

MATEMATICKA GIMNAZIJA

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The following text represents my (very) personal thoughts and various numbers are rather intuitively estimated. No official data are used.

The cornerstone of specialist mathematics education in Serbia is the Mathematics High School (*Matematička Gimnazija* in Serbian, or MG throughout the text) in Belgrade. It was founded in mid sixties as an experimental school for mathematically talented kids. In Serbia there is, and always was, an 8 year elementary school education and a 4 year high school education. I think that the idea of founding such a school was borrowed from Russia, after one of the founders spent a year in Moscow and returned with very positive impressions. In the first few years it accepted second year students and, from early seventies on, first year students were enrolled. The enrollment is constant and is limited to 100 per year (Belgrade has population of nearly 2 million). There is a single 3 hour qualifying exam in mathematics usually taken by nearly 200 students. There is no dormitory and classes are standard, 6 hours a day, no reading courses!

There are 8 hours of mathematics a week (ordinary high schools have at most 4), 4 hours of physics (others have 2–3) and 3 hours of computer science related courses. Many of the teachers in these subjects are from the University of Belgrade and from academic research institutes, although there are full-time employees. Concerning mathematics, the main subject is

- ‘Analysis and Algebra’ (4 hours a week, each year),

followed by

- Geometry (4 hours in the first two years),
- Linear Algebra and Analytic Geometry (3 hours in the third year).

In the fourth year there are

- Probability Theory, and
- Numerical Mathematics courses

with 2 hours a week each. This is in my opinion out-dated, especially the last two courses, and usually in Numerical Mathematics course that I teach one can learn what the Banach-Tarski paradox is and what Euclidean domains are.

There were always significant results of MG students in Olympiads: in former Yugoslavia's olympiads they won regularly at least half of the diplomas, sometimes even three quarters—and similarly in IMO's. To illustrate this point let me say that there is a student who already has 4 IMO gold medals (plus a silver and a bronze I think) and who expects to win the fifth gold these year and to become the best ever competitor! His name is Teodor von Burg.

I think that only St. Petersburg School has more IMO medals than MG, but I'm not sure. A special attention is paid to these competitions and several training courses are organized, some of them are week-long outside Belgrade and are organized in co-operation with the Serbian Mathematical Society and the local Archimedes Mathematical Club. There are very carefully prepared sets of tricky problems and students in the first and second year like them very much. However in grades 3 and 4 only the best (I would call them professional competitors) attend these courses.

Besides the three main subjects, all the other courses were considered as less important and teachers were very 'mild'. In the beginning only math and physics were interesting to students but this is no longer true, for example recently only 20 out of 100 students choose a topic in mathematics for their 'graduation paper' (this is a kind of 20-30 page seminar-like paper on a chosen advanced topic). 40 years ago 60 out of 100 did it. In my opinion this is due to outdated course programs and to significant improvements in teaching Computer Science, Chemistry and Biology courses.

The school was always considered as free-thinking because 'the law of arguments' ruled ever there. All the graduates like their school and keep close connections after graduation (for example my 1980-class meets

once a month). The most popular Belgrade faculty for MG graduates is Faculty of Electrical Engineering, 30-40 enrolls there, 10-15 study Mathematics or CS while the others study at other faculties (estimates are personal and rough). I know 2 actors and 2 movie directors who are MG graduates. Recently the Trinity College in Cambridge became very popular among them and every year at least one student continues studies there (two years ago 6 of them went there).

The experimental status was replaced by regular ‘specialized school status’ only ten or fifteen years ago while classes with the same program were formed in several other cities in Serbia. The interest in such classes outside Belgrade is low and they hardly enroll 10–15 students a year; even the best students from their territory come to Belgrade and enroll MG. Now the experimental status was obtained for 7. and 8. grade of elementary school where 50 pupils are enrolled each year.

As a student I attended MG in the late seventies, then I got involved in teaching competition preparation courses and later in regular teaching which I still do. Nowadays it is not the school that I was attending. Students are much more competitive and not so ‘open’ to the others. I blame exaggerated media interest in the school, every once in a while various reporters come there to praise olympiad successes, and nowadays there are various olympiads . . .

To summarize my thoughts:

- (1) I think that ‘free thinking’ schools are good because there those loving ‘the law of arguments’ meet similar souls; it is not that easy in any school.
- (2) A close relationship of such a school with a university is necessary. I think that teaching in such places does well to the university staff, too!
- (3) Course programs have to be flexible and I do not think that it is good to teach standard university courses in such schools: the level of generality has to be lowered, because at that age most of the kids cannot follow excessively abstract exposition.
- (4) Tricks are what most of the kids like the most, but the course programs must not rely exclusively on tricks. Otherwise, they may

get an impression that the science is a set of randomly found tricks rather than a carefully built brick wall (under construction). There are many examples of good competitors whose academic career was short; there are many examples of non-competitors whose scientific career is great . . .

About the author

Predrag Tanović is a mathematician working in (logical) model theory.