

SAMPLE PROJECT SUMMARY

Sheryl Ball, "WITS: A Wireless Interactive Teaching System"

The Wireless Interactive Teaching System (WITS) represents an exciting new approach to improving the quality of STEM (science, technology, engineering, and math) education for undergraduate students. WITS is an inexpensive, portable wireless system of handheld computers designed to enable and enhance active learning in economics classes using interactive exercises – classroom “experiments”. These experiments can be used to illustrate vividly many different concepts in economics. Decision and outcome data from the exercises are projected on a screen as needed during class and can be posted on a web site for use in answering a related homework assignment. Based on our assessment data collected to date in economic principles we can provide potential adopters with evidence of its positive and meaningful impact on learning (Ball, Eckel, and Rojas, 2006).

We request funding to extend and apply the WITS system in three ways:

- **New exercises and materials:** we plan to create and test ten new modules for use in microeconomic theory and economics elective courses, as well as courses in related disciplines such as political science and public policy. We also plan to create student and instructor manuals for our previously developed principles exercises as well as for new exercises.
- **New users:** we plan to conduct training sessions for senior graduate students and targeted faculty at the PIs’ two very different universities, and assist them in developing and implementing interactive exercises in their classes. This training will also help us to prepare for future broad dissemination.
- **New audiences:** we plan two new sets of tests to see whether the learning gains we have seen with WITS generalize across other educational settings. The first is with students in microeconomic theory. The second is with minority and community college students.

Intellectual Merit: Many students have difficulty learning economics. Earlier research with the WITS system successfully demonstrated that allowing students to experience economic theory through economics experiments improved student performance, especially for groups that currently struggle most with the material – women and freshmen. The current proposal would allow us to extend WITS to microeconomic theory and courses that apply theory to real world problems. Success in intermediate micro course is an essential element of an undergraduate economics degree; applied courses teach students how to think about difficult problems using economics. The flexibility of the WITS system enhances the instructor’s ability to help students develop and test their own hypotheses, so that students learn economics by “doing science”.

Broader Impacts: We plan to conduct evaluations of the system in two new student populations: community college students and minority students (both at UTD and at an HBC.) These new pilot venues allow us to evaluate the potential uses of the system and its flexibility in meeting alternative educational needs and goals. Given the results of our initial pilot program, it is particularly important to test the system in environments where students have varying ethnicities, ability levels and learning styles.

Broader impacts of the research also include its impact on the recruitment of women students into economics, and building interdisciplinary and cross-institution bridges. A concern expressed at NSF and elsewhere is the low rate of participation of women and minorities in STEM disciplines, including economics. Our previous evaluations indicate that women and younger students benefit most from learning with the WITS system. If this mode of teaching helps women to succeed in undergraduate economics, then more of them may choose to attend graduate school, eventually increasing participation in the field. Furthermore, the WITS system can be adapted for teaching in other STEM disciplines, thus extending the learning gains beyond economics. Additional broader impacts involve building intellectual bridges between economics and other social sciences, as we implement the use of the system in other fields, and between two major research universities, an HBCU and community colleges. Finally, since both undergraduate and graduate students have been and will continue to be involved in the WITS project we are helping to achieve the NSF’s goal of integrating research and education.