

DEVELOPMENT INTO A MATHEMATICALLY HIGH-ACHIEVING STUDENT DURING BASIC EDUCATION

Laura Niemi¹, Jari Metsämuuronen², Markku S. Hannula¹ and Anu Laine¹
¹University of Helsinki, ²Finnish Education Evaluation Centre

Several studies show that student's self-concept predicts better achievement in school (e.g. Bryan, Glynn & Kittleson, 2011; Jiang, Song, Lee & Bong, 2014). Hiltunen and Nissinen (2018) found that mathematically high-achieving Finnish students in PISA 2015 had a higher motivation than other students. However, also other factors have been shown to be important for student's mathematics achievement.

In this study, we investigate the development of mathematically high-achieving students from basic education to the end of compulsory school. We focus on the best achievers in the grade nine evaluation and examine the development of their mathematical performance and attitudes from the grade three. The research questions are:

1. How did the mathematical competence of high-achieving students develop during basic education?
2. Which factors distinguished the mathematically high-achieving students from others?
3. What characterizes students who succeed lower than average level in the third grade and yet develop into high-achieving students in the ninth grade?

In this study, we use Finnish national evaluation data for mathematics that EDUFI and FINEEC have collected (e.g. Metsämuuronen, 2013). The longitudinal evaluation followed one age group's development of mathematical competence during 2005-2015 from the third grade of basic education to the twelfth grade. In our study we focused on mathematically high-achieving students of the grade nine to examine how their skills had evolved during basic education. Moreover, we analysed what kind of factors distinguish them from others less well achieving students.

The longitudinal data consists of 2051 students, who have taken part in mathematics examinations in the third, sixth and ninth grades. We defined high-achieving students based on success in the examination of the ninth grade. Total number of high-achieving students was 256 (12,5 %).

In this study, we used the comparison of means and the Regression analysis for analysing the data. We used different forms of t-test and the Analysis of Variance (ANOVA) to compare between group means.

The results indicated that high-achieving students are distinguished from others in the grade three and the difference with other students is clearly visible in the grade six. Students' previous mathematical competence, self-concept and the level of parents' education were explanatory factors for better competence in the grade nine. We found that the level of high-achieving students can be attained from a lower than average competence level.

References

Bryan, R. R., Glynn, S. M. & Kittleson, J. M. (2011). Motivation, achievement and advanced placement intent of high school students learning science. *Science Education*, 95(6), 1049–1065. <https://doi.org/10.1002/sce.20462>.

- Hiltunen, J. & Nissinen, K. (2018). Erinomaiset matematiikan osaajat. Teoksessa J. Rautopuro & K. Juuti (eds.), *PISA pintaa syvemmältä. PISA 2015 Suomen pääraportti*. Kasvatusalan tutkimuksia 77. Jyväskylä: Suomen kasvatustieteellinen seura, 213–234.
- Jiang, Y., Song, J., Lee, M. & Bong, M. (2014). Self-efficacy and achievement goals as motivational links between perceived contexts and achievement. *Educational Psychology*, 34(1), 92–117.
<https://doi.org/10.1080/01443410.2013.863831>.
- Metsämuuronen, J. (ed.) (2013). *Perusopetuksen matematiikan oppimistulosten pitkäjäsenarviointi vuosina 2005-2012*. Koulutuksen seurantaraportit 2013:4. Helsinki: Opetushallitus.