



# Motivation to Learn and Teach Mathematics and Science in Middle Schools: Insights from a US Study Tour

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After seven years of activity and towards formulating a “roadmap” to reinforce excellence in middle school mathematics and the sciences, Eli Hurvitz, Naama Axelrod Tayer, and Lena Raved (of the Trump Foundation), together with Edit Yerushalmi (Weizmann Institute), Talli Nachlieli (Levinsky College), and Michal Ayalon (University of Haifa) set out for a study tour in the United States.

We took advantage of the AERA Annual Meeting in New York to meet with education experts, to visit educational institutions, and to learn about research and practice in the field of teaching middle school sciences and mathematics. We met with Pamela Grossman, Arthur Levine, Paul Cobb, Karen Hammerness, Janine Remillard, Peggy Brookins, John Hattie, Hilda Borko, and others.

Additionally, we visited the Advanced Math & Science III School (New Visions Network) and Paramus High School, the headquarters of the RELAY School of Education and STEM Teachers NYC (Columbia University).

Students:

Most educators and researchers with whom we met claimed that student motivation and commitment to learning are important conditions. However, this is difficult to achieve particularly in middle school when students are at a stage of forming their identity and their areas of interest. As adolescents, they tend to lose interest and concentration, which presents a big challenge to engaging them in learning.

- Trust between teacher and student is a prerequisite for motivating students. A relationship of trust is built based on deep familiarity, individual attention and commitment, and creation of a sense of belonging.
- In order to create a deeper commitment to the learning process, ideas were raised, such as: demonstrating a connection between content studied and real-life contexts; engaging students in active classroom discussions; and creating experiences of success. The challenge is to connect what interests students to what seems to be important to their future. A good teacher combines the two while maintaining a broad and deep base of knowledge.
- Researchers pointed to the effect of project-based, problem-based, and inquiry-based learning methods. Teachers, on the other hand, said that these

learning methods are often quite superficial and neglect a solid base of knowledge and proficiency. They, therefore, recommended using them to introduce a new topic and/or at the end of teaching a topic.

- Everyone mentioned that even when students understand the importance of mathematics and science, they do not necessarily translate that into investment and persistence. Consequently, it is very important to set ambitious targets, calibrate the learning process, conduct explicit discussion of objectives and the effort required to achieve them, and measure the outcomes.
- There frequently is a gap between teachers' assessment of student abilities and their actual success. The understanding that abilities are an outcome of learning, persistence and adoption of a growth mindset are important for creating a sense of self-efficacy and an aspiration for excellence for students and teachers alike.

#### Teachers:

- When teachers do not believe that students are able to attain achievements, they do not see the need for their own professional development. Even if they do attend professional development courses (since they have no choice), they relate to it as a waste of time since they believe their teaching has no effect on their students' achievements.
- It was suggested to us to form a group of outstanding and committed teachers who understand the unique needs of students of middle school age and believe that this is a significant period for learning, and to help these teachers become mentors and leaders. That is, to attract the best teachers to lead the process and to provide them with the appropriate opportunities.
- In conversations with respect to preventing burnout and creating professional pride and motivation to learn and improve, the creation of professional development tracks with the potential of career advancement as mentors or leading teachers repeatedly came up.