

Visual Analytics for Students and Teachers (VAST) Model at a Minority Serving Institution: A Department of Homeland Security Project for Strengthening STEM Teaching and Learning

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EXECUTIVE SUMMARY

This chapter focuses on a model for the teaching and learning of STEM by undergraduate students, teachers, and faculty at Morgan State University that focuses on visual analytics. This project represents an interdisciplinary approach to the teaching and learning of STEM at a Minority Serving Institution funded by the Department of Homeland Security. The chapter also outlines salient strategies associated with challenges at the university. In addition, the chapter discusses partnerships developed with Visual Analytics for Command, Control, and Interoperability Environments (VACCINE), a DHS Center for Excellence at Purdue University that supports DHS priority research in the area of visual analytics.

I hear and I forget. I see and I remember. I do and I understand. —Confucius

ORGANIZATION BACKGROUND

Morgan State University is a public urban research university in the state of Maryland that focuses on excellence in teaching, interdisciplinary research, effective public service and community engagement and outreach. Morgan State University prepares diverse and competitive graduates for success in a global, interdependent society. Morgan State has a Carnegie Foundation classification as a doctoral research university.

SETTING THE STAGE

In 2008, the U.S. Department of Homeland Security's (DHS) Science and Technology Directorate, Office of University Programs, provided funding to Morgan State University to "*Increase the Pipeline of STEM Majors among Minority Serving Institutions.*" This was a three year project that employed diverse methodologies designed to enhance both the teaching and learning of early career faculty and minority students engaged in science, technology, engineering, and mathematics education, also referred to as STEM. Part of this project also called for the introduction of cybersecurity into various aspects of the university curriculum. The ultimate purpose was to address the disparities gap within the STEM field (Flores, 2007).

During this time, fifteen (15) students were introduced to a diversity of approaches that would later broaden their tapestry of knowledge by introducing them to some of the best and most creative methodologies, processes, technologies, and training available. These ranged from smartphone app development and geospatial analysis to interdisciplinary informatics and data visualization. For example, after their training, a number of the students began helping to create and conceptualize what the Director of Residence Life and Housing, Douglas Gwynn, called "SMART Suites."

Through their effort, they began learning what we collectively agreed is systems and concept mapping, and critical thinking. In essence, the work and training of the students demonstrated a hierarchy of thinking in how we should lay out the SMART Suite labs, systems, structure, function, and operation. Concurrently, five STEM professors were also supported by DHS, to varying degrees, to enhance and disseminate their research in order to help determine how their scientific acumen and hierarchical thinking could benefit the broad needs of the DHS and STEM education.

Throughout this time period between Fall 2008 to Fall 2011, Morgan State University embraced the fiscal, technical, programmatic, and scientific resources and expertise provided by DHS, its program officials and the *Visual Analytics for*

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