

An undergraduate service-learning project to teach immunology concepts while increasing healthcare equity by enhancing access to stem cell donors among underrepresented populations

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ABSTRACT Active learning has been shown to increase STEM student engagement and decrease the achievement gap among underrepresented students. As a parallel to the lack of equity in STEM education, BIPOC patients who require a life-saving hematopoietic cell transplantation (HCT) are much less likely—sometimes less than half as likely—than individuals of White-European descent to find a suitable donor when using the National Marrow Donation Program (NMDP). The Be the Match (BtM) Registry has made significant improvements in the likelihood of matching underrepresented patients, but the disparity persists. This activity uses a service-learning project to teach undergraduate students about stem cell donation and to add potential stem cell donors to the BtM Registry. A small data set of pre-/post-surveys from one cohort shows learning gains on the topic of HCT. The approach is flexible and scalable, and students overwhelmingly reported the project as a great use of class time and very rewarding.

KEYWORDS service-learning, hematopoietic cell transplantation (HCT), healthcare equity, immunology

Approximately 18,000 people in the United States annually are diagnosed with life-threatening conditions requiring a hematopoietic cell transplantation (HCT)—70% of those cannot find a suitable family donor (1). Successful donors should match recipient's human leukocyte antigen (HLA) genes. To increase the chances of finding donors outside of immediate family, the National Marrow Donation Program (NMDP) and Be the Match (BtM) Registry were created in 1986 (2). A 2014 study highlighted their success—10,000,000+ registered donors and a 75% chance of finding a donor matching all eight screened HLA loci for patients with certain genetic backgrounds (3). However, non-White-European backgrounds had a significantly lower chance: Middle Eastern (46%), Hispanic (34%), and African (19%). Efforts to expand the registry to underrepresented groups have been somewhat effective. By 2022, the match probability for African backgrounds increased to 29% (4).

College campuses are ideal venues to recruit potential donors. HCT from younger donors generally has more success (5), and earlier registration provides more time on the registry. Populations with higher levels of education (6, 7) or knowledge about blood diseases and/or transplantation (8–10) are more likely to donate. Registration requires a cheek swab, and distrust of medical workers may decrease the likelihood of individuals to donate DNA samples (6), so seeing BtM volunteers who are peers or ingroup members may increase willingness to register.

Educationally, undergraduate microbiology/immunology student drive volunteers benefit by participating in active learning. Active learning strategies in STEM courses increase learning gains and pass rates (11). It can also increase student engagement (12, 13) and help narrow the achievement gap among underrepresented STEM students (14).

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Furthermore, this activity aligns with recommendations for a more effective and inclusive immunology education (15, 16).

PROCEDURE

On the first day of an 8-week immunology course at our small liberal arts minority-serving institution, the activity was introduced alongside a lecture on HLA typing and HCT. Then, students created subcommittees to work on (1) week of drive logistics, (2) pre-drive course visits and advertising, and (3) athletics and campus club outreach (see Supplemental Material). Group leaders volunteered to spearhead the projects and communicate with the instructor outside of class for expediency. Each week, short check-ins provided some time for teams to work. A representative from BtM visited class during week 3 to discuss need for HCT, racial disparities with matching, and common questions about registration. They also trained students on recruitment strategies and registered several students (modeling the process). The outreach and advertising teams spent the next 2 weeks visiting student groups, teams, and classes. Students reported preparing for 0.5–10 hours (average of 2.5). Student volunteers were stationed in a campus building with high foot-traffic building for 1–8 hours (average of 4) over the 5-day drive (Fig. 1). The drives have no/minimal risk, as registrants swab their own cheeks and data collected by the registry are confidential.

CONCLUSION

Registry drive

In our second and most successful weeklong drive, we registered 252 people, including 57% from non-European backgrounds—much higher than the 39% national average of registrants in 2022 (4) and resembling our campus demographics. Most registrations took place face-to-face, but at-home swabbing kits can be mailed upon request. Social media outreach was also effective, in line with previous studies (17). Non-US residents are not able to sign up through BtM and may be directed to partner registries in other countries (18).

We predicted that known student recruiters would be more successful than faculty volunteers or those unaffiliated with the campus. Drives on our own campus were more successful, presumably because outreach was more personal and familiar. Anecdotal evidence suggested that BIPOC student volunteers had more success in recruiting



FIG 1 Immunology students recruiting potential registrants. All promotional materials, banners, shirts, and kits are provided by Be the Match.

students from their same backgrounds. Previous studies of African American blood donors indicate that targeted outreach is a motivator, as was knowledge that their donation would be used to help other African Americans, such as those with sickle cell disease (10).

Student gains

IRB-approved pre-/post-surveys (appendix 1) were distributed to immunology students to assess perception of the activity and knowledge of the process and immunology of HCT. Data indicated the biggest changes in perception were regarding the donation process itself. Myths that donation primarily required drilling into bones (64%), lengthy recovery times (64%), and blood type matching (42%) were completely dispelled in all participants. As a course activity, all students reported that it was a good use of class time (11/12 strongly agreed), and they were glad the course included the drive as a service-learning project (10/12 strongly). Additionally, although only 4/12 students had previously donated whole blood, 11/12 said that they would be more likely to do so in the future.

Potential alterations

We had great success for a campus of our size, perhaps due to the trust and personal connections between volunteers and registrants. Since someone can only register once in their lifetime, the population of willing registrants may decrease after consecutive drives, and expanded pools are required. Our most recent class partnered with a nearby campus, but it was challenging to coordinate (see Supplemental Material for instructor notes). In response, a group of students formed a club that will continuously work to organize drives beyond our campus and course. Student feedback requested more time in class for drive preparation and role-playing recruitment conversations beforehand to practice. They enjoyed their 10-minute visits to other classes and wanted to visit more non-STEM courses. This is important since some registrants indicated that they would not have enrolled without learning about the drive from class visits. Surveys were created to measure motivation and knowledge of potential registrants, but they were rarely completed as time was limited and registration was more important than survey distribution. This is an area of future research.

This activity is scalable to larger classrooms and campuses. If the service-learning component is not possible, incorporation of HCT and an opportunity to register are still worthwhile activities. A shorter lecture and introduction to BtM was previously used in a general microbiology course. Positive student comments inspired the expansion toward the current project.

Summary

Our project aimed to bridge the gap in stem cell donor matching through active learning and education. In addition to educational gains, students were overjoyed to learn a registrant from our drive has already successfully donated. This service-learning project is literally saving lives.

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ETHICS APPROVAL

Student surveys were conducted with NPU IRB approval and participants' informed consent.

ADDITIONAL FILES

The following material is available [online](#).

Supplemental Material

Supplemental material (jmbe00157-23-s0001.docx). Pre/post-activity surveys, workflow, and instructor notes.

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