Empowering Turkish Youth Through STEM Makerspaces

Country of Project Implementation: Türkiye
Sponsoring College: University of Virginia
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Background
Both past¹ and present² analyses identify low educational quality as one of the strongest correlates for interpersonal violence. A better education—and by association, a higher income—decreases the chance of being both a victim and a perpetrator of violence³. Access to high-quality educational materials can help prevent one from falling into the cycle of poverty and the associated stresses that contribute to petty and violent crime.

Proposal
This proposal seeks to promote peace by implementing an innovative hands-on engineering educational initiative at two high schools in rural Türkiye. Project funds will be dedicated to STEM makerspaces, providing the two schools each a 3D printer, Arduino microprocessors, circuit-building components, and other relevant hardware. The two makerspaces will be housed at Fen Liseler, specialized science high schools dedicated to educating especially bright students from across all income brackets. This summer, I will travel to Türkiye, meeting with area high school and project liaison Tarsus Amerikan Koleji to collect, assemble, and distribute the makerspace hardware. I have already established connections with administrative staff at this local center and with nearby science and technology teachers at the schools where the makerspaces will be housed. The project has received the full approval of the host schools. With this project, educationally underserved students will receive an opportunity to push the bounds of their creativity and learn in-demand technical skills on actual industry-standard hardware. For example, students will be able to design a Java program, deploy it on a microprocessor, and route power to a motor via a custom, hand-built circuit. Students will also learn principles of computer-aided design, designing custom parts in TinkerWorks and creating them with a 3D printer, expanding their engineering skill set. Each of these skills are helpful for finding an entry-level software development position as well as preparing for university curricula. This center will help students to potentially earn well above the median annual Turkish wage of 94,000 lira—$5,040 in USD.

The project’s central location on school premises will permit existing STEM teachers to integrate the hands-on work directly into school projects and curricula, allowing a large number of students to take advantage of these new learning opportunities. In addition to coordinating the development of these makerspaces, I will develop and translate educational curricula to provide interested students with some projects for getting started. Sample projects will follow the three central themes of creating, innovating, and building (geliştirmek, yaratmak, yapmak), and will range from assembling elementary circuits and programming a microcontroller to designing and fabricating 3D printed parts.

Itinerary
Preparation

May 2023
- Order hardware to be shipped and stored at Tarsus Amerikan Koleji
  ▶ Project hardware includes 3D printing/design setup and equipment, microprocessor and programming setup, circuit-building kit, soldering kit, and robotics kit.
- Write introductory curricula for educational projects and use of hardware
- Translate curricula from English to Turkish

Execution

Early June 2023
- Travel to İstanbul (flight IAD → IST)
- Travel to Tarsus Amerikan Koleji by car and meet with local liaison
- Touch base with administration at the nearby Özel Çağ Fen Lisesi: School 1
- Transport hardware to School 1 and assemble it
- Touch base with administration at the nearby Sesim Sarpkaya Fen Lisesi: School 2
- Transport hardware to School 2 and assemble it
Conclusion

- Meet with STEM teachers at School 1 to discuss project sustainability
  ➢ Meeting will target points relevant to continued project impact, such as ensuring students' awareness of the new makerspace once school re-opens, equitably allocating center resources and time to interested students, and protocols for maintaining the hardware.
- Meet with STEM teachers at School 2 to discuss project sustainability
- Travel to Istanbul and return home (flight IST → IAD)
- Continued contact and technical support for project schools after returning to the US

Rationale

Line items in the budget were selected to furnish makerspaces for modest cost at the two target schools. All together, the project funds and associated hardware will supply a 3D-printing and design station, a microprocessor kit for studying programming and the Linux environment, an Arduino circuit building kit, a soldering kit, and a modular robotics kit. Together, these items will facilitate learning computer-aided design, programming, hardware engineering, and robotics design skills, in conjunction with the pre-prepared educational materials. A small portion of the project funds are allocated towards travel and lodging, with prices in accordance with regional economics.

The project sites and target educational area have been carefully selected for optimal returns on investment. Türkiye is an ideal location for an educationally-centered project to have outsize impact. Geopolitical events such as refugee influx due to the Syrian Civil War and, more recently, the Russian invasion of Ukraine have strained public resources. Additionally, recent macro-level conditions have caused a 80% drop in the value of Turkish lira over the last 5 years, exacerbating the effects of income inequality in the country. Together, these conditions have overextended educational infrastructure, causing the current needs of both Turkish and refugee youth to go unmet. This project addresses the economic distress and hopelessness facing students by providing them a chance to learn valuable skills and potentially find high-wage remote work. If unaddressed, these issues could contribute to political unrest and a rise in violence, underscoring the need for quality educational initiatives that engage students’ creativity and help them learn an economically valuable 21st-century skill set.

Secondly, Türkiye’s linguistic isolation further complicates their existing educational strain. In former Western colonies where English is widely spoken, even poor students can access a wide range of digital educational content, provided they have an Internet connection. Unfortunately, Turkish-language educational content in programming and hardware engineering is not widely available to the same extent. English education is limited in Türkiye outside the private school system dominated by the Westernized wealthy class. This project seeks to remedy this issue by committing both time to develop and translate Turkish-language educational STEM content and also funds to ensure students can apply these lessons by working on real hardware. In doing so, it addresses both this growing need and helps remedy the effects of income inequality.

My educational and cultural background is ideal for implementing this project successfully. Born a Turkish-American, I can read, write, and speak Turkish fluently and understand the requisite nuances of Turkish culture. I also have 9 years of experience in competitive robotics, during which I competed at the World Championship several times and for several years coached local youth robotics teams. At UVA, I am majoring in both Neuroscience and Computer Science, applying my computational background for interdisciplinary biomedical research. In implementing this project, I will leverage these vast experiences together with cultural understanding and area connections in order to ensure this project will have a lasting impact.

References