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Students' perceptions of the teaching subjects and student achievement as factors of orientation towards mathematics and natural sciences in high school²

Extended summary

Relevant literature indicates an insufficient number of high school students in the Republic of Serbia, emphasizing that they should present the basis for forming the future cultural and intellectual elite, the foundation for continuing education at universities, and the support that drives the country's development. On the other hand, a declining student interest in STEM, which is necessary for the progress of the modern society, represents a worldwide problem. Previous research has shown that students understand the importance of mathematics and natural science subjects in everyday life and find them interesting, but also complex and abstract, and that not all students, despite their efforts, can achieve high performance. Pointing out how interests related to natural science and mathematics are changing, researchers explain that it is essential to consider factors related to three significant elements: family influence, academic success, and the context in which education occurs.

In this paper, the authors focused on analyzing the previous educational experience of the high school students to identify some factors that may influence the continuity of students' interest in mathematics and natural sciences. Earlier studies regarding students' perceptions of different teaching subjects did not consider students' orientation. Therefore, this study examines the high school students' perceptions of their educational experience in primary school,

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comparing the differences in the responses of students enrolled in the mathematics and natural sciences stream of studies and other students. The sample consists of 1054 students from two high schools from Kragujevac (551 students) and two high schools from Novi Sad (494 students). To reach the potential differences in students' perceptions, the authors divided the sample into two groups. The first group encompasses the students (435) who chose to study mathematics and natural sciences more thoroughly (students attending the natural sciences and mathematics stream of studies and specialized departments for students with special abilities in mathematics, informatics, physics, biology, and chemistry). All other students - social sciences and humanities stream of studies, bilingual departments, and students with special abilities in sports and philological sciences - represent the second group of the sample (610).

One of the factors for enrollment in high schools, especially the classes in which mathematics and natural sciences are dominant, is the overall students' success at the end of primary school, as well as potential differences between the two groups of the students. More precisely, it has been confirmed that students who study mathematics, informatics, physics, biology, and chemistry more intensively have a higher overall success in primary school. Students who enrol at natural sciences and mathematics stream of studies, as well as specialized departments for mathematics, informatics, physics, biology, and chemistry, have less favourable opinions of subjects such as native language, foreign languages, history, geography, art, physical education, but also biology, while they significantly prefer mathematics, informatics, and physics. Additionally, students oriented towards natural sciences and mathematics perceive mathematics and informatics, physics, and chemistry, as considerably less difficult, and rate the teaching content as more interesting and useful compared to their peers. Interestingly, biology as a natural science does not fit into this pattern; there are no differences in the perception of the difficulty, interest, and usefulness of this subject between the two groups of students. Moreover, the students oriented towards social sciences, arts, and sports consider biology to be a more favourite subject than the students oriented toward mathematics and natural sciences.

Students from the sample do not rate the difficulty, interest, or usefulness of teaching subjects by the highest average rating. Although the fact that students do not perceive subjects as too difficult could be optimistic, the rating of interest and usefulness of subjects differs from the responses of students from a few decades ago. Those results can lead to broader pedagogical dilemmas related to contemporary students' views of school and education.

Keywords: students' preferences, factors of orientation, high school, natural sciences, mathematics

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