# Enhancing PISA 2022 Mathematics Performance in Slovenia: A Gender Analysis Approach to Additional Instruction Methods

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## Ethical considerations

Not applicable

## Consent to participate

Not applicable

## Consent for publication

Not applicable

## Declaration of Competing Interest

The authors have no competing interests to declare.

## Funding

This work was supported by the Research and Innovation Agency grant J1-4031.

## Acknowledgments

The authors have no acknowledgments to declare.

## Data availability statement

The authors declare that the data supporting the findings of this study are publicly available. Dataset used is publicly available at OECD <https://www.oecd.org/pisa/data/>.

## Abstract

Background

The PISA 2022 datasets offer valuable opportunities to deepen our understanding of the additional factors influencing students’ performance on mathematics assessments. In Slovenia, there is growing interest in how various instructional methods beyond the classroom impact student outcomes.

Methods

This study employs an exploratory design to investigate the impact of supplementary mathematics instruction on Slovenian students' performance in the 2022 PISA assessment. The research analyzes the prevalence and perceived effectiveness of different instructional approaches, including one-on-one tutoring, digital resources (such as video instruction), and group study sessions. Chi-square tests were used to examine gender differences and compare distributions between Slovenian and international student samples. Additionally, we conducted a regression for mathematics performance to assess the effect of various instructional methods on students' math literacy in Slovenia, using Rubin's rules for pooling estimates.

Results

The analysis revealed that most students reported not receiving additional instruction. Among those who did, Slovenian students showed a preference for video instruction, while one-on-one tutoring was more common globally. Significant gender differences were observed: in Slovenia, females preferred one-on-one tutoring, while males favored video instruction. Internationally, gender differences were significant across all methods except for large group instruction. Regression results showed that one-on-one and large group instruction were negatively associated with math scores, while video and small group instruction had positive effects. Notably, students who received no additional instruction performed significantly better than those who participated in one-on-one or large group formats.

Conclusions

The findings highlight the diverse instructional preferences among students and the role these preferences may play in shaping educational outcomes. This study emphasizes the need for a balanced integration of digital and traditional learning methods and provides insights that can inform educational practices and policymaking aimed at enhancing mathematics instruction and student achievement.

## Keywords

Assessment, Gender Differences, Instruction Methods, Mathematics education