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Gender Differences at Mathematics Competitions in Serbia

Extended summary

Numerous studies in the world indicate the existence of gender-related differences in students' mathematical achievements. These differences have significantly decreased over the last few decades, but have not completely vanished. Mathematical competitions play an important role in increasing interest, motivation, self-confidence, and enthusiasm for mathematics, but also in identifying and supporting mathematically gifted students. Therefore, it raises the question whether and to what extent gender differences exists in mathematics competitions. Since there have been no in-depth studies on the topic of gender and math competitions in the Republic of Serbia, we have decided to make it the subject of our research.

The aim of this paper is to analyze the continuity of student interest and success and to examine the existence of trends in district mathematics competitions concerning gender during the ten-year period, from 2014 to 2023. The research sample comprises 53,490 students from the 4th to the 8th grade of elementary school, who participated in district mathematics competitions for elementary school students in the Republic of Serbia from 2014 to 2023. We employed tests consisting of five tasks, and participants were allotted 150 minutes for completion. These tests are organized every year and the scoring proposal is made by the State Commission for the Competition of Elementary School Students. The Mann-Whitney test and the

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Mann–Kendall test were used in the statistical analysis of the data to check the significance of differences and trends.

The obtained results do not show a trend of change in the total number of participants in district competitions. The primary reason for this is the emergence of the COVID-19 pandemic, although there was a trend of increasing the number of participants in the 6th grade and a trend of decreasing the number of participants in the 8th grade before 2021. Altered working conditions in schools led to a reduced number of competition participants, so two years after the abolition of epidemiological measures, the number of participants remains lower than in 2015. A significant decrease in the number of participants per class was registered, where the average number of students at the end of the second cycle of compulsory education being 63.8% lower than at the end of the first cycle.

In the observed ten-year period, every year in all classes, a greater number of boys participated than the number of girls. Although there is a slight decrease in the difference in the number of boys and girls when moving from the 4th grade of primary to middle school grades (grades 5 to 8), however, by the end of elementary school education, the difference becomes significantly larger. While no trend of increasing participation of boys or girls at the class level has been determined, there is a global trend of increasing the number of boys compared to the number of girls among all district competition participants. In terms of student achievement, it was determined that the average number of points of boys in the fourth, fifth and seventh grades, was consistently higher than that for girls over the past 10 years. Girls achieved a better result than boys in only 3 out of 50 measurements. The data show that there is a statistically significant difference in the achievements of boys and girls in 60% of cases, with this difference favoring boys 96.67% of cases. Additionally, it was established that there are no permanent statistically significant differences among students of the same generation from 4th to 8th grade concerning gender. At the top of the distribution of students in relation to the achieved results, there is a consistently higher representation of boys. Only in the fourth grade, there is a trend of increasing the number of boys among the top 5% of the most successful students. Conversely, at the top of the distribution, a larger number of boys are noticeable among students whose achievements fall below the median, while in the sixth grade there is also a trend of increasing the number of girls with achievements below the median. Based on the research findings, it can be argued that there is a gender gap in relation to participation in competitions. The findings of our study indicate the need to investigate the causes of gender differences in participation and success in competitions and to determine the ways to address them.

Keywords: gender differences, mathematics competitions, student achievement, trend analysis

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