

## **Rethinking High School Mathematics to Prepare Students for College and Career**

Each year our mathematics department asks two questions: (1) what learning experiences do students need to engage in for college and career readiness and (2) how do we organize that learning to get there? Part of the challenge of planning learning experiences in mathematics in high school for college and career readiness is the fact that our vision for the quantitative future changes—a lot. The key is not gaining perfect knowledge of the future, but rather revisiting these two questions every year and refining initiatives.

### **Demographics of The Morgan School**

The Morgan School is the public high school of Clinton, Connecticut. Current high school enrollment is 530. Clinton Public Schools is classified within District Reference Group D, with 37.3% of students eligible for Free or reduced-price meals. For more information please visit [The Morgan School Program of Studies](#).

### **What Learning Experiences Do Students Need for College and Career Readiness?**

Traditionally, much of our mathematics preparation for college and career readiness has focused on the “race to calculus.” While calculus can function as an appropriate capstone course for many students, it may not be the best course for college and career readiness. Knowledge of statistics is required for the most popular majors and concentrations in social science, business, and technology while “data science” itself is emerging as its own field of study. In addition, success in college and career increasingly requires knowledge of programming and discrete mathematics topics like graph theory, voting methods, financial mathematics, and number theory. In addition to the increase in the importance of topics in statistics and finite mathematics, students in upper mathematics courses are looking for learning experiences that approximate the world they are headed into.

### **How Do We Organize Student Learning to Get There?**

Our solution began with an assessment of our current courses. Four years ago, students seeking a fourth mathematics class could take AP Calculus, ECE Statistics, Statistics, and Trigonometry. What we found was that students in the highest-level courses had two well-established pathways for college and career readiness. They had the option of a calculus pathway and a statistics pathway—and these were the two general pathways we thought best prepared students for quantitative work beyond high school. Students in college-preparation courses, however, did not have such rich options. In response, we revamped our preexisting semester courses in statistics and trigonometry and made them into a full year statistics course.

The first year was a success but we wanted to further refine the course. We decided that students would be more college and career ready through participation in a more interdisciplinary course like data science. We believed that replacing a good portion of the theory with application and an opportunity to code with an opensource programming language such as R or Python would give students an edge in life after high school. After studying our options, we settled on “Introduction to Data Science (IDS)” course developed by University of California Los Angeles (UCLA) and the Los Angeles Unified School District (LAUSD) using a National Science Foundation (NSF) grant. The curriculum is application driven, has students build their own datasets through “participatory sensing,” and requires students to complete analyses using the R programming language.

In our self-assessment, we also determined that we needed to do more for struggling students in our core algebra-geometry courses if we wanted to ensure that they had access to the opportunities offered by our pathways. In response, we created an intervention program that offered both Tier 2 support with a mathematics paraprofessional as well as a Tier 3 support through a “Mathematics Concepts and Problem Solving” course. Students identified for the Tier 3 course enroll in what can be thought of as a “double dose” mathematics course. The course does offer direct support for student learning in the traditional algebra and geometry courses through targeted pre-teaching of foundational skills needed for topics in these courses, but a particular emphasis is placed on strengthening mathematical practices. In every session, students in the course engage with both curricular and non-curricular mathematics tasks to help build their perseverance, quantitative reasoning, argumentation, modeling, and confidence.