' perceptions about Mathematics make students confuse and nervous ranging from the most of the smallest are students from the country: (a) Indonesia, lodging factor 0.037; (b) Australia, lodging a factor of 1.00; (c) Singapore, lodging a factor of 1.465. Students from all three countries have the same perception that is mathematics making students confuse, loading factor is 1.00. The different thing is nervous perception, starting from the most up to the smallest are students from countries: (a) Indonesia, loading factor is -0.313; (b) Singapore, loading factor -1.451; (c) Australia, loading factor 2.345.

4) Based on the analysis of the Rasch (Winsteps) model, it shows that the reliability of students' abilities in the three countries is the same, Australia = 0.74, Indonesia = 0.75; and Singapore = 0.75.

SUGGESTION

Based on the research results above, there are important suggestions like the following. We should be thankful for the TIMSS, which is one of the index measurements of Indonesia's numeracy literacy level compared to other countries. It is hoped that with the TIMSS, we can improve the education method because through education can contribute to increasing the interest in numeracy literacy, making Indonesian citizens smart so that they can improve the economy and prosperity later. For this reason, there are a number of specific suggestions for teachers at school so that Mathematics is preferred by students at school through the answers to the following questions. (1) How can I make mathematics more fun for students? (2) How can I ease their mental barriers when facing math lessons? (3) What methods can I try to help them in learning. (4) What games can we play? (5) What resources are available to help in the lesson progress?

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