Mathematics anxiety in dealing math exams

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Abstract. Mathematics anxiety is one of the factors impacting the students’ achievement. The current study aims at describing the mathematics anxiety of XI class students. This study emphasizes the mathematics anxiety in general and each indicator. This research is a qualitative study adopting the case study approach. The purposeful sampling has been used to select the subjects. The subjects of this study are 17 students of class XI Science in Senior High School 1 Puding Besar. Data have been collected through observations, interviews and questionnaires of mathematics anxiety. Students have been asked to fill out a questionnaire developed by the researcher. Three mathematics anxiety indicators have been considered including somatic, cognitive, and attitude in the context of math exams. The data analysis of the questionnaire findings showed that students generally experience mathematics anxiety at moderate level. The total percentage of mathematics anxiety is 29.4% at high level, 41.2% at moderate level, and 29.4% at low level. The results of interviewing the teachers showed that both students with high and low achievement could encounter light anxiety what could become an aspect that requires teacher’s attention when preparing their students to carry out mathematics exams.

1. Introduction
Mathematics is a basic knowledge needed by students to extend learning to a higher level. Mathematics is an important subject therefore mathematics began to be learned since early childhood education until college. Mathematics is an inherently social activity, in which a community of trained practitioners (Mathematical Scientists) engages in the science of patterns, systems, experiments, to determine the nature or principles of regularities in systems defined axiomatically or theoretically ("pure mathematics") or models of systems abstracted from real world objects ("applied mathematics") [1]. In other words, mathematics is the knowledge obtained from observation, studies and experiments derived from real objects. Mathematics is not only about learning numeracy but also training the ability to think logically, critically, creatively, and systematically. These four abilities play an important role for human life in solving problems.

However, although the ability to master to math is very important, it is inversely proportional to the results of students’ math skills in Indonesia. This can be seen from some previous studies which explained that the ability of students in term of low mathematical ability in Indonesia. One result is the Trends in International Mathematics and the Science Study (TIMSS) which is a student assessment activity and the result of an existing education system within a country. In 2016, Indonesia got rank 36 out of 49 countries in TIMSS [2]. This condition shows that the mathematical ability of students in Indonesia is still behind other countries.
There are many things that can affect the students' low mathematical achievement. The fact that math anxiety is only weakly related to overall intelligence would seem to support the theory that anxiety affects math performance independently from math ability [3]. Mathematics anxiety is a significant barrier in mathematics learning resulting in low mathematical achievement [4]. Mathematics anxiety can affect student performance in solving math problems [5]. Mathematics anxiety has been recognized as one of the key psychological factors that can affect student academic outcome [6]. It should be considered in improving student achievement and their success in science, technology, engineering, and mathematics [7].

Mathematics anxiety is a feeling of tension and anxiety that disturbs numerical manipulation and solving mathematical problems in various life situation and academic situations [8]. Then, mathematics anxiety is regarded as a panic, helplessness, paralysis, and mental disorder that emerged among some people when they were asked to solve mathematical problems [9]. Mathematics anxiety can be caused by embarrassing mathematical experiences or due to lack of application of mathematical concepts so that thus causing errors in a problem [10]. In addition, mathematics anxiety of parents also influence mathematical achievement [11]. Mathematics anxiety as a new term to describe students' attitudinal difficulties toward mathematics and define it as a syndrome of emotional reactions to arithmetic and mathematics [12].

Mathematics anxiety can be defined as an individual's emotional reaction that may affect mathematics learning achievement. In this case, the individual's negative emotional reaction to mathematics is seen as a factor affecting low mathematics learning outcome [13]. Based on the opinions which previously described, the researcher concluded that mathematics anxiety is a feeling in response to an inconvenience that occurs as a response or emotional reaction when faced mathematical problems such as when dealing with mathematical assignments, learning mathematics or math exams.

From the definitions above, the researchers here chose an indicator that includes somatic, cognitive, and attitude. Somatic associated with changes in the state of a person's body, such as sweating or palpitation [14]. Cognitive is associated with a person's cognitive changes when dealing with math like not being able to think clearly or become forgetful of things he or she normally remembers. Attitude which related to the attitude that arises when a person is dealing with mathematics.

The results of observation made by researchers at senior high school Puding Besar in students of class XI science program on February 1, 2018 showed that at this school there was anxiety of mathematics. This is based on students' responses to math at school. Some students expressed that they often have problems when they faced math exams, for example, feeling headache, resigned to the life situation/give up, lazy to learn because it certainly cannot solve the problem, nervous, anxious, afraid of teachers and parents anger when their scores are bad or getting low scores. The information given by the students shows the existence of mathematics anxiety. However, students also expressed that math teachers who teach at schools, they were not the factors that caused it.

The results of the national exam last 2 years showed that this school was the school with the lowest math test scores at the level of Bangka Regency with a value of 22.78 in 2015/2016 and 28.96 in 2016/2017 [15,16]. Looking at this result and comparing it to the description of students who did not like mathematics, perhaps mathematics anxiety was one of many things that affects low math scores in this school. Therefore, researchers here wanted to investigate and analyze their mathematics anxiety when they faced math exam with somatic indicator, cognitive and attitude. The results can later be used as a consideration of teachers in preparing the lesson plans so that in accordance with the characteristics of students in this school. Method in this section, you are asked to describe method, model, design, subject and location of your research. Please put the procedure of your research clearly so that it is easy to read. Make sure that you employ appropriate research method in line with research problem and the purpose of your research.

2. Method
This research was a qualitative research with case approach strategy. The researcher identify a research problem based on trends in the field or need to explain why something happened. In this case study, the
researcher explore a phenomena that deals with mathematics anxiety of students when facing math exams. This research was conducted in February 2018 at Senior High School 1 Puding Besar. Researchers here involved 17 students from the 11th grade as research subjects which selected by Purposive Sampling. The data taken was in the form of mathematics anxiety questionnaires, interview notes and observation of mathematics learning activities in the classroom. Mathematics anxiety questionnaire was measured by Likert scale with 4 scale description 1 = never, 2 = sometimes, 3 = often, and 4 = always. Researchers developed the instruments by referring to the indicators of mathematics anxiety. The indicators of mathematics anxiety in this study included Somatic, Cognitive, and Attitude. The researchers observed students' behavior when their teacher taught them while learning and when the math exam conducts with guidelines of these indicators.

The researchers made observations first, then asked the students to fill the questionnaire about math anxiety then conducted interviews. Mathematics anxiety scales, interviews, and observation were analyzed qualitatively to describe students' math levels of anxiety and characteristics. The data analysis includes data reduction, data presentation, and conclusion. Researchers here analyzed the results of mathematics anxiety as many as 17 students, then divided into levels of anxiety is high, medium, and low. After that, the researchers interviewed several students and teachers to give an opinion on the mathematics anxiety from questionnaire results. Researchers wanted to express the mathematics anxiety with mathematics anxiety indicators. Researchers here also observed the characteristics of students' mathematics anxiety during math exams.

### 3. Result and discussion

The results of this study include the results of observation, mathematics anxiety questionnaires, and the results of interviews to students and teachers to be provided in the form of sentences and Tables. Table 1 will explain the percentage of mathematics anxiety as a whole, and Table 2 will explain the percentage of mathematics anxiety per somatic, cognitive, and attitude indicator.

#### Table 1. The results of the percentage of students' mathematics anxiety in overall levels.

| Aspects              | Level   | Mathematics Anxiety |
|----------------------|---------|---------------------|
| Mathematics Examination | High    | 29.4%               |
|                      | Medium  | 41.2%               |
|                      | Low     | 29.4%               |

Based on table 1 above, the overall data show that the mathematics anxiety experienced by students when the math test was at a moderate level with a percentage of 41.2%. Meanwhile, the mathematics anxiety was at a high level with a percentage of 29.4% and on mathematics anxiety that was at a low level with a percentage of 29.4%. These results showed that there were still many children who had problems with mathematics anxiety. Next, it is the description of the percentage of mathematics anxiety per indicator, it is described in table 2.

#### Table 2. The results of the percentage of students' mathematics anxiety in levels of each indicator.

| Aspects             | Level | Indicators | Somatic | Cognitive | Attitude |
|---------------------|-------|------------|---------|-----------|----------|
| Mathematics Exam    | High  | 41.2%      | 41.2%   | 17.6%     |
|                     | Medium| 23.5%      | 35.3%   | 64.7%     |
|                     | Low   | 35.3%      | 23.5%   | 17.7%     |

Table 2 showed that the data illustrated the mathematics anxiety which experienced by students when they did the mathematical exams and it was analyzed each diverse indicator. The percentage of mathematics anxiety on somatic indicator at high level with percentage 41.2%, moderate rate 23.5%,
and low level 35.3%. Things that cause high mathematics anxiety on the somatic indicator in accordance with the recognition of students who mentioned before that they often experienced dizziness and even sweating when completing math exams alone when facing a problem that they have never seen before. Students also admitted nervous at the math test with a variation of problems and especially if the students had less preparation for the exam materials.

The percentage of mathematics anxiety in cognitive indicators at high level with its percentage 41.2%, moderate rate 35.3%, and low level 23.5%. Things that cause high mathematics anxiety on cognitive indicators that students often forgot what they had learned for the exam, students were also often uncontrolled during the exam, students were confused what they should do with the matter first and they did not want to fail the exam. Most students considered that mathematics to be the most difficult subject than any other subjects. The height of mathematics anxiety was also caused by the mathematical problems which were very complicated and the most difficult thing so that it was difficult to be understood by students. Moreover, most students at school did not attend additional tutoring/additional course outside school hours. In this cognitive indicator, it may affect the somatic indicator because if the students were ready and they could solve math problems then the possibility of anxiety on the somatic indicator in the low level appears. Most students who have high mathematics anxiety are difficult to understand the material given than those who got low math skills.

The percentage of mathematics anxiety on attitude indicator was at high level with its percentage 17.6%, medium grade 64.7%, and low level 17.7%. The teacher expressed students this year a little more interested in compared with previous students. Students also reveal that teachers who taught them were fun so they felt comfortable at the time of learning although students sometimes felt embarrassed when they were told to move forward. But the teacher reveals when the math test conditions make students' attitude become tense, anxious, and even annoyed at friends who interfere with their concentration. The fear of math exams was like a tradition from year to year.

Looking at students' responses, they proved that between the mathematics anxiety indicators, one with another were interconnected. Then, from Table 1 and Table 2 above, mathematics anxiety was still experienced by students of Senior High School 1 Puding Besar. In this case, mathematics anxiety still affects the mathematical achievement of students [17,18]. Many factors which cause mathematics anxiety, but the most obvious was the fear of the math test itself. Anxiety about math exams that they had met while they were still in junior high school [19]. The fear of mathematics exams does not only happens to passive students but also some active students. The proper design of teacher's way of teaching or preparation and the teacher's emotional approach to students were needed so that the fear of math exams can be reduced.

Based on the above explanation, the results showed that data from questionnaires of mathematics, interviews, and observation showed mutually supportive results. From the results of the analysis, researchers argue that the anxiety of mathematics that occurs in this school was still general. Mathematics anxiety experienced by students was at a moderate level. However, in term of the somatic indicator, and cognitive was at a high level whereas the attitude indicator was in the middle level. These results needed to become the teacher's concern for students' achievement in this school to get increased.

### 4. Conclusion

Based on the results and discussion of this research, the researcher concluded that in general, the anxiety of mathematics in the students of grade XI Science program/ IPA in Senior High School 1 Puding Besar at the time of the math test was in the medium category. However, the Somatic and Cognitive indicators showed high levels of mathematics anxiety. Meanwhile, the attitude indicators of math anxiety at the middle level. This may happen because students considered that mathematics as a difficult subject, they considered that the exam was a scary thing that many students got dizzy when dealing with math exams. Though students liked the style of teachers who taught in the classroom that made them comfortable, but their circumstances were different when experiencing the math test. Students also experienced the anxiety, nervousness and fear when they were not ready for doing a math test.
Mathematics teachers should consider the level of students' mathematics anxiety especially when facing math exams. Teachers should also make learning plans which not only think of fun learning but also must be able to optimize students' math skills so that they were ready to be given even complex mathematical problems. Researchers here hope that there will be further research about the solution which can solve the problem of mathematics anxiety in this school so that students' mathematical achievement can be increased.

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