

Equity in Learning Opportunities for Middle School Students: Connecting Communities and Transportation Through GIS

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Introduction

GIS is a skillset that is needed in the workforce to support current and future transportation systems. This leads to advocacy for safer and better managed streets in California communities, addressing CA Senate Bill-1 Objective 4. In particular, introduction to GIS as a technology and basic skills in grades K–12 empowers students to explore potential career opportunities and pathways. Still, training and awareness resources are underutilized. The outcome of this pilot project and prior SB1-funded teacher-focused training is best practices, lesson plans, and curricular materials that can extend the reach of the project to additional classrooms, students, and teachers.

Study Methods

The bootcamp for this project was coordinated in partnership with Rio Hondo College, which provided the instructor and connection to the students at the Mountain View Unified School District in El Monte, CA. There were four-hour sessions held over three Saturdays in April and May 2022. Students filled out pre- and post-bootcamp surveys about their awareness of transportation and GIS and how the curricular tools impacted that awareness. The bootcamp was advertised as a “geographic information systems and drones” bootcamp at the recommendation of Rio Hondo College because drones are familiar and exciting to middle school students. A follow-up webinar was held with teachers and administrators involved in integrating GIS in the classroom. The webinar served as a way for the project team to discuss observations from the bootcamp with middle school teachers, gather ideas and challenges, and to share GIS curricular resources from the project and other sources.

Bootcamp Design

The bootcamp was held over three consecutive Saturdays. Each session was four hours and included classroom-based work as well as drone demonstrations and piloting which took place outdoors on the school campus. The students had laptops for hands-on activities. The students self-selected their participation in the bootcamp from a number of topics. The instructor, Warren Roberts from Rio Hondo College, brought prior experience with middle school students to curriculum design and delivery.

The bootcamp started by introducing mapping to the students (without mention of “GIS” specifically). The pre-bootcamp survey results revealed that most students had heard of robotics prior to the bootcamp but not GIS, so subtly introducing GIS helped with the initial learning curve associated with GIS terminology and acronyms. The instructor discussed concepts of direction and scale, as well as governance and political jurisdictions (e.g., city vs. county vs. state), which are concepts the students were familiar with beforehand.

Various technologies and platforms kept the students engaged throughout the four-hour sessions. As mentioned, drones were used to demonstrate how to capture images that can be turned into data to better understand the students’ surroundings. In the classroom, use of the Kahootz live quiz platform and interactive maps visualizing interesting or offbeat topics kept the lesson portions engaging. The Map Craft resources linked below were used as instructional tools during the bootcamp lessons. Map Craft is a “spatial detective” GIS curriculum developed at Rio Hondo College.

- London’s Deadly Disease Epidemic
- Investigating LA
- Investigating San Francisco Poop Problem
- New York Investigation

Findings

The bootcamp and follow-up webinar were successful as a pilot to gauge the impact and potential of introductory GIS and drones instruction and activities on student awareness of transportation and career opportunities. All student participants reported interest in learning more about GIS, despite “drones marketing” being the primary reason for enrollment in the bootcamp. More than half reported feeling comfortable creating a StoryMap, a narrative mapping hybrid GIS product, on their own after participating in the bootcamp.

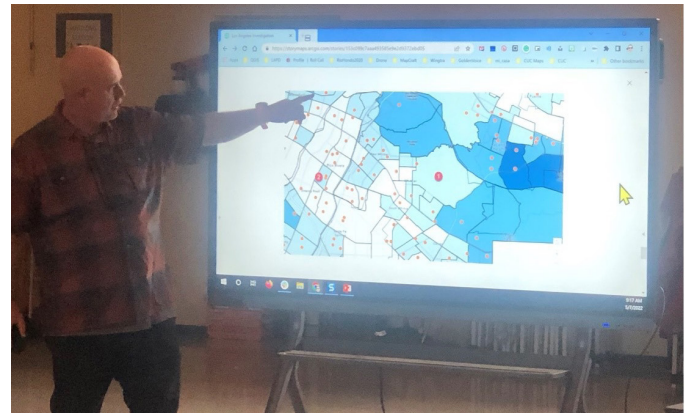
Despite teacher, administrator, and student enthusiasm, there are some barriers to implementing GIS more broadly in middle school classrooms. Webinar participants shared that teachers may be interested and enthusiastic but are busy and stretched thin as-is; many are still weary from the challenges of teaching during the COVID-19 pandemic quarantine. Motivated teachers may bring GIS to their curriculum themselves, but broad adoption will likely require direct curriculum and/or standardized score requirements. GIS is hard to introduce because it is pathway-adjacent, rather than a standalone pathway itself.

Webinar participants were active in the discussion and shared some novel ideas. Administrator participants suggested that to work around teacher overwork and exhaustion, curriculum researchers and designers could interface with curriculum vendors about integrating GIS into their products. There are also existing state programs into which GIS instruction could possibly be integrated.

Policy Recommendations

The partner infrastructure that was developed as part of this project and outlined earlier in this report can be repeated and replicated. The curriculum can be refined via this process. Future iterations of this bootcamp would benefit from surveying teachers as well as students. Teacher understanding of GIS, transportation, and career concepts is important for the success of the curriculum. There was potential to more explicitly tie the skill to transportation concepts and career opportunities.

Middle school is not too soon for students to expand their awareness of different skills and career opportunities connected to them. Working with research, funding,



and K–12 education partners to create and implement an accessible and viable curriculum to deliver to middle school students will encourage them to explore new skills and start to consider their career pathways.

About the Authors

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To Learn More

For more details about the study, download the full report at transweb.sjsu.edu/research/2247



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