2019 European Girls' Math Olympiad

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Samuel Beatty Report

Introduction

This year, I had the immense privilege of being a member of Team Canada at the European Girls' Math Olympiad (EGMO), for the second time. My personal experience at EGMO was multifaceted and enriching in many ways. Participating in the competition and training as part of Team Canada connected me to the very important higher purpose of increasing female representation in mathematics, the issue that I deeply care about. On a more personal level, being part of Team Canada and traveling to this event broadened my knowledge, strengthened my problem solving skills, built my character, and gave me invaluable international experience.

EGMO's mission

EGMO is so much more than any other international Olympiad. It is a symbol of hope, progress, and community. Being a competition that brings together talented and hard working female contestants from all over the world, it is a unique event that not only recognizes young mathematical talent, but also increases representation for girls and women in STEM, including mathematics. As a two-time contestant at EGMO and longtime female competitor in mathematics, I have a firsthand understanding of some of the impacts and severity of the gender gap, especially at a high school level.

First and foremost, EGMO is such a unique experience because of its mission. It is no secret that there is a huge gender discrepancy in high school Olympiads in all STEM fields. For example, only around 11% of the participants at the International Math Olympiad (IMO) are girls. There are similar statistics in other higher-level math contests like AIME and Canada's own Math Olympiad (CMO).

Uneven gender distribution in many team contests tells the same story. For example, in school teams for contests like HMMT and PuMAC, as well as Canadian team contests, I would often be the only girl, or one of two girls on the team, out of 6 or 8 students. Many people do not understand why this is even an issue if there is no "direct discrimination"

towards girls. They may think, "why can't everyone just enjoy the math and other STEM competitive activities, regardless of gender"?

Unfortunately, it is not that simple. In fact, the higher up one looks at the "contest ladder" (i.e., the more "prestigious" the contest), the more and more girls are dropping out at each level. This represents a serious phenomenon, which goes well beyond just high school competitions. As you go farther in math careers or degree levels, the "10% rule" shows that at each level, the proportion of women decreases by about 10% (for example, from undergraduate degrees in mathematics to graduate degrees to research positions to professors). This is not because of any lack of innate mathematical ability in girls; girls in fact perform better than boys in high school and university math. There are many theories as to why exactly this happens. I believe that it is a serious cultural and social issue, which can be very discouraging, especially at a young age, and it causes a vicious cycle. Less representation and genuine support leads to less interest, which leads to less representation, and so on.

While not every girl might have experienced these issues, the majority of girls I know have, to varying extents. Their journey has come with many challenges along the way. When I talk to other young women, who compete at a national or international level, participate in math team contests, attend competitive summer programs or even enroll in graduate programs in the field, many share the same feelings and similar stories. Although many teachers and competitive team leaders are very encouraging throughout our journey, young women share the feeling of being out of place and, sometimes, worrying about how their performance as the only girl in the room would be perceived by others or reflect on their gender. This is why I believe that opportunities to recognize female talent and bring young women together are so crucial. We as a society need to generate more opportunities so that new girls entering the field can be inspired to succeed.

Having opportunities like EGMO gives girls a chance to be around other girls with similar interests and passions, who had to persevere, grow and develop as mathematicians in spite of adversity. This goes well beyond being just "encouraging"; it is seriously inspiring and motivating to see people who share that experience with you excelling, and to be in an environment of female contestants sharing this passion for math where your gender is not a very small minority, or even being the only girl in the room.

This feeling of community gives girls who are competing in mathematics at a high level something to look forward to and share this experience with their greater community. EGMO has a powerful impact for the future because it pools together young women with strong potential, many of whom look forward to studying mathematics in university,

expanding the role of women in STEM, becoming role models, and giving back to their communities.

Building knowledge, problem solving and achieving personal growth

Besides inspiring me to go forward in mathematics and share my experiences with incredibly talented girls for a higher purpose, EGMO has helped me sharpen my skills as a problem solver, deepen my mathematical knowledge and intuition, and grow as an individual.

There is no doubt that the contest itself is a very important part of the event. At the end, the team received two Bronze Medals and two Honorable Mentions.

Working on the 6 intriguing problems for a total of 9 hours was a tough but rewarding experience. Admittedly, it was stressful knowing that my progress on these few problems within a limited time would represent Team Canada.

Figure 1. Team Canada, Leaders and Guide

But with the encouragement of the amazing team leaders, Dorette and Sarah, I put the worries of my score behind me and immersed myself in problem solving; challenging my own limits, trying new techniques and ideas and innovating as I was going through the process.

In 2019, there were two geometry problems, an algebra problem, and three combinatorics problems. Some of the problems were relatively easy for me, and I solved them right away. The others were challenging. For example, although I worked on problem #5 for about two hours and tried several approaches, I was not able to draw a full solution during the competition. Even though it was frustrating to not be able to crack this seemingly simple challenge, it gave me a greater appreciation and understanding for its difficulty and the creativity of potential solutions.

I left EGMO with a better understanding of my strengths and where I can improve: I got many new ideas and prospects about some mathematical techniques which I'd never thought of before. In addition to the problem solving itself, I got to learn from the other

contestants (some of whom had completely different training) about their ideas, approaches and different techniques.

Beyond challenging and enhancing my mathematical skill set, attending and training for EGMO was an important and, sometimes, unexpected way to learn about myself and build my character. Preparation for the contest required a lot of self-motivation and perseverance, and I am very happy that I have learned so much in the past year and put a lot of hard work towards this contest. As Olympiad problems can be quite challenging, often requiring several hours to make progress, I strengthened my ability to deal with disappointments and pressure.

It is also a big responsibility to be representing my country at such a highly publicized event, and it feels good to be able to take it on and thrive from this experience. I have also learned to redefine my meaning of success by looking beyond the scores. While the scores are very important as they determine the ranking of each competitor and each national team, they are not everything. The true value is in learning, taking on new challenges, giving a full effort to the problems, and looking at the bigger picture. At the end, what I took away was not only the number of points I got on each problem, but also a better understanding of myself, my improvement, and the opportunity I got to learn from the others.

Building international community

The international aspect of EGMO was especially enriching and valuable. It was eye opening to talk to girls from many parts of the world- from almost 50 countries, from all parts of Europe and around the world- Asia to North America- and realize how much we have in common.

An added bonus of EGMO is the travel opportunity. Last year, I got to travel to Florence, Italy, and this year, I went to Kiev, Ukraine.

Figure 2. Teams Canada, Australia, US, and Germany

This year, Sasha, our enthusiastic and dedicated guide, did everything she could to give us an opportunity to enjoy the spring sunshine, expansive landscapes with Orthodox monasteries and churches and well appointed avenues that mix various architectural styles, as well as to learn about Ukrainian and Eastern European traditions, dance, language, and daily life (including the deepest subway station in the world), and so much more. Real Ukrainian vareniki, borscht, decadent chocolate, and Kiev cake were also a part of this enriching cultural experience.

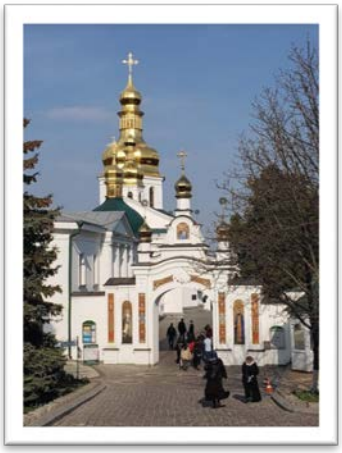

Figure 3. Ukrainian Orthodox Monastery

Conclusion

Overall, EGMO has been an incredibly valuable and unique experience. It builds up and deepens our appreciation for such a culturally diverse, yet closely-knit, math community. It challenges us to discover new ways of thinking. It builds our character to become more resilient, diligent and forward looking. And, finally, it gives us an invaluable international experience.

We as a community need to make the field of mathematics more inclusive and diverse among all age groups and levels. We need to work together to present and enhance opportunities like EGMO, which recognizes and rewards the hard work of girls who have a passion for and talent in mathematics. We can and we should expand on the idea and mission of EGMO to provide more events with similar goals within our communities at local and national levels that we could reach out to more girls who are making decisions on what to pursue and could be inspired by the exciting possibilities in the field of mathematics.

Thanks

After EGMO, I feel that my appreciation and connection to mathematics has been enhanced and amplified. Being a part of this extraordinary event with girls from all over the world with a shared passion in math is a truly life changing experience. I want to give my immense gratitude and thanks to everyone who worked hard to make this a reality.

I would especially like to thank the Canadian team leaders, Dorette Pronk and Sarah Sun, for their incredible dedication to designing and delivering a training program and

materials, marking papers, traveling with us, raising our spirits in the moments of doubt, supporting the team no matter what, and being open and honest with us about how we can improve and move forward.

I also want to thank the other girls on the team this year- Katie, Elaine, and Ruby- for being so supportive of each other and be such a great group to travel, train, and spend time with.

In addition, I would like to express my immense gratitude to the CMS for preparing our team for the competition and arranging our travel and funding behind the scenes, as well as our sponsors for seeing the significant potential and future in this event and supporting Team Canada.

Finally, I want to thank the organizers of the 2019 EGMO for their tireless work in founding, planning and managing such an important event that has impacted the lives of so many talented high school girls around the globe and has influenced their dedication to STEM and future career choices.