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An Exploration of Students' Anxiety in Mathematics Online Learning using Augmented Reality at Junior High School: A Rasch Model Construct

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Abstract

Learning mathematics has been a fundamental subject for students. The sample will be restricted to students in junior high school who had studied learning mathematics using augmented reality. The population was derived from private and public junior high schools in various provinces. Data were collected using an online survey to reach large audiences from different provinces and analyzed using RASH Model. The results were used to classify the level of students' anxiety. Students from public junior high schools of education were more anxious than private ones to solve mathematical problems.

Keywords: Anxiety, Students, Learning Mathematics, Augmented reality, Rasch model

Introduction

Mathematical anxiety is easily induced in students who do not comprehend elementary mathematical ideas (Brown and Sifuentes 2016). Learning Mathematics is the core of learning science that students must take before classroom practices (Septiany, Purwanto, and Umam 2015; Umam et al. 2017) and the core of many mathematics materials (Yung et al. 2007). Mathematics is the foundation for advanced math, so students' instructors must master it. Students' mathematics knowledge is improved by research. In previous research, Umam, Nusantara, Parta, Hidayanto, & Mulyono [5] analyzed flipped classroom learning to support students' mathematical understanding. Although there has been innovation in classroom practice, they still need help, especially in encouraging students to be motivated to learn Mathematics. Learning outcomes are closely related to classroom practices and psychology, such as anxiety and self-motivation (Mamaril et al. 2016; Young 2007)occupational, and social problems. While much of the literature explores the psychological and social factors underlying Internet addiction, little if any empirical evidence exists that examines specific treatment outcomes to deal with this new client population. Researchers have suggested using cognitive behavioral therapy (CBT. Anxious students suddenly change their learning mood, especially during Mathematics learning practices. They might suddenly space out the material while solving the problems. Research in mathematics education primarily focuses on improving learning outcomes (Godino, Granada, and Vicenç Font 2006; Khoerul Umam et al. 2019; Wasserman et al. 2017). This research analyzes the psychological aspects of anxiety for students. It is essential to explore students' anxiety about Mathematics learning practice.

Furthermore, the exploration is related to students' anxiety during online learning. Limited access to the internet and learning facilities in virtual classroom practices has enhanced students' mathematical anxiety. The early sign of students' mathematical anxiety will be looked at closely, such as less motivation, ignoring problems, and not finding solutions (Aarnos and Perkkilä 2012; Hanna and Dempster 2009).

The student's ability to explore learning is driven by very high motivation. Students with internal motivation can solve mathematical problems independently (Amir et al. 2020; Huu Can 2020; Østerlie et al. 2019)the Situational Motivational Scale (SIMS. Internally motivated students actively process information and events while using the learning resources available to acquire new knowledge and skills in self-directed ways (Bishara 2018; Dyrberg, Treusch, and Wiegand 2017; Özcan 2016)metacognition, and behaviour. For example, when students find it difficult to understand specific mathematics material, those with very high motivation are more likely to look for references outside the teacher's lessons, such as YouTube channels, open-coursed ware, et cetera. They tend to look for other learning sources when experiencing difficulties with a specific material.

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These students can learn independently using various platforms, ebsites, or mobile phones (Lo and Hew 2017; Zhang and Wu 2016).

A dramatic increase in studies on online resources for education has been conducted on the use of online resources to motivate people to informal learning (Axelsson 2009; Stern 1990; Tague and Czocher 2016; Zulherman et al. 2021). Students are no longer limited to formal classes held by educational institutions. Students nowadays can improve their mathematical comprehension abilities, digital mathematical abilities, and mathematical reasoning abilities by using open-coursed that widely available online learning platforms. This situation is different from reality in general, where teachers currently do not facilitate informal learning (Borromeo Ferri 2010; Visscher and White 2019), and they are even less knowledgeable about how the individual directs himself to learn in such an environment.

The significant problems arising from online learning should be resolved as soon as possible. This situation is mainly caused by online learning that will remain indefinitely, especially during the COVID-19 pandemic (Mulyono, Suryoputro, and Jamil 2021; Prahmana et al. 2021). Online learning over long terms periods potentially produces mathematical anxiety among students. Furthermore, the growing concerns related to students' anxiety at the educational researchers and practitioners' level have not been explored in rigorous scientific inquiry (Karimi and Venkatesan 2009). Early personal causes of mathematics anxiety involve negative emotions and holistic embarrassment towards mathematics. Cognitive factors can generally affect a restricted view of mathematics (Aarnos and Perkkilä 2012). Anxiety can be examined from some dimensions, such as cognitive, affective, and psychological. In an uncertain pandemic situation, online learning is a choice for transferring knowledge to students effectively. It needs more professional development and teacher training to reduce and prevent math anxiety in students (Barry 2017). Math anxiety stems from low self-esteem and failure fear. It hinders information processing for problem solutions. It causes problems in processing the incoming information for problem-solving (Karimi and Venkatesan 2009). Students who have high mathematics anxiety tend to generate a lower score and vice versa (Karimi and Venkatesan 2009). This result is also supported by (Ashcraft and Kirk 2001) that a significant negative correlation exists between students' mathematics anxiety and academic performance. High mathematics anxiety students tend to have no maximal results in mathematics learning. The result is related (Bai et al. 2009; Ironsmith et al. 2003) that students with higher grades and test scores in mathematics tend to have lower math anxiety levels. This study aims to determine factors, causes, and the relationship between students' mathematics anxiety in a Mathematics course.

Theoretical Framework

Mathematical Anxiety

Online learning and the limited facilities owned by students have caused anxiety. This situation has become a phenomenon that has emerged a lot, significantly, as the learning platform has changed from face-to-face to fully online learning. Students' anxiety arises when students have difficulty understanding basic mathematics concepts (Brown and Sifuentes 2016; Núñez-Peña, Suárez-Pellicioni, and Bono 2013; Winardi, Halini, and Hamdani 2019). Easy difficulties not resolved well in a specific time cause students' mathematical anxiety. Mathematical anxiety can be defined as feelings arising from students' inability to understand basic mathematical concepts, number manipulation, and mathematical problem solving (Aarnos and Perkkilä 2012; Barry 2017). Oktawirawan (2020) states that mathematics anxiety can be influenced by three causal factors: personality, environmental, and intellectual factors.

Anxiety caused by personality factors arises because students do not want to ask questions about their math difficulties. This reluctance to ask questions is influenced by shame, insecurity, and indifference. Students' desire to overcome difficulties is essential in overcoming anxiety from personality factors. For example, when students do not understand a mathematical concept/problem during learning, they must have the courage to ask questions to either the teacher or their peers. Students' courage in expressing their lack of understanding about the material must get appreciation from the teacher, not vice versa. When students ask questions, the courage to reveal their weaknesses becomes vital in learning. In this context, students have shown a strong desire to understand mathematics.

Environmental factors can also influence students' math anxiety. Students' negative experiences with peers and teachers who are not sensitive to the mathematics learning process can be categorized as unsupportive school environments. Some facts also show the use of traditional teaching methods, in which mathematics requires students to memorize formulas and manipulate numbers and extended algebra (Mark H. Ashcraft 2002; Batchelor 2015).

Mathematics-related intellectual anxiety variables include an improper learning style, a lack of student attitudes, tenacity, confidence in math skills, and a lack of perceived mathematics utility. While some researchers have found that learner-centered activities are central to student satisfaction in the online course (Ellis and Cohen 2005), (Cuthrell and Lyon 2007), a recent investigation discovered that students preferred a mix of instructional strategies that incorporated active and passive modes of instruction. Other factors that are related to student satisfaction in online courses are presence (social, cognitive, and teaching) (Pelz 2010), community

(Sahin 2007), and frequent feedback and assessment (Swan, 2003). Students use technology to support their learning process in online learning, particularly in mathematics subjects. Suppose mathematics at all levels uses technology to increase the learning process. In that case, students will be well prepared to use technology appropriately, fluently, and efficiently to do mathematics in technology-rich environments where they will study and work in the future (NIESS 2006). In online learning process give an improvement in the education process level and is a critical issue in this time of the pandemic, which is how all students access and get the internet, appropriate supply of electricity, reliable internet connectivity to online learning platforms, and the necessary tools (Queiroz and Agnoletto 2020). Some students have limitations in accessing technology for reasons such as Socioeconomic status (SES). Socioeconomic status (SES) also plays a role. Students with a low SES may not have sufficient exposure to the kind of education and experiences that promote positive feelings about math (Furner and Berman 2003; Gautreau, Brye, and Lunceford 2016; Mailizar et al. 2020). The use of technology can provide convenience in the student learning process so that it is fun and exciting. Students with this condition may be disproportionately affected in the learning process since they may not have the same access to technology at home and school. Technology can be a tool to engage with mathematics in an anxiety-reducing way (Barry 2017). Nevertheless, technology in higher education inadequately diminishes students' mathematics anxiety since they are more worried about not understanding the concept of mathematics than applying such technology (Istikomah and Wahyuni 2018).

Several studies have examined the critical factors of learning using an online environment. Conrad (2020) investigates the main learning factors through online learning resources from learners' perceptions. The findings indicate that the key factors impacting the effectiveness of online learning are: (1) management of learning resources (accessibility, adaptability, and reusability); (2) technological aspects; and (3) metadata ontology (Sridharan et al., 2010). Although these aspects may be necessary, their study focuses on formal learning environments rather than informal situations. Some researchers focus on the positive aspects of emerging technology as a critical learning factor (e.g., (K. Umam et al. 2019; Wang 2017; Zhang and Wu 2016)). For example, emerging technology can help learners develop metacognitive awareness and problem-solving skills, have teaching experience, and eventually become independent learners (Ferrer-Torregrosa et al. 2016; Özcan 2016). However, the learner's perspective must also be considered when discussing the use of technology.

A wide variety of online learning resources can be useful learning materials for informal independent learners. There are many possible achievements from the use of these resources. Previous studies examined the motivational aspects of students in independent informal learning from online learning sources. Thus, this study explores informal students' motivational factors in independent and informal learning when using online learning resources.

Research Method

This research used purposive sampling because only students who experienced using augmented reality in learning mathematics. A sample size of 200 students was taken from three different provinces in Indonesia. They are junior high school students at private and public junior high schools. The data is collected by questionnaire technique. The math anxiety questionnaire consists of 15 items, and Mathematics instruments consist of 12 items to measure math anxiety and students' performance in Mathematics. The Likert scale ranged from strongly agree, agree, neutral, disagree, and strongly disagree. Item Response Theory with Rasch Model was conducted to analyze the items using Winstep software. Winstep provides indices of the adequacy of scales and items. Winstep software gives information related to item fit, item-person fit, item difficulty, item discrimination, and the function of each item distractor. DIF (Differential Item Functioning) was conducted to analyze response items based on demographic data (e.g., gender, location, SES, et cetera.).

Data collection

Data were collected using an online survey (Astuti et al. 2022). The primary purpose of using an online survey is mainly because the participants were from three different provinces, such as DKI Jakarta, East Java, and West Java. Before inputting the instruments in online forms, the experts validated the instrument and were reliable using statistics assessments. The invitation to the online survey was shared through WhatsApp and Facebook. The participants will take approximately about 20 minutes to complete the forms.

Demographics Population

The sample for this analysis was derived from students who had completed Mathematics as their subject. The sample and sampling procedures for this project includes students of private and Public Junior High School of education. In brief, students from seven private and public junior high schools in DKI Jakarta, East Java, and West Java agreed to participate in the survey on Mathematics anxiety. The population of this study was classified into four different characteristics such as gender, province, students' classification, college level, and Mathematics understanding classification.

Data Analysis

All survey data collected on Google Forms is then stored with excel data. All data collection was categorized using

Table 1: Demographic features of the sample studied

Characteristics	*Percent*	*Characteristics*	*Percent*
Students Origins Province		Gender	
DKI Jakarta	71%	Male	36 %
East Java	24%	Female	64 %
West Java	8%		
Mathematical Achievement Level		Junior High School classification	
Below	64%	Private Junior High School	54 %
Middle	25%	Public Junior High School	46 %
High	11%		

Rash Analysis software (Dranitsaris and Lacouture 2014; Faustino et al. 2019). The data was collected in excel data, then the researcher converted it into a number that strongly agrees with the number 5, agrees to be 4, neutral becomes 3, disagrees to be 2, and strongly disagrees with 1. When all data has been converted into numbers, the next step is to input data into Winstep to be analyzed using the Rasch Model. It obtains an accurate Rash analysis; it is generally recommended that a minimum participant of this study was more than 200 participants. The data collected from this study exceeds the minimum limit of research standards that must be analyzed for the Rasch model, which is about 201 respondents. After the data was inputted on Winstep, the researcher further analyzed it by classifying it into three categories: low anxiety, moderate anxiety, and high anxiety.

Results and Discussion

Level of Anxiety

For starters, this study obtained results in distributing students' anxiety on completing Mathematics material based on their level of anxiety. Three groups of student anxiety levels are divided into low anxiety, moderate anxiety, and high anxiety. The Rasch model results show 11 students in the high anxiety group, 157 in the moderate anxiety group, and 33 in the low anxiety group. It indicates that in numbers, students tend to be at a moderate level of anxiety. Furthermore, the indication of the grouping is based on the value range of each group. Students who have a score below 57 are in the low anxiety group. Then, students who had scores between 58 to 86 were included in the moderate anxiety group. Meanwhile, students above 87 are part of the high-anxiety group.

As can be seen in the table, the overall average value obtained is 71.69. This value indicates that, overall, students are at a moderate level of anxiety. Students' adaptation process can influence moderate anxiety from face-to-face to online learning (Visscher and White 2019). Adaptation from face-to-face mathematics learning can be complex for most students. This situation causes the loss of the opportunity to listen to the teacher's explanation directly and reduces opportunities for students to discuss. It is different when online learning is balanced with face-to-face learning since it is still vital to encourage students to clarify understanding and discuss with friends when finding problems. Online learning meetings that are carried out continuously impact the adaptation process that students must carry out, causing anxiety.

Furthermore, Table 2. shows the distribution of anxiety levels based on gender categories. From a total of 201 respondents who participated in filling out 22 questionnaire items, there were 33 male students and 168 female students. Male students were indicated to be at a moderate level of anxiety, as indicated by their mean scores. It illustrates that the change in learning from face-to-face to online today is not a significant obstacle for most male students. For computer skills and digital literacy, prospective teachers need an adaptation process. Their digital abilities help them to adapt to the online learning process full-time. Various student habits also support using computers, laptops, and handphones (Long, Cummins, and Waugh 2017; Zhang and Wu 2016) so that the anxiety that arises is still in the moderate category. It can also be seen from an average of 67.18, which is included in the moderate anxiety group. Female students felt the same thing. With a mean score of 72.58, they were also part of the moderate anxiety group. In simple terms, male and female students have the same moderate anxiety level.

On the other hand, this is the case with the information shown in Table 3. In addition to examining differences in anxiety levels for gender, this study also examined anxiety levels based on academic levels. There are two levels of education tested: private and public junior high school students. As informed by Table 3., Junior High School students experienced anxiety at a moderate level with an average score of 71.65. Like private Junior High School students, students at the Public Junior High Schools also experienced the same anxiety level, moderate anxiety. The average value obtained by state college was 71.89. both values indicated as part of

Table 1: Overall Level of Anxiety

Level of Anxiety	*N*	*Minimum Score*	*Maximum Score*	*M*	*SD*
High Anxiety	11	87	110	93.82	6.31
Moderate Anxiety	157	58	86	70.36	6.57
Low Anxiety	33	28	57	50.91	6.13
Total				71.69	

Table 2. Level of Anxiety by Gender

	Gender					
	Male			*Female*		
Level of Anxiety	*N*	*M*	*SD*	*N*	*M*	*SD*
High Anxiety	2	89.5	3.54	9	94.78	6.51
Moderate Anxiety	26	67.65	5.37	131	70.90	6.67
Low Anxiety	5	44.4	11.80	28	52.07	3.82
Total		67.18			72.58	

Table 3: Level of Anxiety by Educational Level

	Educational Level					
	Private Junior High School			*Public Junior High School*		
Level of Anxiety	*N*	*M*	*SD*	*N*	*M*	*SD*
High Anxiety	8	94.25	6.11	3	91.67	8.08
Moderate Anxiety	103	70.17	6.47	54	70.72	6.87
Low Anxiety	26	50.54	6.53	7	52.29	4.46
Total		**71.65**				**71.89**

the moderate group. It shows that students at both levels of education experienced Mathematics completion anxiety at moderate anxiety levels and are still considered normal.

Types of Anxiety

The questionnaire in this study contained three dimensions of the scale that were used as benchmarks to compare the types of anxiety felt by students. The three types are avoidance behavior, cognitive anxiety, and somatic anxiety. Table 4. shows that students tend to feel anxiety in the cognitive anxiety type (M = 28.54, SD = 5.27). The next type of anxiety felt by students was somatic anxiety (M = 21.89, SD = 4.79), followed by avoidance behavior (M = 20.73, SD = 3.48). From the information shown in Table 4, it can be concluded that students tend to fear other people's judgments. The perceptions and judgments of others for private and public junior high school students contribute to the tendency to develop mathematical anxiety among students (Cropp 2017; Long et al. 2017). These assessments can be in the form of ridicule from friends or negative evaluations from the teacher. This situation, of course, needs to be avoided so that students feel comfortable in the learning process. It can be minimized together by realizing a commitment to learning

Table 4: Result of Subscales

Types of Anxiety	*Score*	*M*	*SD*
Avoidance Behavior	4166	20.73	3.48
Cognitive Anxiety	5193	28.54	5.27
Somatic Anxiety	4400	21.89	4.79
Total	13759		

that is far from a negative response from all students and teachers. Students are more afraid of their Mathematics completion results being judged negatively by others than trying to avoid Mathematics problems or convince themselves psychologically (Cipora et al. 2015; Peker 2009). The fear prevents students from developing cognitively and inhibits increasing students' psychological courage. When students are afraid of making mistakes in the learning process, students will tend to be silent. If it is neglected for a long time, the fear within these students will lead to remarkably high anxiety (M.H. Ashcraft 2002; Cipora et al. 2015)although math anxiety is supposed to be a transcultural trait, assessment instruments are scarce and are validated mainly for Western cultures so far. Therefore, we aimed at examining the transcultural generality of math anxiety

by a thorough investigation of the validity of math anxiety assessment in Eastern Europe. We investigated the validity and reliability of a Polish adaptation of the Abbreviated Math Anxiety Scale (AMAS.

Figure 1. reinforces the previous argument that additional information is a percentage of each type of student anxiety. As a result, cognitive anxiety was the most common anxiety experienced by students (38%). Cognitive anxiety refers to the fear of suppression of nasty comments from others. Negative comments given by peers to students can cause students mathematical anxiety (Cropp 2017). However, positive peer comments will tremendously impact students' anxiety recovery (Cropp 2017; Gautreau et al. 2016). Friends' positive energy positively affects mental and psychological well-being

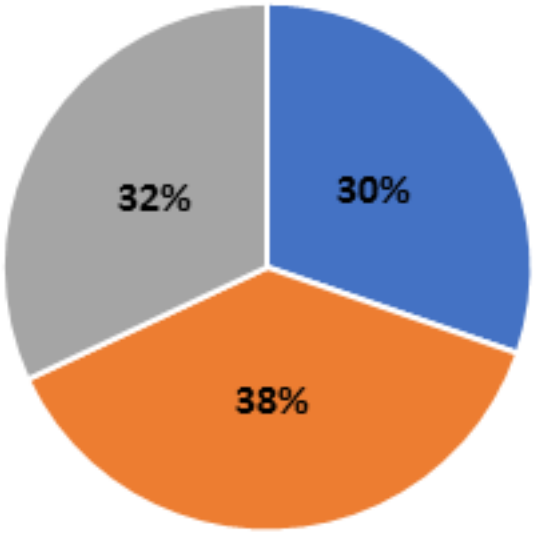

Fig. 1: Percentage of Subscales

Zhou et al. 2020). Then, somatic anxiety (32%) is also felt after cognitive anxiety. Somatic type anxiety causes students to feel deep psychological pressure, such as sweating or shaking, while working on Mathematics problems.

Meanwhile, avoidance behavior is a type of anxiety that students rarely feel (30%). Most students rarely feel this type. In this type of anxiety, students are not afraid of self-psychological pressure or negative comments from others. However, students tend to avoid doing Mathematics problems first as a form of worry.

Table 5. Provides information regarding the types of anxiety felt by students based on gender, as can be seen in Table 5. Both male students (M = 24.79, SD = 5.36) and women (M = 26.04, SD = 5.24) are on the same type of anxiety, namely cognitive anxiety. It can be seen from their average score for the cognitive type, which is higher than the somatic and avoidance behavior types. However, compared to male students, the female students' level of anxiety was higher. Female students obtained an average score (M = 26.04), which was higher than male students (M = 24.79) in cognitive type. Although female students have anxiety, Axelsson's (2009) study shows that the anxiety that arises can be corrected.

Encouragement and motivation from peers and teachers are proven to reduce math anxiety that arises (Brennan and Hugo 2016; Gautreau et al. 2016; Suárez-Pellicioni, Núñez-Peña, and Colomé 2016)which was carried out by Ashcraft and Ridley (2005. Moreover, female students' anxiety is higher than male students. It can be concluded that both of them feel anxious if other people evaluate their Mathematics results.

Table 6. shows the different types of anxiety students feel based on the level of education they can afford. Based on the data presented in Table 6., it is indicated that private and Public

Table 5: Types of Anxiety-Based on Gender

	Gender					
	Male			*Female*		
Type of Anxiety	*N*	*M*	*SD*	*N*	*M*	*SD*
Avoidance Behavior	33	19.94	3.49	168	20.88	3.46
Cognitive Anxiety	33	24.79	5.36	168	26.04	5.24
Somatic Anxiety	33	20.73	5.19	168	22.12	4.69

Table 6: Types of Anxiety-Based on Educational Level

	Educational Level					
	Private Junior High School			*Public Junior High School*		
Type of Anxiety	*N*	*M*	*SD*	*N*	*M*	*SD*
Avoidance Behavior	137	20.74	3.69	64	20.69	3.01
Cognitive Anxiety	137	25.63	5.52	64	26.36	4.68
Somatic Anxiety	137	21.53	4.89	64	22.67	4.49

Junior High School students feel anxiety in the cognitive type. Each got the highest score for the type of cognitive anxiety, men (M = 25.63, Sd = 5.52) and women (M = 26.36, SD = 4.68). There is no difference between private and Public Junior High School students. They are more anxious about cognitive anxiety types than other anxiety types (e.g., somatic anxiety and avoidance behavior). However, when explicitly assessed, Public Junior High School students were more anxious about cognitive anxiety types than private Junior High School students.

DIF Analysis Between Students' Demographic Profile

Analysis using Rasch modeling with Winsteps software version 4.3.4 allows the researcher to get more specific results. The analysis used in this case is the DIF analysis. DIF analysis provides accessible information regarding persons' responses to items based on demographic data (e.g., gender and educational level). In order to test the DIF, this study provides twelve selected items from each subdimension (e.g., avoidance behavior, cognitive anxiety, and somatic anxiety) contained in the questionnaire. Twelve items are the items most approved by the respondents. The high logit value indicates this for these items.

DIF Plot Based on Gender

Figure 2. is the DIF test result for the twelve selected items that have been previously selected based on the logit value for each dimension. The twelve items were then tested using student responses based on gender classification. The result shows the differences in response patterns between male and female students to each of the items tested. As an introduction, female students tended to feel more depressed than male students when doing integral Mathematics under time pressure (item SA1, diff. = -0.2442). Then, there was a similarity in response between males and females to the anxiety of solving the integral Mathematics, which was then evaluated (item CA2, *diff.* P = -0.0149, *diff.* W = -0.0149). Male students always do their best to avoid any mistakes in solving integral Mathematics compared to female students (item AB2, *diff.* = -1.418).

DIF Plot Based on Educational Level

Meanwhile, female students were more worried if their writing results were worse than others (item CA3, diff. = -0.2339). When doing integral Mathematics, female students did not feel shaking or sweating when writing under time pressure (item SA3, diff. = 0.6111). Then, item CA4 (diff. P = -0.5064, diff. W = -0.5064) informs that both genders are worried if their integral Mathematics answers are evaluated and get poor scores. Parents and teachers play a role in encouraging female students to spend more time studying to reduce anxiety and improve learning outcomes (Mark H. Ashcraft 2002; Axelsson 2009). Male students sometimes prefer to avoid being asked to do integral Mathematics (item AB3, diff. = 0.3545). Male and female students had the same anxiety when asked to write integral Mathematics under time pressure. They felt confused and uneasy when writing answers (item SA4, diff. P = -0.018, diff. W = -0.0391). Time pressure in solving math problems adds to the cognitive load and creates mathematical anxiety for students (Cipora et al. 2015). Female students sometimes panicked when writing integral Mathematics and answered under time pressure (item SA5, diff. = -0.1535). However, they rarely hesitate to convince themselves when asked to complete integral Mathematics (items AB5, diff. = 0.2606). Unlike the case with male students, they tend to be more worried if the results of their integral Mathematics completion are categorized as bad (item CA8, diff. = -0.0658). Based on these things, men and women agree not to use integral Mathematics in solving math problems (item AB7, diff. P = 1.1931, diff. W = 1.1306).

Figure 3. shows the DIF measurement results against demographic data in the form of educational level. From the questionnaires distributed and filled in by respondents, there are two categories of school level: private and Public Junior

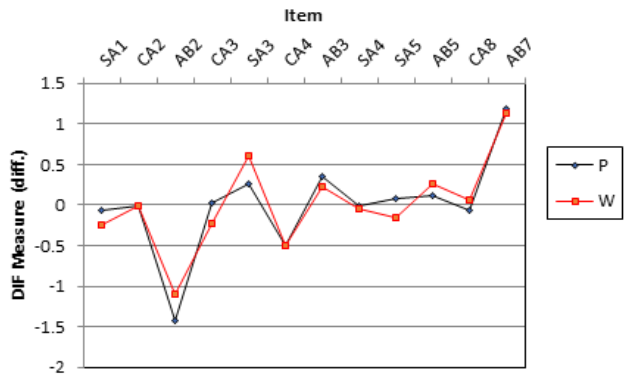

Fig. 2: DIF Plot Gender
Note: P = Male, W = Women

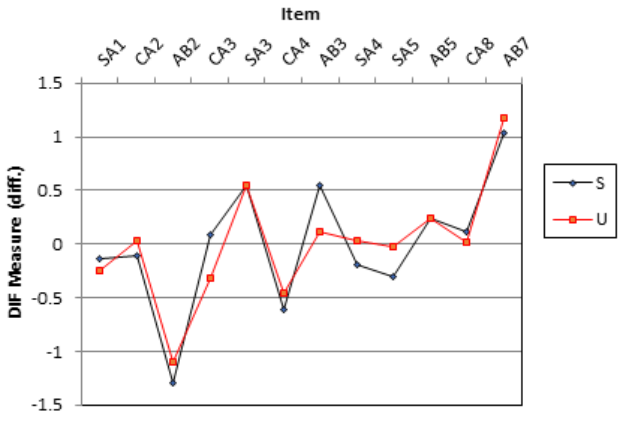

Fig. 3. DIF Plot Education

High School. Item SA1 indicated that private Junior High School students felt nervous and even had a racing heart while completing integral Mathematics under time pressure (*diff.* = -0.2469). On another side, Public Junior High School students tend to feel worried and anxious if their result of completing integral Mathematics is evaluated, as informed by item CA2 (*diff.* = -0.1151). This condition is fascinating, where students feel worried when the results of their work are checked. This concern can arise from the fear of being wrong or having low scores. Students feel embarrassed when the results of their work do not match the answers, especially when the results of the answer get a negative response from their friends. From this data, it can be said that the anxiety that arises when collecting student work needs to get the teacher's attention. The concern that can be done is how the students dare to express their inability to solve math problems. Positive feedback from the mathematics teacher on the work that has been completed is the primary key to generating student courage.

When students bravely reveal their weaknesses in understanding the subject matter, the teacher can discover that specific topics need explanation. In this case, the teacher must be encouraged to re-explain particular material according to students' questions. With the courage that emerges from the students to reveal their weaknesses, the student's math anxiety will gradually decrease. The discussion space between students and teachers needs to be increased so that students can open themselves up to express their struggles. This anxiety is also supported by item AB2, which shows that Public Junior High School students always do their best to avoid making mistakes in solving integral Mathematics (*diff.* = -1.3016). It is different with private Junior High School students; they are even more worried if their integral Mathematics answers are worse than others, as indicated by item CA3 (*diff.* = -0.3214).

Both students from private and public junior high schools felt that when they finished integral Mathematics under time pressure, they felt shaky and even sweaty, as informed by the item SA3 (*diff.* S = 0.5532, *diff.* U = 0.5532). The same thing was expressed by Peker (2009) and Stent (1977). The time pressure in solving math problems caused anxiety for some students. This problem arises due to the negligence factor that students usually do, such as delaying work that should be completed so that students have difficulty solving problems quickly. The onset of anxiety in a short time is caused by the desire to solve it is not directly proportional to the ability to solve problems (Alves et al. 2016; Gautreau et al. 2016; Núñez-Peña et al. 2013). In this case, students cannot measure their ability to deal with a problem. When students find it challenging to solve problems, it is better to complete the completion process immediately.

Furthermore, item CA4 indicated that Public Junior High School students were worried if their integral Mathematics answers were evaluated and scored poorly (*diff.* = -0.6107). However, they quickly solve integral Mathematics (item AB3, *diff.* = 0.5412). It can be due to the strategy in finding solutions to problems carried out by a person can change from time to time (Sidney et al. 2019)and this variability is adaptive. In two studies, we examined the relationships between mathematics anxiety, working memory, strategy variability and performance on two fraction tasks: fraction magnitude comparison and estimation. Adults with higher mathematics anxiety had lower accuracy on the comparison task and greater percentage absolute error (PAE. However, they sometimes feel uneasy because their thoughts get mixed up while completing integral Mathematics in a limited time (item SA4, *diff.* = -0.1932). Sometimes, when it cannot be controlled, they panic, as informed by item SA5 (*diff.* = -0.3002). For item AB5, the resulting measurements indicated that private and Public students were equally hesitant or had difficulty when asked to solve integral Mathematics problems (*diff.* S = 0.2382, *diff.* U = 0.2382). Also, they were not too worried about the result of solving their integral Mathematics in the wrong category (item CA8, *diff.* S = 0.1115, *diff.* U = 0.0185). However, compared to the two private Junior High School students, students tended to be more confident in using integral Mathematics to solve math problems than Public Junior High School students (item AB7, *diff.* U = 1.1808).

Conclusion

The research data indicates that both private and Public Junior High School students feel anxiety in the cognitive type. Anxiety that arises in each of them gets the highest score for the type of cognitive anxiety, men (M = 25.63, Sd = 5.52) and women (M = 26.36, SD = 4.68). The scores obtained have no difference between Public Junior High School students. They are more anxious about cognitive anxiety types than other anxiety types (e.g., somatic anxiety and avoidance behavior). However, if explicitly assessed, public junior high school students are more anxious about cognitive anxiety than private Junior High School students. The results indicated that private and Public Junior High School students were hesitant or had difficulty convincing themselves when asked to solve integral Mathematics problems (*diff.* S = 0.2382, *diff.* U = 0.2382). In addition, they were not too worried about the result of solving their integral Mathematics in the wrong category (item CA8, *diff.* S = 0.1115, *diff.* U = 0.0185). However, compared to the two private Junior High Schools, students tended to be more confident in using integral Mathematics to solve math problems than Public Junior High School students (item AB7, *diff.* U = 1.1808).

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