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Özgür Akas

Robert College of Istanbul

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Seen With Other Eyes:
A Service Learning Project
for High School Mathematicians
Working with Visually Impaired Learners

Özgür Akas

Robert College, Istanbul, TURKEY
oakas@robcol.k12.tr

Synopsis

Seen With Other Eyes (SWOE) is a community involvement project that focuses on mathematics education for the visually impaired. In this essay I describe this project, which I developed together with my students at Robert College, a private high school in Turkey, and share some of our story. In the past few years, our work was welcomed by the global mathematics education community, as a testimony to the power of social media to connect like-minded educators with one another.

Can you imagine what would happen to:

Student motivation

Understanding how to apply concepts in geometry (or any course),

Sense of global value and global voice

Teamwork

Value of creating a lasting legacy

Grit and focus

if you presented your students with a complex real world problem to solve?

Introducing problem solving with purpose can create a much more powerful and highly successful learning environment than I ever imagined. As a traditional teacher in a highly competitive school who loves mathematics

and sharing my knowledge, I have discovered that I have underestimated my students' ability to apply themselves beyond my trained professional expectations.

The key is to present a purposeful challenge that shifts control to my students on how much they own the struggle to seek knowledge and solutions. In many ways, "less is more".

I do not know if other mathematics teachers ever wonder about assigning purposeful work to our students. Of course like most of my peers, I find math meaningful and beautiful, but the challenge is always there, at least for me, to connect what happens in the classroom to anything that goes beyond. This is the story of a project that I think has done precisely that.

How Things All Began

When in 2009 I started working at Robert College, a prestigious private high school in Istanbul, Turkey, with rigorous academic standards, I learnt that I would have to assign a yearlong project to my students. When it comes to mathematics—and a year-long project—I thought that keeping students on task for a year would be very difficult. Then an idea just occurred to me.

I had only recently met with a friend who used to work at a school for visually impaired kids. During our chat she mentioned that they do not teach geometry to blind kids. I was quite shocked because as a math teacher I was thinking that it should not be that difficult—you can give them a ball and can talk about spheres for instance—but my friend told me that their students were not responsible for the geometry questions when they took a centralized exam.¹ At that moment I decided what I would do with my students during the next academic year!

¹ There are a handful of centralized exams Turkish students take, in order to be placed in private or advanced science high schools, or to enroll in a college or university. Disabled students can and do take these exams though their disability status is taken into consideration when evaluating their performance. At Robert College we used to have a blind student (98% visually impaired) who took the TEOG exam to enter RC because there is no other way to get in. This student was lucky because from the very beginning her mother was with her all the time and she did learn normal alphabet instead of Braille.

That is how we started our *Seen With Other Eyes* (SWOE) project as a year-long homework project in 2010-2011 education year. After learning that every Robert College student should complete at least fifty hours of Community Involvement Service, I made sure to designate our project as a Community Involvement Project — one stone two birds, students thought!

When I first told my students (RC14): “We’ll teach geometry to blind kids,” they responded: “Well, Ms. Akas, this is a good idea, but how do we do it?” They asked me if I had worked with blind kids before, or if I had any other experience that could be relevant.

I said, no.

That is how I became a part of my learning team. I now believe strongly that this is a must for a teacher engaging in a project with her students; as they are learning, you too need to learn along with them.

After a few organizational meetings, my students split subjects among themselves and got to work. They spent a lot of time and energy working in teams to recreate geometric terminology for the kids who had never seen with their eyes. They also invented some tools to explain notions related to angles, see Figure 1 below.

After a while my students were ready to share their new curriculum and tools with visually impaired children. We were able to get in touch with *Kabartma Düşler*, a center for blind kids from 12 to 18 years. My dedicated students went there every Saturday morning to study with the members of this center for the rest of that academic year.

Some Reflections

I think one of the most exciting parts of this whole project was that my students did not only discuss geometry or more broadly mathematics with the kids; many other things came up as well, such as how to fold your t-shirt, how to pour water into a glass, how to make a toast without burning your fingers. Through the process, close bonds were formed. We had a party together at the end of May, and then the next lesson while they were presenting their project many of my students were excited and very emotional. One said: “I don’t have any siblings but after this project I feel like I have one now . . . and I feel useful for the first time.”

At that moment I felt that as educators we can change the world!

Figure 1: Here I am holding my students' invention to explain angles. The tool has two fixed arms and another arm that can move 360 degrees. With the fixed arms you easily teach the idea of a right angle; if the moveable arm is between the two fixed arms, you can talk about acute angles or complementary angles and so on. Photo by Aydil Durgun (aydil.durgun@milliyet.com.tr), first published in <http://www.milliyet.com.tr/robertlilerden-odullu-proje/cumartesi/haberdetay/09.06.2012/1551323/default.htm>.

Extending The Project

In the following years with different Year 9 students, I kept working on the project with the same group of kids and the same center.

Then in the summer of 2014, I attended [BLC14](#) (Building Learning Communities) conference in Boston, USA, and met Alan November. Alan is the author of *Who Owns the Learning* [3], which made the New York Times bestseller list for education books for 2013. During his master class, he was talking about six important points of an effective project. At some point when I was talking about my project, Alan asked me why I was not thinking bigger and making the project global. There was another AHA! moment.

At the beginning of the 2014-2015 academic year when I described the SWOE project in class I said "You'll be famous!" (Of course we all knew I was kidding, but I did expect a lot more visibility to come out of this next stage

Figure 2: 2015, Umut (9) is working with a special weigher. Photo by the author.

of the project.) I clearly explained my expectations about a website for our project. The next day my students came to me and said, “Ms. Akas, here is our Twitter account and the website. . .”² I did not immediately see the need for a twitter account, but they said, “To promote our web site we’ll tweet!”

We should not underestimate our students’ creativity and their understanding of social media that can be applied in a constructive manner!

Alan then invited me as a keynote speaker to the [2015 Building Learning Communities conference](#) he was organizing. My keynote was recorded and may be viewed at <https://vimeo.com/138335021>. This talk led to many interesting conversations on social media. Through various threads on social media, I was able to connect with other educators and others interested in our work.

² Our project may be accessed on our website <http://www.seenwithothereyes.org>, and through our twitter account [@seenwothereyes](#). In 2018, we are still working on our website and continuing to add new lessons. So far we have had 856 visits from 69 different countries.

Figure 3: 2016 spring. Two RC students took Recep (8) outside for a walk to teach counting. Photo by the author.

Figure 4: Ahmet (9) and Recep (8) playing instruments and working on rhythmic counting. Photo by the author.

Several articles have been published in Turkish news outlets about our project in the past few years. Also see the YouTube video (available at <https://www.youtube.com/watch?v=r6t3IzyazkE>), where I talk briefly about our project.

Student Experiences

Here are some thoughts from one of the students involved in the project.

My topic was Logarithmic Functions.

I learned that even though it is really hard to feel like a visually impaired person, even doing something that would help them and make their life easier is very satisfying.

I learned that even a little contribution may change someones life or I hope it did.

Figure 5: Two more snapshots from 2010, the first year of the project (Veysel Vardar Boarding school for blind kids, Kilyos, Istanbul). RC students teaching angles with play-dough and then using the angle tool. Photos by the author.

Figure 6: Another snapshot from 2010, showing angles with playdough. Photo by the author.

I learned that Texas Instruments have a talking TI especially for visually impaired, and I recommended it in one of my recordings.

And yes, it is hard to imagine that you are blind but when you are doing something like we did, we had to think how would they think and how would they act; so I learned how hard it is to look at the world from someone else's shoes.

Önder Kaan Köseoğlu RC19

Here is the report another student wrote about the project:

As I mentioned at the second part of my project, we would start our visits to the school in order to observe whether our materials work or not. The first visit is occurred successfully and the second visit of this project is completed at 27th of March. In this visit there were two different age groups. One of them was fourth grade, whereas the other one was seventh and eighth grade. I divided our volunteer group to two in order to take care of both groups. First volunteer group includes following people:

Erhan Deniz Cem, Feyza Haskahraman, Uygar Szer, Buse Kurtar and Ula? Aktok whereas the second group includes the following people: Meri Ate?alp, Gken Polat, Duru Gkeo?lu, B?ra Papila and me. To the younger students group, the basic geometric shapes were introduced. Corner, length, circle, rectangle, angle etc. conceptions were explained to them. To the older students group, as they already knew about geometric shapes, the coordinate system new topic- is introduced to them. It was really hard situation; because it is really hard to understand coordinate system without seeing; however our material worked really well. So all student could understood easily. We used domino to create a coordinate system on the desk and each stone became a point on the axes.

Even though we can say that, the second visit of this project is completed successfully, there are still parts of this project to improve. First of all, we should revise our curriculum; because the students are much more familiar with geometry than we thought. We just need to show further geometric and mathematic subjects; such as permutation.

At this visit, we could not bring our materials to the school. We should prepare much proper materials and get benefit of them. As an example, domino game was a really clever way to teach coordinate system.

This visit showed me that, there is an physiological part of this project, besides mathematical part of this project. The students dont have people around them to talk. They really feel necessity of discussions and introducing themselves. Therefore we should make them feel relax in these short time of our visits. All students were asking “when will you come back?” and I think it was the best evidence to that, we are achieving our purpose. We are causing them to live different, beneficial and funny experiences, which was my aim in this project.

Ahmet Utku AKBIYIK RC13

Final Words

As a high school math teacher I learned a lot from this project. I do follow many educational conferences, and I am familiar with many new trends in education; I think this project reflects well all the knowledge and experience I have accumulated through the years. In my twenty-four years as an educator, I have always believed in the capacity of the younger generations. The world is quite different from their perspective; of course they need guidance but they also need to be listened. As the Harvard physics professor Eric Mazur says, we should not be under the curse of knowledge as educators. We should collect and analyze more from our students to learn more.

Working with visually impaired kids gave me another perspective in education. First of all we can do more for them, and while we do that, we also can learn a lot from them. The students in the project said very similar things about the project year after year; when they are asked to design and create or re-create something, it causes deep thinking where they start learning real things in life, not just real, but also useful and purposeful. They say it is beyond a standard homework assignment; it is mostly learning a lot while collecting life-long memories.

Lawrence B. Baggett says, in his memoir [1], that he learned a lot from his sighted peers.^{3,4} And I can imagine how, after seeing my students working with their visually impaired friends. After each and every lesson you can see the happiness and pride on their faces...doing something that makes them believe in themselves. That trust takes them on to another stage in their lives. They now know better that they need to be prepared and learn deeply to change someone else's life.

³ As a blind child in the 40s and 50s, Baggett experienced the very beginning of the mainstreaming movement. Although his early schooling took place at the Perkins School for the Blind, for fourth grade he left the community of the blind to be educated at Gotha School. His teacher, Helen Watson, took on the job of educating this most uncommon of students. Her guidance, according to Baggett was "the first, and possibly the most important, milestone of [his] integration into the ordinary world of sighted people". From that point on, his schooling (and eventual teaching) took place alongside his sighted peers.

⁴ For more on blind mathematicians, see [2]. For more on making mathematics accessible in the context of hearing challenges, see [4].

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