Literaturverzeichnis

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Multiplying Mathematical Teachers

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These reflections are meant to inspire, they can be used in full or in part, they should be adapted to circumstances. When you judge whether my proposals are good or not in your opinion, please remember that your judgement should not be a yes/no answer to these very proposals, but it should rather be a comparison with respect to the other alternatives facing the considerable lack of mathematical teachers.

Delegate proctoring (school level)

Assume that there is a lack of mathematical teachers but no lack of teachers in other disciplines. Then one should delegate (as much as possible) tasks to teachers of other disciplines. For example, if during mathematical tests pupils do not interact with the mathematical teacher, then proctoring of mathematical tests should be delegated to nonmathematical teachers. If mathematical teachers wish a bit of mathematical interaction during tests, then with some creative schedule adjustments one could make parallel tests for 3 classes (if mathematical teachers cooperate well with one another, then they can also assist tests of classes which are not their own).

So, the first proposed option allows to spare for each class as many hours as the duration of the mathematical tests and the second option two thirds of those hours.

Each pool of mathematical teachers could make their own calculation of the hours spared in this way.

Example: One mathematical teacher from Luxembourg told me that delegating proctoring this school year for the few long mathematical tests would allow him to spare 12 hours for each class with much mathematics and 6 hours for each class with little mathematics, thus 42 hours in total.

Self-learning in class (school level)

Every teacher has a personal way of presenting a topic, but formulas are standard and easy examples are, in some sense, standard. So one could produce videos that explain the terms of a formula and make standard examples of applications.

The pupils could watch a 10-minutes video and then have 10–15 minutes of quiz (they can watch again part of the video and/or do a multiple choice test to check their understanding of the video). During this time, the pupils should be proctored by a nonmathematical teacher.

Example: A teacher with a 50 minutes lesson slot could divide this time into two parts and teach two classes within this time, because the actual presence in one class would only be one half of the full time.

Remark: This option could be considered as a long-term strategy (excellent videos will be available, it is only a matter of time) but it is also a possible solution for a short leave of a mathematical teacher. For the latter, one should ensure (possibly, in advance) that the two mathematical classes have simultaneous mathematical slots in their schedule.

Remark: Producing videos can be parallelised because a small pool of teachers can write scripts (this constitutes most of the work). Then a voice narrates all scripts. And a technical expert produces a teaching avatar and a readable blackboard (as done in the videos produced by Béatrice Bach, Master in Secondary Education Luxembourg, that have been approved of by the Luxembourg SCRIPT Director

in December 2022). Videos should be freely accessible and without advertisement. They can be easily translated in many languages. To produce them, one can start with the material for the lowest class so that this very class has year by year the videos it needs.

Remark: Self-learning in class is not necessarily "videos". One could more generally have suitable Apps (in the style of the ANTON App) or "books". By books I have in mind the current school texts but also more flexible digital editions, where for example one can open up blocks of text for further explanations only if needed. Moreover, books on paper have a linear order for their content, however this restriction is not necessary for digital books. Indeed, introducing some new "notion" (definition, formula, idea) could allow to access a selection of new topics or exercises at the same time. Notice that more flexibility in this respect would allow teachers to customise their lessons more easily.

Team work (school level)

In a class with many mathematical hours, one hour per week could be devoted to exercises, for individual pupils or as team work. In a class with less mathematical hours, one hour every three weeks. Again, such sessions could be proctored entirely by non-mathematical teachers, or one mathematical teacher could alternate between two classes.

Example: The first option without assistance of a mathematical teacher would spare my sample Luxembourgish teacher 48 hours during this school year, and the option of covering two classes at the same time 24 hours.

Teachers' mobility (ministry level)

Mathematical teachers may live for personal reasons in other countries, or may wish to work in other countries. If this is not made possible for them, they may exit the school system, which would be a great loss due to the world-wide lack of mathematical teachers. Each country should better have detailed and transparent information that are made publicly available concerning state examinations and required qualifications and recruitment. Talented teachers already living in the new country deserve a custom plan aimed to entering the school system in the best possible way, possibly within 2 years (the time to finalise language competences and complete examinations).

Remark: Having the citizenship of a country is not the same as having language skills (for example, Germany requires level B1 for the citizenship, while the teaching profession should require C1 or at least B2).

Remark (for Germany): Introduce an overarching Deutschland-Staatsexamen, choosing for it the most difficult of the current Bundesland-Staatsexamen.

Career options (ministry level)

Mathematicians who did a PhD and possibly other jobs afterwards should have a highway to enter the school system. Many of them already experienced teaching (at Bachelor level) and are good teachers. The same holds for mathematicians without a PhD who did other jobs (thus acquiring at least social skills). The same holds for physicists or other scientists/engineers/economists with a very good mathematical sense for proofs and abstract reasoning: these mathematical competences may better be proven with oral exams. Such a workforce could have a dedicated training to learn what they need to enter the school system.

Remark (for Germany): Providing access to quality childcare allows parents to work more years, so an early childcare (3 months onwards) would allow to spare many mathematical teachers' years country-wise.

Many thanks to my sample mathematical teacher in Luxembourg and to the Director of the GDM for valuable feedback.

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