

Published by

Finnish Education Evaluation Centre (FINEEC)

Name of Publication

Matemaattisen osaamisen piirteitä ammatillisen koulutuksen lopussa 2015 ja pitkän ajan muutoksia

Authors

Jari Metsämuuronen & Visajaani Salonen

The report assesses the level of mathematical competence and the factors connected to it at the end of vocational education in 2015. The materials used represent the fourth set of materials that have been gathered from the same students; the mathematical competence of the students has been monitored at the transitional phases of their primary education after the 2nd grade in 2005, after the 5th grade in 2008 and at the end of the 9th grade in 2012, as well as at the end of their vocational education in 2015.

The final target group included 741 vocational education students. The students who participated in the data collection were on average somewhat more motivated and advanced in their mathematical competence than those who did not participate. However, these materials include a fairly comprehensive number of students representing all levels of competence at the end stage of their vocational education from the different parts, municipality types and language groups of the country.

Two versions of the competence test were developed: one for upper secondary schools (high school) and one for vocational education. Both versions of the tests were based on the test that the students had already completed in the 9th grade. 78 per cent of the tasks were taken directly from that test – part of the tasks were from the 6th grade test and part from the 3rd grade test. The vocational education version included two tasks from the 1998 test for mathematics in vocational education and one problem-solving task related to a practical situation from an old matriculation examination.

When evaluated as a whole, the competence only hardly increased during vocational education. In general, the mathematical competence remains at the level achieved in the 9th grade, but some students regress to the level of 6th or even 3rd grade of basic education.

Men are significantly more successful in mathematics than women by the end of vocational education. The competence of women trails men by approximately two years. Female students felt significantly and remarkably more negative emotions during their studies.

Different language groups provide the chance of achieving an equal mathematical competence level. Swedish-speaking students rose to the level of Finnish-speaking students from clearly weaker starting points and achieved the level of Finnish-speakers by the beginning of the 6th grade, after which there were no differences between any of the groups that were studied. The change has been especially major in the non-urban areas of the former province of Southern Finland.

Vocational education offers the chance of achieving a competence level that is equivalent to an adequate, basic mathematics syllabus competence level. When the students are active, their level does not deviate from the average level of competence produced by the advanced syllabus in mathematics in secondary schools. Therefore, a vocational education does not prohibit those interested in mathematics from developing themselves and achieving a very high level of mathematical competence without a double degree, but this requires personal interest in the matter, as this level is not reached by just following the basic requirements of a vocational education degree. The number of students in vocational education who reach a good level, or especially an excellent level, is very small.

In vocational education, there is a clear connection between having parents with an upper secondary school education and a better result in mathematics. Both parents having completed the matriculation examination – independent of the compositions of their matriculation examination tests or the points received – adds around a 1.5–2 year study advantage for overall competence when compared to those students with neither parent being an upper secondary school graduate. The benefit of a matriculation examination does not seem to increase in secondary school education: the difference between students with upper secondary school graduate parents and students with non-upper secondary school graduate parents is formed during the lower grades and remains the same throughout the school years.

When assessing the pedagogical solutions of teachers, the key factor for explaining *competence* in vocational education is how often the students feel that the matters studied became clear to them. However, it is difficult to determine the cause and effect: it is unclear whether the lack of competence in students is the result of the matters not becoming clear to them or if the matters do not become clear to them since their level of competence is low. It seems likely that, in the best student groups, the best results are achieved with a teacher-led model in which a meaningful differentiation in accordance to competence levels and assessment of the gained results' meaningfulness are combined in the teaching.

The *change* in competence cannot really be explained with factors related to the teacher's pedagogical solutions. The majority of the changes in competence during vocational education can seemingly be explained with other factors.

In vocational education, the variation in student competence levels within the educational organisers is so great that the organiser's actions do not explain their competence at all, with their effect being around 0.5–1%.

The assessment policies of organisers with the best and weakest results do not match. Those units that receive the best results clearly require more competence for the student's final marks than those units that receive the weakest results.

When evaluated as a whole, the competence seems to have slightly increased between the years 1998 and 2015. The competence has increased very significantly in the Natural resources and the environment field. The significant change in competence is likely to be caused by technical reasons; it is possible that the expansion of syllabus in the Natural resources and the environment field and especially in the units of Swedish-speaking organisers has enabled the motivation of those students, who have succeeded mathematically in basic education, to choose this field of study.

The competence has increased especially in Numbers and calculation and it is notable in Statistics and probability and Algebra, as well. The competence of men has increased more than that of women. Possible explanatory factors are the willingness of boys to apply to vocational education even though they would be competent enough for upper secondary school. In addition, the starting competence of girls is lower than that of boys when applying to vocational education.