

# Project Summary

## Intellectual Merits

This Small Business Innovation Research Phase II project chooses to aid learning at the higher education level. This project specifically targets the problem modern colleges have with successfully educating students in entry level mathematics. In a sampling of colleges, more than half of the students attempting College Algebra failed to pass it (Miami-Dade Community College) (Austin Community). This project will improve the learning process by specifically improving the students personal study time... It was determined that teachers communicate at over 180 words per minute, whereas students are able to record notes only at approximately 20 words per minute. Furthermore, these incomplete notes suffer from their static nature, and cannot repeat the step-by-step processes fundamental to mathematics. The objective of this project is to develop a working integrated multimedia recording and distribution system based around commercially available digital whiteboard technology. The entirety of the instructor's oral lecture and written notes will be stored in a compact, real-time format that will be distributed to students. Phase I of this project has proven the viability of recording and synchronizing the audio and graphical data. The exploratory research has proven the feasibility of gathering the data, synchronizing it, and storing it in a readily distributable format.

## Broader Impacts

This project will offer several broad advancements to modern digital presentation technology. Foremost, this project will offer distribution methodology for presentations superior to current options. This will be achieved by storing all graphical information in a vector-based format which is much smaller and much more accurate than bitmap or raster graphics. Additionally, storing graphics as vector-based strokes with timestamps will allow the real-time replay of the presenter's written notation in such a way that it directly replicates the timing and order of the original writing. This will give a lossless repeat of the presenter's performance in a visual style equivalent to a movie, but with file sizes several orders of magnitude less, while also escaping the compression and lossy data storage that plague modern digital movie formats. This project's achievements can not only be used in university mathematics instruction but also across all subjects in a university setting, especially ones featuring step-by-step processes such as physics, chemistry, and other technical subjects. Beyond the university level, this project would be a superior solution to most applications used by digital whiteboards in the business world. The ease of recording and distribution would allow businesses to integrate the product into their daily communication.

## Keywords

Digital presentations, vector graphics, digital communication, multimedia, mathematics instruction, educational, media synchronization

## Topic

Information-Based Technologies (IT)  
F. Education Applications  
2. Applications in Support of Learning  
c. Content authoring systems