**Title:** The Importance of Incorporating Service-Learning Projects into the Medical School Curriculum

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| **Conceptualization** | Ideas; formulation or evolution of overarching research goals and aims. | X | X | X | X | | |
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Second year Medical Students at FAU show how incorporating Service-Learning Projects into the Medical School Curriculum benefits communities and future physicians.

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**ABSTRACT.**

The incorporation of Service-Learning Projects (SLPs) into the medical school curriculum is an effective way for students to adopt the leadership skills necessary to apply their traditional education on social determinants of health into targeted action. For our SLP, our team of second-year medical students organized an after-school science program to address the concerns of academically at-risk K-5$^{th}$ grade students at a local Non-Profit Organization (NPO). The goal was to increase interest in Science, Technology, Engineering, and Mathematic (STEM) subjects and careers. Our weekly lesson plans always utilized experimental learning models in an effort to foster engagement. Throughout the duration of the project, student participation grew to three-fold of the initial cohort. Through this SLP, we identified a disparity within our local community and developed a targeted solution to address this issue. We honed our skills not traditionally covered in a medical school curriculum, including program planning, fundraising, marketing, etc., and feel more capable taking on more significant leadership roles in the future. Additionally, our specific SLP provided us with an invaluable lesson in fostering communication skills that will benefit patient education.

**Key Words**: *medical students, medical education, mentorship, leadership*

## THE EXPERIENCE

Physicians have a unique authority to lead projects addressing healthcare disparities due to their extensive knowledge and training, as well as the inherent high status associated with their occupation. [1] While traditional medical training prepares students to recognize socioeconomic status, ethnicity, and insurance coverage as social determinants of health, [2] there is a shortage of physicians graduating with the leadership skills necessary to influence these frameworks. [3]

Many studies have called for the incorporation of leadership competencies in community service into the medical school curriculum. [3,4,5] A study at the University of Colorado Denver School of Medicine showed that medical school curriculums that incorporate community-based service projects are "effective at increasing student empowerment and disposition toward community service". [3] Student's participating in community-based service projects learn to identify problems in their community, formulate a project to directly mitigate it, and actively implement a solutions-based approach. Nationally, these programs have shown an "increase […] students' self-efficacy around multiple dimensions of leadership skills (e.g., fundraising, networking, motivating others)". [4]

Florida Atlantic University's (FAU's) College of Medicine has established a SLP requirement for all second-year medical students. Here, students work in small groups with local NPOs, assessing any challenges (medical and non-medical) they may face and designing targeted interventions.

For example, our group was assigned to an NPO that serves academically at-risk K-5$^{th}$ grade students. During our introductory session, we asked students to create dream boards; this allowed us to understand students' aspirations, which included dreams of becoming rich, models, teachers, and Whole Foods employees. We were surprised that no students had interests in pursuing medical careers, and almost none chose science. When probed, the students commented that their disinterest in higher education originated from repetitive textbook lessons and homework assignments, in addition to labelling science as "boring". Their concern was that we would use our sessions to make them study. Reflecting on our own journeys to medicine, we realized that our greatest motivators and points of inspiration were experiences that helped us conceptualize "boring" textbooks topics. For this reason, we created an after-school science program that used hands-on projects as the centerpiece of each weekly lesson.

While our school's SLP initiative is not funded, we were able to bring our plans to life thanks to generous donations from FAU's faculty of medicine.

The goal of our project was to make learning fun and in so doing, improve student engagement and interest in science topics. Through our SLP we aimed to inspire the next generation of learners to pursue STEM careers.

## DISCUSSION.

Each session took several hours of preparation to choose a topic, research language to properly convey these topics, and design a project that was stimulating, but also within budget. For example, when creating our lesson on electricity, traditional "circuit kits" we found online were expensive. However, we came up with a cheaper alternative: batteries, lightbulbs, foil, and a variety of household conductors and insulators for students to experiment with. This method truly cemented nuances, like the difference between "conductors" and "insulators", to students who were otherwise struggling to grasp the concept of varying flow of electrons through different materials.

We took on the role of teachers, creating lesson plans complete with lesson objectives, guiding questions, whiteboard interaction, and stepwise directions for the accompanying project. Throughout the weeks, students communicated a greater degree of enthusiasm, not only for our sessions, but for science in general. By the end of the semester, interest in participating in our program increased to the point where our NPO added an additional classroom of students to our sessions. We believe that these enriching projects have positively impacted the students and inspired them to further explore interests in STEM.

As future physicians, we must actively garner the tools necessary to bridge gaps in medicine. This begins with recognizing the importance of education - a key component of the patient-physician relationship. Our SLP gave us the opportunity to practice communication and simplification of complex scientific topics to a wide audience. Furthermore, our commitment to fostering engagement in learning translates to our future duty to encourage active discussions and patients' participation in their own health maintenance. These are skills we hope to continue to expand upon throughout our medical education.

On a small scale, advocating for the establishment of similar SLPs across all medical school curriculums would minimize the negative mindset to being successful that medical students tend to develop regarding their impact on the social determinants of health. [4] Although medical students can be taught how to identify social determinants of health such as literacy, accessibility, and income, it is important to instill in them the drive to amend these disparities in healthcare. SLPs serve as a microcosm for the complex, real-world problems that medical students will face in practice. They allow students to build the critical thinking skills necessary to not only identify socioeconomic obstacles in patient care, but also the forethought to take initiative and enact a functional plan that will address them. Through SLPs, students are able to see their direct impact on the community and be empowered to advocate for their future patients' health. Without this, students may feel discouraged when they are able to identify social determinants of health but lack the basic foundational tools to help fix them.

On a larger scale, these experiences prepare medical students to take on more significant leadership roles in the healthcare field as they progress through their training. [5] Students develop a breadth of skills not traditionally taught, including networking, program planning, fundraising, marketing, motivating, etc.[4] Though our SLP experience was required of all FAU medical students, we are eager to pursue and create similar projects in the future, and are confident we will be successful.

As the COVID-19 pandemic further exacerbates challenges, both healthcare-related and non-healthcare-related, faced by underserved populations in our communities (access to education, medical care, food, and other resources), medical students would benefit from the formalized incorporation of SLPs into their medical curriculum. These SLPs should be entirely student-led and should be continued until the identified challenge has been addressed and resolved in a cohesive manner.

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## SUMMARY - ACCELERATING TRANSLATION

Title: The Importance of Incorporating Service-Learning Projects into the Medical School Curriculum

Florida Atlantic University's Schmidt College of Medicine's requirement that all second-year medical students complete a Service-Learning Project (SLP) afforded us the opportunity to become leaders in our community and gain invaluable skills, such as simplification of complex topics and communication to a wide audience that will benefit our future careers as physicians. We present our experience in hopes of inspiring additional medical schools throughout the country to incorporate SLPs into their curriculum. In doing so, we believe it is possible to cultivate physicians with leadership competencies and motivation to tangibly influence barriers to health within their community.

Our group of 4 medical students worked with academically at-risk K-5$^{th}$ grade students, with the goal of generating interest in Science, Technology, Engineering and Mathematics (STEM) subjects. At our first session, we asked the students about their interests and inquired about their future goals and aspirations. We quickly realized that a lack of interest in STEM fields was due to traditional textbook and homework teaching styles, and decided to target this disinterest as the goal of our SLP. To increase student engagement, we designed weekly hands-on lessons and projects that would teach students STEM topics through experiential learning. For example, one week's lesson focused on electrical circuits and the basics of electricity. In order to accomplish this, we brought in batteries, lightbulbs, and other simple materials needed to create a circuit. We had the students experiment with the materials to figure out how to light the lightbulb. As they slowly discovered that aluminum foil worked better than yarn, we were able to explain the difference between conductors, insulators, and other electricity basics.

Implementation of our SLP required creating weekly interactive lesson plans, fundraising money for materials, and purchasing necessary materials. Our school faculty graciously donated money for us to purchase the materials needed for each lesson.

Every week, we saw enthusiasm for learning increase. This was evident in the smiles we received as soon as we walked in the door, in the increased participation from lesson to lesson, and in the various questions crafted by our students who were curious about topics they previously dismissed. We believe that our time with this academically at-risk community has changed their viewpoint not only on STEM, but also on learning, and hopefully inspired them to pursue careers in STEM.

While the community could benefit from formal SLP programs in all medical schools, medical students such as ourselves could also benefit tremendously. For example, we learned how to work with community partners to identify problems and address them directly. We also learned how to leverage our positions as medical students to positively influence our community. Additionally, we gained first-hand experience simplifying complex topics in a way that primary school students could understand; a skill that will become necessary in our future careers as physicians who must explain complicated medical diagnoses and pathophysiology to patients with varying educational backgrounds.

**FIGURES AND TABLES.**

**Figure 1.** An example of one of the formal lesson plans we created for each session.

SLP Lesson Plan

Title: What Do Plants Need to Grow?
Date: Tuesday, September 28, 2021 (semester-long project)
Learning Objectives:

- Students will think critically as to what distinguishes animals and plants and what plants need to grow
- Students will learn the parts of a plant and their function
- Students will understand the importance of plants to the environment and animals
- Students will each learn to care for their own seed/plant by applying what they've learned today. They will follow their plants longitudinally throughout the semester

Students Should Understand:

- Plants are living things that make their own food
- Plants grow from seeds
- All plants need sunlight and water to grow
- Plants grow best in soil, but some can grow without it
- Most plants have roots (for water absorption), stems (to stand tall and support their leaves), and leaves (to collect sunlight). Many also have flowers (to grow new seeds)
- Plants provide oxygen to the environment
- Plants are food for many animals

Lesson Plan/Guiding Questions (3:00-3:30PM):

1. "What kinds of plants have you seen before?" *flowers, trees, bushes, etc.*

2. "What makes an animal different from a plant?" *plants can make their own food using sunlight, while animals must eat plants or other animals (who eat plants) to survive*

3. "What do plants need to grow?" *all plants need sunlight and water to grow (different ones need different amounts). Plants grow best in soil, but some can grow without it*

4. "What are the parts of plant? What is each of their function?" ***use printed image***

   *Plants grow upwards from **seeds***
   *They grow **roots** downwards into the soil that absorb water and nutrients*
   *They have **stems** that support **leaves** that soak up sunlight to make food*
   *Many plants have **flowers** that can grow more seeds*

**Figure 2.** A student using his knowledge of circuits and conductors to turn on a lightbulb