# More compulsory math lessons do not encourage women to pursue STEM careers

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The demand for employees in STEM careers (science, technology, engineering and math) is particularly high, as corporations compete to attract skilled professionals in the international market. What is known as "curriculum intensification" is often used around the world to attract more university entrants – and particularly more women – to these subjects; that is to say, students have on average more mandatory math courses at a higher level. Scientists from the LEAD Graduate School and Research Network at the University of Tübingen have now studied whether more advanced math lessons at high schools actually encourages women to pursue STEM careers. Their work shows that an increase in advanced math courses during two years before the final school-leaving exams does not automatically create the desired effects. On the contrary: one upper secondary school reform in Germany, where all high school students have to take higher level math courses, has only increased the gender differences regarding their interests in activities related to the STEM fields. The young female students' belief in their own math abilities was lower after the reform than before. The results have now been published in the *Journal of Educational Psychology*.

In order to guarantee a good knowledge of math, all school students in the German state of Baden-Württemberg have to attend four lessons of math per week during the final two years before their leaving exams in the wake of a school reform introduced in 2002. Prior to this, it was possible to choose a math course that only involved three lessons per week. Young women in particular often selected the latter option. However, as a good knowledge of math is linked to the choice of

university courses in the STEM fields, experts expected more young women to opt for a STEM course after the reform.

The scientists therefore examined whether the reform had any influence on the selection of university course later, what effects it had on the math performance of young women and young men, how upper secondary students rated their own achievements before and after the reform and, finally, whether their interest in activities related to STEM subjects had changed. To this end, the researchers compared data from approx. 4,700 high school students before the reform to the same number of students after it.

The results showed that the difference in achievements between young men and young women in math had diminished after the reform, even if young men still performed better. However, although the female students' achievement was higher after the reform, their belief in their own math skills was lower than before the reform. "This may be because they'd more often selected courses with less math teaching before the reform and the higher performance level after the reform then led them to underrate their own accomplishments," says Nicolas Hübner, a primary author of the study, suggesting one reason for this. Young men's belief in their own math skills, in contrast, did not change.

Young women hardly showed any greater interest in studying or working in STEM fields either, while young men were even more drawn to technical or academic activities after the reform. "This suggests that interests can also be influenced by school reforms," says Eike Wille, who is also a lead author of the study. "However, this connection has not been adequately investigated and needs more detailed study." The differences in gender in the selection of STEM university courses have not changed as a result of the reform. Significantly more men still choose these study programs than women.

According to the authors, the results are consistent with prior studies showing that educational reforms often have a significantly lower effect than originally expected. They are also associated with unexpected side-effects in many cases. "Reforms in the education system in the past have often been rather like flying blind," says Ulrich Trautwein, Director of the LEAD Graduate School and Research Network, summarizing matters. "The results of our study underline the significance of systematic accompanying research before, during and after the introduction of educational reforms."

**More information:** Nicolas Hübner et al. Maximizing Gender Equality by Minimizing Course Choice Options? Effects of Obligatory Coursework in Math on Gender Differences in STEM., *Journal of Educational Psychology* (2017). DOI: 10.1037/edu0000183

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