Anxiety of Primary Students' Teacher in Learning Statistics and Its Relationship to Statistical Learning Outcomes

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Abstract

Learning statistics are useful for primary students' teachers, although they are prepared to be primary school teachers. Statistics can develop student's critical thinking, logic, and necessary in completing their final project, but some student's teachers do not notice and also have learning anxiety which affects their learning outcomes achievement. Learning anxiety is caused by many factors and must be reduced to achieve maximum learning outcomes. This study explores the relationship between statistical learning anxiety and learning outcomes and describes what factors make students anxious in learning statistics. This study used a quantitative approach that explored the relationship between statistical learning anxiety and statistical learning outcomes using the non-parametric test by Spearman Rank correlation test. Data was collected through tests, questionnaires, and student reflections. Test and anxiety questionnaire results analyzed quantitatively, while the results of interviews and reflections will be analyzed qualitatively. Statistics questions tests are arranged based on statistical learning objectives; questionnaires are arranged based on learning anxiety indicators. The subjects of this study were 72 students of the primary student's teacher. The results showed that there was a relationship between statistical learning anxiety and statistical learning outcomes in primary student's teachers. Students' statistical learning anxiety has impact to encourage students to achieve their learning outcomes goals. Based on interviews and reflection data, some of the factors that influence student anxiety include information from seniors who say statistics subject so difficult, mathematics prior knowledge students still relatively low, and their fear of the risk of failing in statistics subject.

Keywords: Learning Outcomes, Statistic Anxiety, Students Teacher

Introduction

Statistics is a science that discusses data collection, data presentation, data processing and data generalization (Riyanto, 2018). All study programs at universities in Indonesia are equipped with Statistics courses, including for prospective elementary school teachers (González, Rodríguez, Faílde, &; Carrera, 2016; Rangkuti, AN, &; Fitriani, F, 2019); Subekti, FE, & Akhsani, L, 2020. Tishkovskaya, S., & Lancaster, G. A., 2012). Elementary school teachers in general are teachers who can teach various subjects because their learning is based on themes known as thematic learning. So, prospective elementary teachers also need to learn statistics because they are also prepared to teach elementary mathematics. In addition, statistics can also help train someone in solving problems, thinking critically, and making the right decisions based on data (Kesici, Baloğlu, & Deniz, 2011). Statistics help students develop their thinking skills in solving various problems. Statistics focuses on concepts, data, and inference, how to describe inferences about phenomena based on existing data. Statistics is also very applicable and is indispensable in everyday life and various fields (Chasanah, AN, Wicaksono, AB, 2020). Statistics are open to interpretation and have no absolute certainty value because generalizations depend on sample data, so no one can determine their truth. So, statistics are needed for prospective teachers both in work as teachers and as significant members of society.

Prospective elementary school students need to understand what statistics are and why statistics are important. If students can understand problems, design experiments, and collect data, conduct surveys, and ask important questions, students will feel a significant impact from statistics so that students can feel the great contribution that students can make when they master statistics courses. However, students often focus more on the difficulty of learning statistics and their final learning results, so students do not enjoy the process developed in themselves while studying statistics. Their difficulties and obstacles in learning and focusing on the result, this is what triggers their learning anxiety to appear. Anxiety about learning statistics is common in social science students, including Primary student's teachers. This is due to the lack of school mathematics knowledge and the unpleasant previous mathematics learning experience (Malik, S., 2015; Paechter et al., 2017).

Learning anxiety can cause students to lose confidence in learning mathematics (Panitz, T. 2023). Learning anxiety can hinder learners in achieving their designed learning goals (Aryani and Hasyim, 2018; Wulandari & Agustika, 2020). Statistical anxiety is slightly different from mathematical anxiety because statistics deal with procedures, using more than mathematical symbols; The cognitive process of statistical anxiety is different from mathematical anxiety. In addition to the manipulation of mathematical symbols, statistical anxiety is more associated with linguistic understanding of data processing. Statistical anxiety creates significant inconsistencies with respect to cognitive processing compared to mathematical anxiety (González et al, 2016). But these two anxieties are interrelated. Statistical anxiety is strongly associated with math anxiety as well as learning anxiety in other related areas (Yang, S. 2021). Learners with high math anxiety tend to be more anxious about statistics as well.

Anxiety will usually arise if the student faces a situation that he considers threatening. This condition will make students think negatively of themselves. Math anxiety often results from unpleasant experiences in learning mathematics (Panitz, T, 2023). Students who feel excessive anxiety often make mathematics a subject to avoid (Priyani, 2013). Anxiety is a psychological condition full of anxiety due to certain things that can affect including: (1)

physiological conditions such as heartbeats, heart palpitations, paleness, nausea, (2) cognitive conditions such as difficulty concentrating and (3) psychological conditions such as feelings of pressure or fear (Nazliati, N, Sari, R, & Fitriani, F. 2019). Math anxiety is a feeling that involves fear when faced with the possibility of handling Math problems (Febryliani, 2021; Soewardini, H.M.D, 2019). All Primary student's student teachers from Pelita Harapan are students who get scholarships and are bound by various regulations. One of them is the GPA standard that they must achieve every semester and are expected to be completed in 8 semesters during their education. In addition, there are several conditions that must be met, for example, being able to take the first field Experience course on the condition that the course fails a maximum of two courses. Students are also required to live in dormitories, so they have an incredibly open connection with information from their seniors. So that this becomes the situation behind their condition, anxiety, and achievement.

Although failure to learn statistics is entirely influenced by learning anxiety, it is necessary to measure how much anxiety will affect their math ability and what factors affect their math anxiety. This is to be able to help what actions need to be improved to provide a better learning experience for students so that the goals of education can be achieved. This study's purpose is to determine the relationship between statistical learning anxiety and learning outcomes and describe the factors that cause student statistical learning anxiety. By knowing student anxiety, helping to provide information on student learning needs so that learning goals and objectives can be achieved properly because intervention on student mindset will be effective in improving student academic achievement (Bostwick K. C. P., Becker-Blease K. A. 2018).

Methods

This study used a quantitative method approach by looking at the relationship between statistical learning anxiety and statistical learning outcomes using the Spearman Rank non-parametric correlation test with the help of SPSS. Data was collected through learning outcomes, questionnaires, closed student interviews. Learning outcome data obtained from test results and questionnaire results are processed quantitatively, while closed interviews will be analyzed qualitatively. The subjects of this study were 72 primary prospective teachers, Teacher Education department.

Result and Discussion

From the data from the questionnaire of 72 Primary prospective teachers, it was obtained that there was a relationship between statistical learning anxiety and student learning outcomes. From the results of SPSS calculations using the non-parametric Spearman Rank correlation test, the following data were obtained:

			Learning_Outcomes	Anxiety
Spearman's rho	Learning_Outcomes	Correlation Coefficient	1.000	.294[*]
		Sig. (2-tailed)	.	.020
		N	72	72
	Anxiety	Correlation Coefficient	.294[*]	1.000
		Sig. (2-tailed)	.020	.
		N	72	72

Table 1: Correlation between Student's Anxiety and Learning Outcomes

From table 1: significance value of 0.02 indicates Ho is rejected, meaning that there is a correlation between statistical learning anxiety and the value of statistical learning outcomes. By comparing the values of Z count and Z of the table obtained the calculation as follows: $Z = rs\sqrt{(n-1)} = 0,294\sqrt{(71)} = 2,48$ and $Z_{table\,(0,05)} = 1,64$. So, Ho was rejected, meaning that there is a correlation between learning anxiety and student statistics learning outcomes. The correlation value is 0.375 when viewed $R^2 = 0,086$ This means that learning outcomes are only affected by 8.6% of their learning anxiety. The positive correlation value shows the learning anxiety experienced by students encouraging students to learn better. College students' anxiety is not high anxiety but low and moderate anxiety. Where students can still control their anxiety into learning motivation, they are learning more statistics with various support systems provided such as tutorials and peer tutors.

When viewed from the results of the questionnaire, most students experience anxiety about learning statistics. The results of the questionnaire showed that 15% of students did not experience anxiety in learning statistics, but 85% experienced anxiety in learning statistics. Students stated that they were afraid of getting a failing grade in the statistics course. The following are the results of student questionnaires that state that students are afraid of failing in the educational research statistics course:
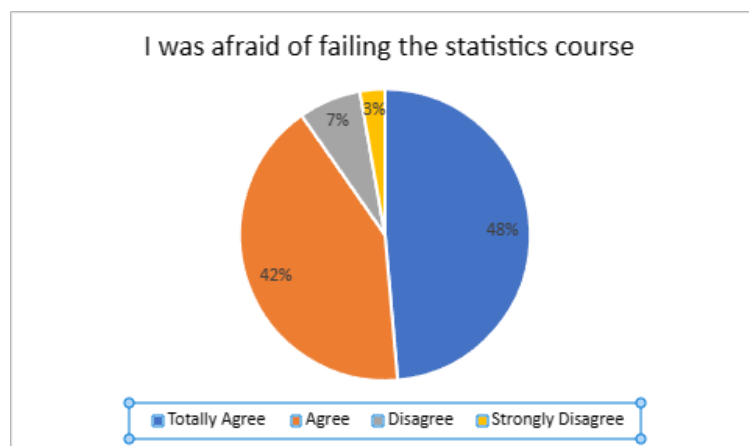

Fig. 1: Student Afraid About Failing in Statistics Course

From fig.1, only 10% of students are not afraid of failure while 90% have a fear of failing in statistics courses. From the results of closed interviews, students are afraid to fail the statistics course because of their poor mathematical skills and material that is still not mastered, the results of quiz and midterm test scores are low, the results of their achievements in that semester will be decisive in participating in the field experience program. If any course fails, it will have a significant impact on the subsequent course contract. However, students do the

tasks given and learn as well as possible. Even so, there are students who are not afraid to fail in statistics courses because students assume that if they have the intention to learn and want to try, students believe that it is important to practice a lot and they want to prove that statistics is not as difficult as what many people say. There are also students who make their worries a motivation to learn this course and try to always encourage themselves to continue learning and mastering the subject matter.

Students experience anxiety before taking tests, both quizzes and written exams such as midterm and final test. Students are anxious when they are approaching the exam because they have not studied optimally in preparing for the exam, unable to complete the questions given correctly, the form of exam questions that are different from the sample questions given in class, the number of assignments they have to collect during the exam week and will interfere with their exam preparation. After exams, students are anxious about their test scores because they have not been as expected and there is no chance of remedial. Students feel that they have prepared for the exam seriously, but the results are not as expected. But even so, when viewed from the results of the questionnaire, students prepare themselves before there is a test. Here is the data from the questionnaire:
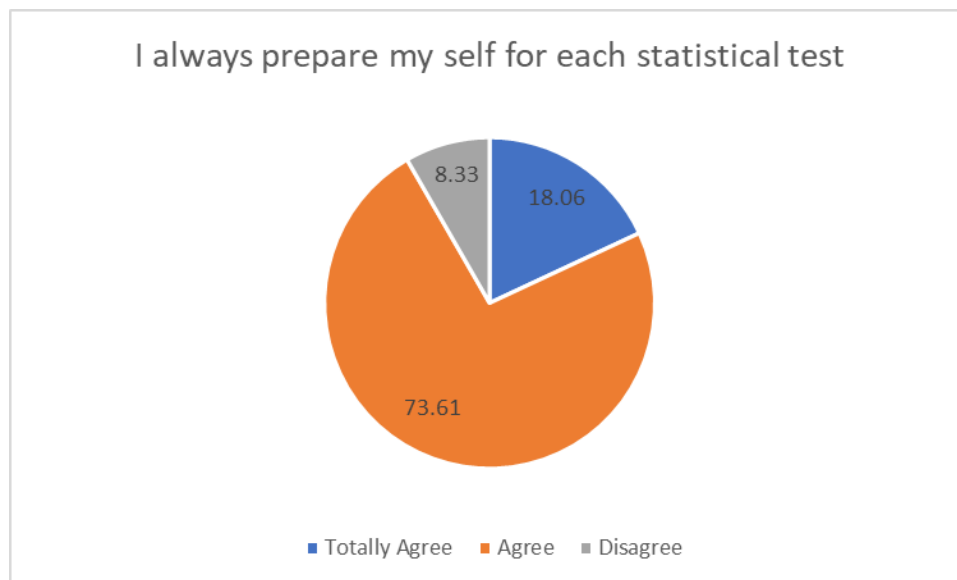

Fig. 2: Student Prepare Their Self for Each Statistical Test

When viewed from the results of the questionnaire in fig. 2 data, although there is anxiety in students, 91.67% of students prepare themselves before the test. Only a small percentage did not prepare well before they took the statistical test, which was 8.33%. Even though they have prepared themselves for the exam, there is still a feeling of fear in students in facing the exam, because the ability to analyze questions is still low, sometimes lack focus and forget what stages to do to do the questions, lack confidence in the answers, and consider the test difficult. But students feel they must learn more than usual. Students who do not prepare well are also very worried because of lack of preparation. Unlike students who do not experience the anxiety of studying statistics, they can manage their emotions well. During exams, students have a unique way of preparing themselves, so they do not tend to panic during exams. In addition to these reasons, there are students who are not so focused on the results; the important thing is that they have done their best in learning. They do not feel anxious and afraid when learning something new and realize that their worries will hinder them from following the learning.

In addition to feeling anxiety before and after the exam, there are also students who experience anxiety during learning when students are appointed to come forward but cannot explain. Yep, (2023) found that students are worried about getting negative ratings from peers if they cannot do the assigned tasks well. In addition, students also experience anxiety about their ability to understand the material explained by the lecturer and consider statistical material to be difficult in nature. There are students who feel anxious when comparing themselves with their friends who have mastered the learning material during class, but they cannot understand learning. Students immediately judge themselves as not being able to master the lesson because their other friends have mastered it. In addition, students' low understanding of mathematics affects students' statistical learning anxiety (Smith, Brumskill, Johnson, & Zimmer, 2018). Students are not yet confident in their mathematical skills in solving statistical problems. The following are the results of the student questionnaire regarding his confidence in solving statistical problems:
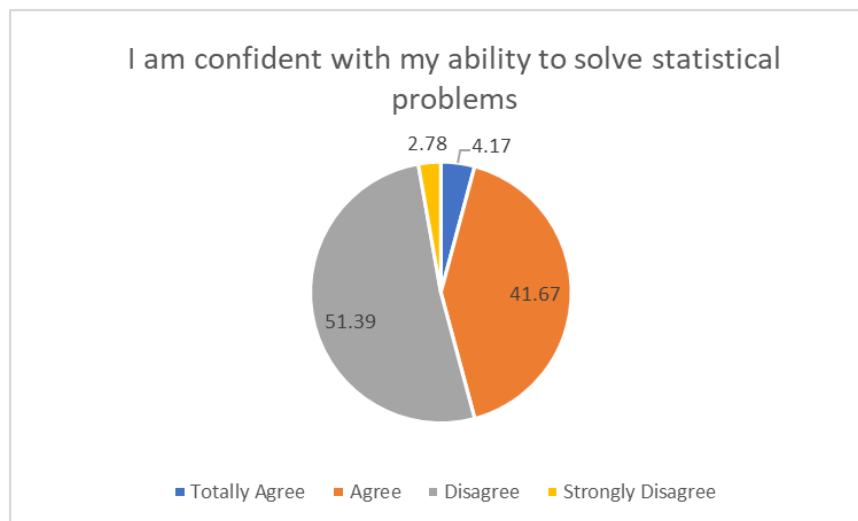

Fig. 3: Student Confident With Their Ability to Solve Statistical Problem

From fig.3, as many as 54.17% of students admitted that they did not have confidence about their ability to solve statistical problems while 45.83% had confidence that they were able to solve statistical problems. In addition, doubts about students' ability to solve and capture statistics lecture material due to lack of initial knowledge of mathematics. Students admit that they are weak in mathematics, have difficulty understanding material concepts, analyzing problems, and applying what formulas will be used. Although many students consider statistics difficult, some students can see the difficulty in learning statistics with different sides. Some students consider statistics not so difficult because the calculations are accompanied by tables that can make it easier to do problems, after attending statistics classes students will be able to master if they focus on listening to the lecturer's explanation in class well, doing exercises seriously and learning more. Some of the things that students do in statistics lectures include always asking friends to study together and asking friends and tutors about material that is not understood, trying to motivate themselves that statistics can still be mastered if they want to practice.

When viewed from the results of closed interviews, things that cause student learning anxiety in learning statistics include: Information obtained from previous seniors that many students who have finished taking this course say that statistics courses are difficult and many students do not graduate in statistics courses. The fear of students if they fail and repeat the statistics course is the main cause of their anxiety. The weight of statistics courses as much as 3 credits

will have a major effect on students' GPA and can affect the courses they can teach in the next semester. Students consider statistics a difficult subject because many formulas and concepts are quite difficult for students to understand (Nurhusain, M, & Hadi, A, 2021). Many students admit that they find it difficult to compile hypotheses and other concepts in inference statistical materials, especially some lecture materials in English. The limited mathematical ability of previous students also makes it difficult for students to understand the material, analyze problems, and apply what formulas will be used (Gurat, M.G., 2018). College students need more practice. In addition, interrelated material factors also affect the mastery of student material because when there is material that students do not understand, it will affect the mastery of the next material.

Conclusion

The results showed a correlation between statistical anxiety and the achievement of mathematics learning outcomes. Student anxiety in learning statistics can still be controlled so that it has an impact in encouraging student enthusiasm in achieving good learning outcomes. The main cause of student anxiety is their fear of failing the course because they see their seniors who repeat by seeing their low math skills and students trying to learn so as not to fail in statistics courses. However, educators need to make students feel comfortable in learning statistics first (Condron, D.J, 2018). Students also experience anxiety when facing exams because students have concluded that statistics courses are difficult, and students' statistical skills are low and their fear of not passing statistics. This condition is a consideration in assessment that does not focus on the form of written assessment and does not focus on the assessment of the form of written tests but the growth of students in learning and can experience the benefits of learning statistics in their daily lives and the benefits they feel in learning. It is necessary to shape the mindset of students by seeing the good impact if they master statistics because they can feel statistics in various aspects of their lives. In line with the results of Nasution's research, S.H. (2019) that interactive tasks with stages of analysis, design and development can reduce student anxiety in doing mathematical tasks. In addition, the results of research by Smith, T.F. (2019) found that by approaching how the mindset of students, how statistics affect their lives, their growth-oriented mindset will reduce anxiety about learning statistics.

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