

## **MINTivation-Motivation<sup>1</sup>** **a multilevel school program**

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### **INTRODUCTION**

German constitutional law and several other acts and norms postulate that equality between women and men has to be ensured by the state. The public opinion suggests that equality is already achieved but recent figures show that we are still far away from equality. In Germany girls achieve better results in schools and universities but they choose only from a very limited range of none-technical professions mostly with low income, low reputation or image and a lack of career opportunities. Boys on the other hand on average score worse in school and do not choose caring and teaching professions. In 2012 only 2.4 per cent of the staff of kindergartens in Germany were male<sup>2</sup>. In addition, 8 per cent of the boys left school without graduation in 2012 compared to only 5 per cent of the girls<sup>3</sup>. From a business perspective, Germany must expand the capacity and diversity of the STEM (German MINT = STEM) workforce pipeline to prepare more students for the best jobs of the future that will keep the country innovative, secure and competitive. From a perspective of human rights, Germany must ensure gender<sup>4</sup> equality and counteract stereotypes in society and schools.

MINTivation-Motivation is a multilevel school program to promote the inclusion of girls in STEM fields, enhance the interest of boys in languages, social sciences and caring/teaching subjects as well as to improve the achievements of boys in school. It was tested in a Gymnasium (i.e. a 10-18 higher secondary grammar school) in Munich with a high proportion of immigrants between September 2011 and September 2014. The program was developed and realised by the Pedagogical Institute of the City of Munich and accompanied by the University of Augsburg. The key elements and key results of MINTivation-Motivation are described herewith.

### **AIMS**

The aims of MINTivation-Motivation base on several consolidated findings<sup>5</sup> that gender equality in schools has not been significantly improved via single short-time projects<sup>6, 7, 8</sup>. Furthermore the comparison of educational systems in Europe showed

low influence of differences in structure and formal differences. Didactical approaches, continuity and the quality of pedagogically-reflected professional relationships proved rather relevant for the success of STEM education<sup>9</sup>.

On account of this, MINTivation - Motivation is based on the conviction that equality of opportunity and justice of participation requires a change in school-culture. Where teachers are accompanied on their way in a communicative process, respecting and including their personal and professional competences and involving their subject-related knowledge and strengths. The program focused in consequence on four main targets.

Firstly, the whole intervention based on the idea of ensuring the equality between women and men and the justice of participation. That means for schools to promote the inclusion of girls in STEM fields, enhance the interest of boys in languages, social science and caring/teaching subjects as well as to improve the average achievements of boys in school.

Secondly, it is a fact that teachers have the highest influence on the pupils, hence it is most effective to develop the teachers' gender-competence. A simple and basic pedagogical principle is that before preparing lessons a teacher has to consider in depth the individual precondition of every pupil involved. Considering gender means thinking thoroughly about all socialisation influences that might have occurred. This requires a high-level of gender-knowledge in addition to self-reflection and awareness of the own sex-role of each teacher and educator in (pre-) school. Without this a gender-sensitive reflection on teaching is not successful. Therefore every female and male teacher and educator in school was trained in gender-sensitive aspects of learning and teaching. Herewith enhancing the gender-competence means - in short - changes in knowledge, perception, attitude and action.

Thirdly, concrete ideas for the daily-life of teaching support the implementation of justice of participation. Showing educators more ways for enhancing individual achievement potential, higher ability and willingness to perform and adopting these for the special circumstances and needs of particular schools and pupils motivates educators and includes their abilities.

Fourthly, the influence of teachers depends particularly on the quality of the relationship between pupil and teacher. On account of this improving the professional relationship-competence is a relevant aspect to determine STEM-education for girls.

## **MEASURES AND METHODS**

The program focused mainly on three elements. These were, periods of single-sex education in special subjects for a limited time, professionalising the gender competence of the educators and co-operation of teachers in accompanied subject-oriented working groups for three years.

### **Single-sex education in special subjects**

According to many authors<sup>10</sup> education in single-sex schools has positive results especially for girls<sup>11, 12, 13, 14</sup>. Girls respectively young women were more participating, more self-confident and showed more willingness to test new ways. They left schools with higher self-efficacy expectations, in a good mood and with better results in STEM subjects. Concerning the consequences of single-sex schools for boys less research is available. Böhmann<sup>15</sup> reports higher emotional involvement and better results in literature for boys. New research has backed the argument that single-sex schooling narrows the gap in educational achievement between boys and girls, particularly for underachieving or social-underprivileged "minority or low-income" boys<sup>16</sup>. More boys could advance via single-sex-education<sup>17</sup>.

The separation of boys and girls may although harbour risks. When Maths for girls or French for boys is associated with low-level lessons for “(naturally) untalented” and e. g. a bad pronunciation in French is tolerated as “normal for this sex”, stereotypes are enforced. Hence pupils cannot evolve their own potential when limiting traditional and overcome role-models were enforced in sex-separated lessons.

Demers and Bennett report that some academics are in favour of a hybrid model, who believe that boys and girls will benefit by engaging, but not exclusively, in some single-sex learning and recreational activities<sup>18</sup>. This hybrid-idea was the basis for MINTivation-Motivation. The program combines the advantages of co-educational systems with the advantages of the mono-educational schooling system and creates a synergetic “Hybridmodel” with single-sex lessons in a co-educational school. The program started with one class out of year 5, 7 and 9 respectively. The interventions in these three classes were at minimum single-sex education in two subjects out of Modern Foreign Language (English or French), German, Mathematics, Physics, Chemistry or Computer Science. The selection of single-sex subjects changed every school year from starting year onwards and was different for each concerned class. Over all 22 classes attended 78 single-sex lessons (in “lessons per week”) in three years. 25 teachers developed a special expertise in mono-education.

### **Enhance gender-competence of educators**

In Germany gender is not at all or only for a very limited period of time part of the vocational training of teachers at the universities. Therefore female and male teachers alike should be instructed on equal levels. Both sexes need knowledge about the differences for men and women our society creates via the socially constructed roles, behaviour, activities and attributes. Therefore all teachers of the school received gender-trainings within the framework of specific pedagogical days. The start-up of the program was created with a whole day of gender training for all teachers. In the following two years the topic was included in pedagogical plenary staff meetings, for at least half a day per year.

### **Co-operation of teachers in subject oriented working groups**

The significant work was done by 29 teachers, who worked together in four subject oriented working groups, Mathematics, Science, Modern Foreign Languages and German. These groups were accompanied by staff of the Pedagogical Institute and trained by specialists on specific topics in focus sessions. They met at least four, most of them six, times a year for several hours in school and worked together in a training centre in the countryside for two days once a year on average. Several focused group discussions about their own role as women or men took place, they exchanged views and beliefs about their subjects and professions and talked about the situation of girls and boys nowadays. The meetings included very different topics like discipline and gender, experiential and adventure education, media education in a gender-equitable way, gender-sensitive language, “I am you and you are me”, “are professions male or female - do they have a sex?”, dramatise and de-dramatise gender, print- and non-print media under a gender-sensitive view, and different didactical and methodical topics.

Nearly all of the participants made use of the possibility for an external quality lesson observation and feedback of a staff member of the chair for Pedagogy of the University of Augsburg. External class observation played a relevant role for the teachers own reflection on their unconscious beliefs about girls and boys.

### **TARGET GROUPS**

Direct target group were all teachers of the school, with a specific focus on teachers in subject-related working groups. All parents were informed in written form,

additional information was given out during parents' evenings and the parents could discuss the issues in depth during personal individual parent-teacher meetings. Indirectly all pupils were involved but in particular the pupils who attended single-sex lessons.

## PHASES OF THE PROGRAM

The realisation process was structured in three transition free phases. It started with information, acquiring knowledge of gender issues, awareness rising and reflection on one's own attitudes, convictions and habits. On this basis the teachers developed alternative concepts and approaches in accompanied subject teams and temporally supported by specialists. Then the educators implemented the new ideas in regular lessons in school.

## INDICATORS FOR ACHIEVEMENT OF SUCCESS

In order to validate the results of the program, the following indicators were used to measure its success.

Regarding the pupils a relevant indicator was the percentage of girls choosing STEM elective subjects or courses as well as the percentage specialising in Modern Language or STEM in higher classes in the Gymnasium. For the boys indicators were their improvement in school, particularly in languages, and the reduction of the drop-out quota. For all pupils for holistic success in life self-concept and expectation of self-efficacy (referred to Bandura) are most relevant. When a young person chooses a non-stereotypical and for his or her sex atypical subject in school, both - girls and boys - need a positive self-concept<sup>19</sup>. They must be self-confident and believe in their own abilities to complete tasks and reach goals. The same applies to the choice of an "unusual" profession.

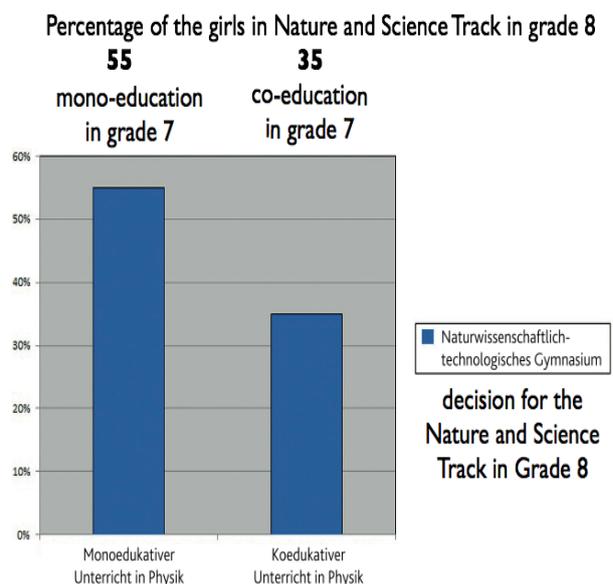
Regarding the teachers, the relevant indicator was their gender-competence.

## RESULTS

In the following section, the main results of the study are outlined. First, specific findings are illustrated, then quotes are provided to illustrate the outcome of the project in more detail.

### Girls choose the Nature and Science specialisation

The MINTivation-Motivation testing school offers specialisation in Nature and Science or in Modern Foreign Languages. At the end of year 7 the pupils decide which track to follow. According to the headteacher before MINTivation-Motivation at maximum round about 25 % of the girls used to choose Nature and Science specialisation. The evaluation<sup>20</sup> showed that during the MINTivation-Motivation program the percentage of girls who attended single-sex lessons in Nature and Science/ Physics in year 7 rose to 55 %. More than half of the girls decided to choose Nature and Science specialisation in year 8. In the parallel classes that share was only at 35 % of the girls.



## **First year Nature and Science single-sex education improves the long-term results for girls and boys**

All the boys and girls who attended mono-educational Nature and Science lessons in year 5 did better in year 6 and 7 than their schoolmates who were mixed in year 5, even when they were in co-educated groups in year 6 and 7.

### **Boys achieve better results in French**

Overall boys performed worse in French than girls, with on average one whole grade (German school grades ranking from 1 to 6 with 1 as the best grade) difference between them. However, the single-sex education proved to be supportive in French, especially for the boys and particularly regarding spoken language skills. Some boys attended single-sex French lessons in year 7 and 8 and on average achieved a grade of 2.82 in year 7 and of 3.16 in year 8. These were the best results in French for the boys. Those who attended co-educational classes received results of 3.42 in year 7 and 3.68 in year 8. All girls and boys improved when they changed from co-educational to mono-educational lessons in French.

### **What do girls and boys say about MINTivation-Motivation**

The single-sex lessons in special subjects were perceived positive by all female pupils; in general girls appreciated the program more than the boys. Some of the boys complained about having to do things which were "(naturally) meant" for women, like cleaning the classroom and working orderly. The girls appreciated the concentrated work-climate, less discipline problems and interruptions. Beside focused group interviews, at the end the pupils had the chance to write a letter and tell the town councillors what they think about the program. Below, excerpts from those letters are provided.

Pupils in senior classes (year 11-12):

*"It was a bit more relaxing in single-sex classes and I participated more often. This even applied to Computer Sciences", "It had a positive effect on the teachers", "Those girls-only lessons gave me some sort of a relaxing break during the day, during which we worked more efficiently in a more relaxing atmosphere", "There was a huge improvement regarding the interaction between the girls in class", "Overall, single-sex classes were more relaxed, easy-going and at the same time more intensive" (quotes from female students)*

*"Single-sex classes were overall more orderly and more disciplined" (male student)*

Pupils in junior high (year 8-10):

*"Shy female students tended to participate more in all-girls classes than during co-educational sessions", "It is negative that there is sometimes rivalry between both sexes" (female students)*

Pupils on elementary level (year 5-7):

*We had more contact with parallel classes and specifically the atmosphere and spirit between girls was better", "I felt that I could truly unfold my potential", "Girls can now focus way better" (female students)*

*"It was a negative effect that I had to clean the classroom more than before even though this is a women's chore", "I think that it was great that the girls could not interrupt the boys from participating in class during mono-ed lessons" (male students)*

### **Gender-competence of the teachers**

The observations of the lessons took place in phase one of the program. They showed diverse (unconscious) stereotyping differences in the teachers' habits and actions towards girls and boys. In order to evaluate the development in gender-

competence of the teachers several focused group discussions were transcribed, and the educators completed a written questionnaire at the end.

The teachers judged the following most valuable to them:

*“greater awareness for this issue”, “I had subconscious stereotypes that I wasn’t aware of before”, “I realised that ‘MINTivation’ is not about rules regarding how to deal with boys and girls but rather how to widen individually their scope of development”, “I realised the cultural background shaping gender specific behaviour”*

Teachers observed the following changes regarding their students:

*“Calmer students became more engaged during lessons.” “Some of the girls developed a certain self confidence in the subject Physics”, “overall improved class atmosphere”, “the interest in the subject raised ... grades not necessarily”, “I could observe a newly gained self consciousness with students”*

Teachers observed the following changes regarding their own teaching:

*“To demand more self-dependence from male students”, “to break open limiting traditional gender roles”, “critical questioning of school books’ lexicon paragraphs regarding gender clichés”, “paying more attention to gender neutral wording”, “specific exploration of certain gender related topics (i.e. occupational choice, discussion of internships...)”, “to pay more attention to a gender equal participation during lessons or rather demanding it”*

### **Teachers’ quotes in the subject-oriented working groups**

*“I am now able to address provoking comments of students regarding gender and discuss them appropriately”, “I started noticing and especially using media reports as gender discussion topics in class”, “I realized that the need for action regarding gender equality is greater than I thought”, “Gender stereotypes now catch my eyes, even outside of work”, “gender stereotypes are being addressed and actively prohibited”, “I realised the cultural background that shapes gender specific behaviour”, “Firstly, we wanted to provide different topics for girls and boys but then we realised that this would dramatise and even enhance gender stereotypes”, „In the end, gender sensitisation led me to provide an equally good class for female and male students”, „It is possible to hold a gender sensitive class without any of the pupils even noticing that we (the teachers) paid specific attention to gender equality”*

### **Further results**

The teachers developed special gender-reflective lessons, like “La dance” or “development of comics”, “pros and cons of different professions” in a career-seminar in year 11, “percent-calculation”, “special lines in triangle”, probability calculation, a gender-reflective adventure learning cave school excursion day, and an overview of special links for gender-reflection in the regular curriculum.

## **DISCUSSION – OUTLOOK**

Based on the findings of this study and the cited literature, it can be concluded that the best in regard to gender equality were to “MINTivate-motivate” each individual school. However, as currently there exists no wide initiative regarding these aims, here are three other suggestions that each school could easily adopt.

An absolute no-cost and underestimated measure is setting simple goals and evaluating the results. Most of the schools are not aware of the actual gender gap in all subjects, they do not discuss the gender-specific differences neither in results nor in specialisation and most importantly of all not the reasons for it.

Furthermore, the most effective measure is training the teachers. Teachers have to learn about gender stereotypes and gender awareness to avoid reproduction of stereotypical choice of subjects of their pupils. Schools are constructing gender

differences through teachers' attitudes in addition to the influence of peers, gendered learning material and didactics. Training the educators does not take too much time it is more a question of willingness and consequence in daily school life.

Moreover, single-sex lessons for a limited time in specific subjects, e.g. Physics for girls and French for boys, have proved to be another promising and successful measure. This is particularly the case during the start-up-period in "un-typical" lessons. The realisation is only a question of organisation in schools. In parallel classes and parallel organisation in special subjects, division in all-girls- and all-boys-groups for two classes together require no additional resources. As long as society constructs such strong and different roles and attributes for girls and boys we help them develop their own personality by giving them times of single-sex activities. According to Kessels<sup>14</sup> psychological concept of the "working self" being a boy or a girl is not so relevant for one's own behaviour and convictions when only girls or boys are in class. Then the learning and individual achieving process comes to the fore.

## SUMMARY

MINTivation-Motivation is a multilevel school program to promote the inclusion of girls in STEM fields (German MINT = STEM), enhance the interest of boys in languages, social sciences and caring/teaching subjects as well as to improve the achievements of boys in school. It was tested in a Gymnasium (i.e. a higher secondary grammar school) with a high proportion of immigrants between September 2011 and September 2014. The program was developed and realised by the Pedagogical Institute of the City of Munich and accompanied by the University of Augsburg.

The three main interventions were on the one hand the improvement of the gender-competences among the staff, on the other hand single-sex lessons (mono-education) for a limited time in special subjects, e.g. Physics for girls and French for boys and furthermore the co-operation of teachers in subject-oriented working groups for several years. MINTivation-Motivation is structured in three transition free phases. First information, acquiring knowledge of gender issues, awareness rising and reflection on one's own attitudes, convictions and habits. Second development of alternative concepts and approaches and third the implementation of the new ideas in regular lessons in school.

The direct target group of the program was the whole staff, especially the teachers of the single-sex classes and the teachers, who participated in the subject working groups, which were Mathematics, Science, German and Modern Foreign Languages. Indirectly involved were all pupils of the school but particularly the pupils who were mono-educated in special topics for a limited time (with the minimum being half a year). All parents were informed about the program. Everyone received a letter from the headteacher and the Pedagogical Institute of the City of Munich. In addition the parents of the MINTivation-Motivation classes were personally informed during parent-teacher conferences and could ask questions at any time. The reactions were very positive and the parents welcomed the program.

MINTivation-Motivation produced several positive results. For example, more than 55 % of the girls who attended single-sex lessons in their first year in Physics in year 7 decided to specialise in Science and Technology instead of in Modern Languages in year 8 whereas in the comparative group from the co-educational classes this number amounted only to 35 % of the girls. The boys in the MINTivation-Motivation groups showed higher participation and achieved better results in languages than the comparative group. The pupils and teachers who took part in the MINTivation-Motivation program showed improved convictions and an adjusted attitude on equality issues and justice in participation.

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