The differences in mathematics learning outcomes of elementary school teacher education UNNES students in terms of gender and specialization of majors in senior high school

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Abstract. The purpose of this research was 1) to determine the differences in the mathematics learning outcomes between male and female students, 2) to determine the differences in the mathematics learning outcomes of students from mathematics and science, social, language, and vocational majors. The population is the third semester of elementary school teacher education Universitas Negeri Semarang (UNNES) students. Samples were obtained randomly. The authors using non-parametric data tests because the data were not normality distributed. From the 228 data obtained, the Mann Whitney data test obtained the Asymp.Sig. 0.57> 0.05, so the fact that there is no difference in mathematics learning outcomes of elementary school teacher education UNNES students when viewed from gender. However, if it is viewed from the specialization of the major in Senior High School, the Kruskal Wallis data test obtained the Asymp.Sig. 0.001 <0.05, so the fact that there is a significant difference in mathematics learning outcomes of elementary school teacher education UNNES students.

1. Introduction

Research in gender always interesting to study. Gender identity is often defined in terms of feminine or masculine sex-role identity [1]. Whether gender influences interest in learning mathematics. Mathematics as a universal science in modern technology development has an important role in various disciplines and human mind power development also [2]. A lot of multi-disciplines implement mathematics. All fields of study require appropriate mathematical skills [3]. In STEM math-intensive fields, females still being underrepresented even though the gender gap in course-taking and performance of math has been narrowed in recent decades [4]. Girls and boys had similar beliefs in their ability for doing math and reporting their anxiety when doing that regardless of cultural background. [5]. Women perform better and consistently solve more math tasks on an extensive and intensive margin at high temperatures [6]. Although the majority of students are women, they constitute a minority of holders of STEM degrees. [7].

Senior High School in Indonesia has various types. The first is Senior High School itself. The second is Vocational High School. The third is the Madrasah Aliyah. In Senior high School, students are given a choice specialization major in 10 levels. They learned more deeply in these majors that they choose. The specialization majors are mathematics and science, social, language, vocational. There are many majors in Vocational High School. There are office administration, accountancy, multimedia, marketing, Syariah banking, health analysis. We think students who choose mathematically and science

have higher abilities in mathematics. There are previous findings that show that vocational school students have low math skills [8]. Previous research found there was a consistently significant positive effect of all schoolboys across STEM outcomes but not girls [9].

Researchers wanted to know why the mathematics learning outcomes of elementary school teacher education UNNES students were low. Researchers want to know the root of the problem and try to find a way out. Researchers want to identify it. Researchers want to know the differences in mathematics learning outcomes of elementary school teacher education UNNES students in terms of two aspects. There are gender and specialization of majoring in Senior High School. Several references that state that men's math abilities are different than women's, but some say both abilities are the same. Elementary school teacher education UNNES accepts students with various majors in Senior High school. There are Mathematics and Science, Social, Language, and Vocational majors. Logically, mathematics learning outcomes will be higher for the students who come from mathematics and science majors than others.

2. Methods

The population of these researched are thirds semester students of elementary school teacher education UNNES. There are 404 students. The researchers take a sample of 282 students-randomly. The data test took a nonparametric test because the data was not normality distributed, so the parametric test assumed cannot be fulfilled. The data test using Mann Whitney test to check the differences in mathematics learning outcomes between male and female students. The data test using the Kruskal Wallis test to check the differences in mathematics learning outcomes between students who choose mathematics and science majors, social majors, and language and vocational majors.

3. Results and Discussion

The first problem in this study is whether the differences in the mathematics learning outcome between male and female students. In this case, the mathematics learning outcome is the advanced mathematical concept course score. For the first step, the authors check the normality distribution of female and male scores. From table 1, we can see that both mathematics learning outcomes data were not normality distributed. So we choose the Mann Whitney test.

Table 1 Tests of Normality male and female mathematics learning outcomes data

	gender	Statistic of Kolmogorov-Smirnov[a]	df	Sig.	Statistic of Shapiro-Wilk	df	Sig.
Mathematics	male	0,140	32	0,114	0.885	32	0,003
learning outcomes	female	0,126	196	0,000	0.954	196	0,000

[a] Lilliefors Significance Correction

Before we use the Mann Whitney test, we check the homogeneity of the data with the test of Levene. Table 2 is the result of homogeneity variances. We can see that both of the data are homogeneity variances. So, we can continue with the Mann Whitney test. Now we can check the differences in mathematics learning outcomes between male and female students. Table 3 gives the information that the Asymp. Sig scores more than 0,05 so there are no differences in the mathematics learning outcomes between male and female students. There are research findings that explain why similar educational systems may have different impacts on the relative performance of mathematics for girls and boys, and also the key factor is the interaction between culture and institutions[10]. Indonesia gives freedom for both men and women to receive an equal education. The hope is that no imbalance in math abilities between men and women in Indonesia. This is good news for the authors. So that researchers do not need to give different treatment in mathematics learning in elementary school teacher education Universitas Negeri Semarang.

Table 2. Tests of Homogeneity Variances Male and Female mathematics learning outcome data

Mathematics learning outcomes

Statistic of Levene	df1	df2	Sig.
0,485	1	226	0,487

Table 3. Mann Whitney test

	Mathematics learning outcomes
Mann-Whitney U	2480
Wilcoxon W	3008
Z	-1,903
Asymp. Sig. (2-tailed)	0,057

[a.] Grouping Variable: gender

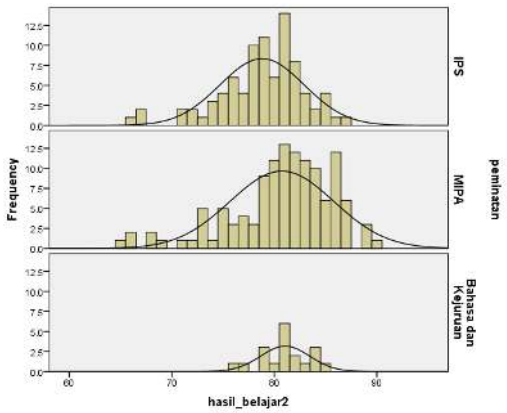
The second problem in this article is whether the differences in mathematics learning outcomes in terms of three majors. There are mathematics and science majors, social major, language, and vocational major. We do the same to check the normality distribution of the data. We can see it in table 4, only one data that normality distributed. So we use the nonparametric test.

Table 4. Test of Normality of the learning mathematics outcomes in term of three majors

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Mathematics learning outcomes	Majors	Statistic	df	Sig.	Statistic	Df	Sig.
	Social	0,132	86	0,001	0.948	86	0,002
	Mathematics and Science	0,133	123	0,000	0.936	123	0,000
	Language and Vocational	0,175	19	0,126	0.953	19	0,437

[a.] Lilliefors Significance Correction

In the second step, we check in each group has the same variability. The result can be obtained from picture 1. From the picture, we can see that the 3 groups have the same variability.



Picture 1. Variability of the 3 group majors

After that, we can see the result of the Kruskal Wallis test in table 5. From that table, we can see that asymp Sig. score 0,001< 0,05 so there is the differences mathematics learning outcome from the three groups. We can see the rank in table 6. The mathematics and science majors specialization be the top rank, second rank language and vocational majors, and the last from the social major.

Table 5 Kruskal Wallis of the three group

	Mathematics learning outcomes
Chi-Square	14.991
Df	2
Asymp. Sig.	.001

[a.] Kruskal Wallis Test

[b.] Grouping Variable: majors

Table 6. The rank of the three group

	Majors	N	Mean Rank
Mathematics learning outcomes	Social	86	92.85
	Mathematics and Science	123	127.85
	Language and Vocational	19	126.08
	Total	228	

It was interesting, we think there is vocational major from accountancy give a big impact in this score rank when beating the social major. The authors are not surprised that the mathematics and natural sciences majors are at the top. But the language and vocational majors take second place is surprising. The authors think social science majors rank second. It turned out to be the opposite. There is a research in Bandung district show that the critical thinking skill mathematically of vocational students is still relatively low, it is based on written tests and interview with students[11]. Besides, almost all the preservice teachers wrote negative statements concerning the vocational high school student attitudes and approaches towards mathematics[12]. Vocational high school students, when they faced with abstract conceptual courses in mathematics classes if only explained by texts and graphs on textbooks and teachers' blackboards, are still quite difficult for many vocational students[13]. The authors do make language and vocational majors into one because there are only a few people in language majors. While there are vocational majors from various vocations. It turns out that after being traced, accountancy vocational majors are the largest compared to other vocational majors. Because in the vocational accountancy department, students often practice applying mathematics more than other majors. This is what causes language and vocational majors to take second place. Vocational interest is an important predictor of life outcome that can demonstrate additional validity for the personality traits of Big Five has demonstrated in research. [14]. Indeed, SMK had a higher effort, mastery goal orientation, and self-confidence[15]. It is necessary to find the best strategy for learning mathematics for elementary school teacher education students of Semarang State University with various backgrounds. This is a challenge for researchers. One important subject in primary school is mathematics. Primary school students need to have mathematical skills to be applied in everyday life. Mathematics lessons in elementary school are also taught in quite a large portion. So that students of elementary school teacher education in Universitas Negeri Semarang who will teach in primary schools later need good mathematical skills.

4. Conclusion

The conclusion from this paper, mathematics learning outcomes between male and female PGSD UNNES students are the same. However, the mathematics learning outcomes of PGSD UNNES students when viewed from their specialization in majors in Senior High School are very different. It will give the information to the lecture what they have to do the learning process for the next.

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