Division of Academic Affairs
Technology Fee – Project Proposal
2015

Proposal Deadline: Wednesday, January 21, 2015

Project Proposal Type

Instructional Technology Enhancement Project (ITEP)

Focused projects proposed by an individual or small team with the intention of exploring new applications of instructional technology. ITEPs will typically be led by a faculty "principal investigator." ITEPs are time-limited projects (up to two years in length) and allocations of Technology Fee funds to these projects are non-recurring.

Project Title

Technology-infused Science Teacher Education for the 21st Century

Total Amount of Funding Requested

$42,600

Primary Project Coordinator

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Instructional Technology Enhancement Project (ITEP) Proposals Template
2015

ITEP proposals must provide the following information:

1. **Project description.**
   With the release of the Next Generation Science Standards (NGSS), K-12 science teachers are now expected to guide their students in more authentic science and engineering practices to deepen their understanding of disciplinary core ideas and crosscutting concepts (NGSS Lead States, 2013). These new standards aim to improve the quality of K-12 science education towards ensuring that 1) all students have a strong background in science; and 2) more students from underrepresented populations (e.g., females, certain racial/ethnic minorities, English language learners, learning disabled) continue in the STEM pipeline and become the scientists and engineers of tomorrow. The purpose of this Instructional Technology Enhancement Project (ITEP) is to enhance the preparation of pre-service elementary and middle school teachers for teaching science as practice using technology. More specifically, pre-service teachers will be trained to use probeware to collect, analyze, and interpret data during investigations of natural phenomena in their science education coursework (e.g., SCE 4310: Teaching Science in Elementary School; SCE 4320: Teaching Science in Middle and Secondary School). They will also have the opportunity to check out this technology to use with young students in science lessons during subsequent field experiences and student teaching.

   Research indicates that training novice teachers to use a technology does not guarantee that they will effectively integrate it into their teaching (Barton & Haydn, 2006; Martinovic & Zhang, 2012; Tondeur, van Braak, Sang, Voogt, Fisser, Ottenbreit-Leftwich, 2012). Tondeur and colleagues (2012) identify continuous scaffolding and support as critical elements for pre-service teachers' successful use of technology in their teaching. Guzey and Roehrig (2009) further note that such support is necessary to help teachers overcome the constraints in incorporating technology, and effectively develop Technological Pedagogical Content Knowledge (TPACK). TPACK represents the highly interrelated knowledge of technology, content, pedagogy that teachers apply as they use technology to represent concepts in the classroom (Schmidt, Baran, Thompson, Mishra, Koehler, & Shin, 2009).

   Therefore, as a part of this project, a library of NGSS-aligned and technology-infused lesson plans will be available to pre-service teachers interested in using probeware in their placements. These lessons will include both commercially available lessons as well as exemplary lessons developed by students. Given the severe lack of quality science materials available in the local schools, additional materials necessary for the enactment of these lessons will be available in kits. The probeware and materials kits with lesson plans will be available in the Professional Education Library, with overflow storage of the science materials located in the closet in room 107 of building 86. Finally, two workshops modeling appropriate enactment of these lessons including the use of probeware will be offered each semester. Graduate students in Curriculum and

Instruction and alumni at local elementary and middle schools will be invited to attend, and will also be permitted to use the probeware after attending at least two workshops.

2. **Description of project alignment with UWF Strategic Plan.**
This project seeks funding to support UWF's mission to provide students with access to high-quality and relevant learning experiences and aligns with UWF's strategic plan: *Priority 1.1. Foster student learning and development to include the knowledge, skills, and dispositions that optimize students' prospects for personal and professional success*.

By providing training and access to pre-service teachers on the use of probeware in conducting science lessons, we anticipate that our students will benefit in several ways. A number of studies conclude that engaging students in science and engineering practices using probeware can deepen student understanding of science content (Linn & His, 2000; Schneider, Krajcik, Marx, & Soloway, 2002; Schweingruber, Hilton, & Singer, 2005; Thornton, 2008; Zucker, Tinker, Staudt, Mansfield, & Metcalf, 2008). Furthermore, Gado and Ferguson (2006) note that the use of probeware can enhance pre-service teachers' attitudes towards science and self-efficacy for teaching science using technology. Thus, we expect students' knowledge of science content to improve as well as their dispositions related to science and technology. We believe that the improved knowledge and ability to incorporate probeware technology in science lessons, and free access to the instruments as alumni will positively influence students' professional success.

3. **Description of benefits provided:**
    a) Ways in which student access to technology will be enhanced.
    Currently, we have no probeware for our pre-service teachers to use during their science education coursework or field placements. We only have basic science equipment such as thermometers, meter sticks, and a few operational triple-beam balances.

    b) How the student experience will be enhanced.
    Our pre-service teachers will be able to carry out a broader array of investigations in their coursework given the broad utility and greater precision of the probeware. This has the potential to positively impact their knowledge of science. Furthermore, they will be engaged in authentic technology learning experiences which will enhance their confidence and ability to share this technology with their future students.

    c) How assessment will be conducted.
    We will assess pre-service teachers' knowledge of science, teaching, and technology using a modified version of the Technological Pedagogical Content Knowledge (TPACK) survey (Schmidt, Baran, Thompson, Mishra, Koehler, & Shin, 2009). The modified survey will be administrated to students at the beginning and end of their science education courses. In addition, we will administer a brief questionnaire to workshop participants to determine their perceptions of the quality of the workshop and perceived impacts on their knowledge of using probeware in their science teaching. Two focus groups of

randomly selected probeware users will be interviewed about their preparedness and experiences using probeware at the end of Spring 2016 to allow for the possible redesign of the coursework and workshops.

d) Which and how many students will be impacted.
All pre-service teachers in the Elementary Education, Middle and Secondary, and Special Education programs will be impacted by this project. Currently, there are approximately 550 students enrolled in these programs.

e) How students with special needs or disabilities would be helped.
The data representation capabilities of the probeware interface may enhance the learning of students with certain learning disabilities. The interface is also very durable which may allow easier use by students with certain physical disabilities. Furthermore, a stylus can be used with the interface's touchscreen if students cannot use a touchscreen. Specialized software can transform the interface into an adapted data collection device for students who are blind or visually impaired.

f) How training of students and faculty in the use of technology would be enhanced.
The purpose of this project is to not only provide access to probeware but to ensure that our pre-service teachers are prepared to effectively use this technology in their science teaching. To this end, we offer multiple layers of training and support. The appropriate use of probeware will be modeled by instructors in required courses and a workshop series. Additionally, a library of model science lesson plans incorporating probeware will be provided (in kits with required science materials). Students will be involved in developing and refining these lessons during their coursework.

4. **Description of how the initiative has a potential scope within and beyond that of the proposing unit.**
We anticipate that this project has the potential to impact over 100 elementary education undergraduate students and curriculum and instruction graduate students per year through required courses and workshops. After participating in two probeware workshops, graduate students in the Curriculum and Instruction program will have access to the probeware for use in their classrooms and for conducting research. The project team will provide mentoring and assistance to both undergraduate and graduate students who are interested in conducting a research study using the probeware technology. UWF students outside the College of Education and Professional Studies will also have access to the probeware technology. Since students majoring in science in the College of Science, Engineering, and Health often work with children in local schools and informal learning centers, workshops will be advertised and open to all UWF students.

5. **How will success be measured? Provide metrics.**
Success will be measured by a significant improvement (as determined by paired t-tests, $p<0.05$) in the pre-service teachers' scores on the modified TPACK survey administered during science education courses. The use of the probeware by at least 25 students in field placements each semester will also be used as an indicator of success.

6. **Description of resources for the project and projected ongoing resource needs (total cost of ownership for the life of the project) including:**
    a) Any hardware requirements (which should comply with standards established by the ITPAC (Information Technology Planning and Advisory Committee).
        - ***20 Vernier Deluxe Elementary Probeware Packages***
            - Total cost: $14,340+$807 shipping=$15,147
            - Each package includes the Labquest 2 interface and seven sensors for measuring temperature, light, motion, gas pressure, magnetic field, differential voltage, and force. The interface is used to collect sensor data and has built-in graphing and analysis applications.
        - ***10 Vernier Deluxe Middle School Probeware Packages***
            - Total cost: $10,440+$660 shipping=$11,100
            - Each package includes the Labquest 2 interface and ten sensors for measuring temperature, motion, pH, voltage, light, force, gas pressure, heart rate, conductivity, and magnetic field. The interface is used to collect sensor data and has built-in graphing and analysis applications.
        - ***10 Ohaus Scout Pro Electronic Balances, 600g x 0.1g***
            - Total cost: $3,191.50+$100 shipping=$3291.50
            - Many elementary and middle school science lessons using probeware also require the precise measurement of mass.
        - ***Elementary Science with Vernier Activities Guide***
            - Total cost: $48+$15 shipping=$63
            - This guide includes NGSS-aligned 43 elementary activities to investigate the topics in earth science, life science, and physical science using Vernier probeware. Specific instructions for using the probeware during the activities are included.
        - ***Middle School Science with Vernier Activities Guide***
            - Total cost: $48+$15 shipping=$63
            - This guide includes NGSS-aligned 38 middle school activities to investigate topics in earth science, life science, and physical science using Vernier probeware. Specific instructions for using the probeware during the activities are included.
        - ***Miscellaneous Science Materials for Kits***
            - Total cost: $1000
            - These funds will be used to purchase durable science materials (e.g., beakers, graduated cylinders) required to conduct science lessons using the probeware. The materials will be placed into kits with blackline masters of the lesson plans for our pre-service teachers to use in their field placements.
        - ***Total Requested for Hardware and Other Materials: $30,664.50***

    b) Any software requirements (which should comply with standards established by the ITPAC (Information Technology Planning and Advisory Committee).
        - ***Vernier Logger Pro 3 Software***
            - Total cost: $249+$15 shipping=$264

- Data collection and analysis software for PC and Mac. This software allows pre-service teachers to design their own investigations, and download data from the interfaces to personal computers or laptops in Excel. A generous site license is provided that allows all faculty and students to download the software from the company website (http://www.vernier.com/til/1885/) to their computers anytime. According to the company website, "The purchase of Logger Pro 3 software includes a site license which allows you to install Logger Pro 3 on any computer in a department (college or university) or school (K-12), as well as personal computers of students and faculty in the department or school." Updates are also provided free of charge.

➢ ***SciVoice Access Software***
- Total cost: $728+$15 shipping=$743
- Software that provides voice navigation and non-visual access for Logger Pro for blind and low vision students.

➢ ***Total Requested for Software: $1007***

c) Any personnel costs – only OPS and other time-limited appointments, non-recurring.

➢ ***OPS Assistant***
- Total cost: $9000+$328.50 fringe=$9,328.50
- An undergraduate student will be employed 15 hours per week at a pay rate of $10/hr for four semesters (15 weeks each). This student will be responsible for assisting with unpacking, bar-coding, and cataloging the probeware and balances. He/she will also be responsible for unpacking the science materials and using them to build the kits using the materials lists from probeware-based science lessons. He/she will then bar-code and catalog the kits as well. Finally, this student will assist with checking out these materials to our pre-service teachers.

➢ ***Vernier On-site Training***
- Total cost: $1600
- A specialist from Vernier will train project team members and any other interested faculty in the Department of Education and Educational Leadership on the use of probeware in a six-hour workshop at UWF. Travel costs are already included in the fee.

➢ ***Total Requested for Personnel Costs: $10,928.50***

7. Provide the proposed timeline for the project with major milestones and project end dates.

Semester	***Project Activities***
Summer 2015	• Purchase probeware, balances, and science materials • Vernier on-site training

	• Assemble elementary and middle school kits using Vernier-developed lessons • Design coursework and workshop experiences • Submit research proposal for IRB approval
Fall 2015	• Use probeware-based lessons in science education courses • Conduct workshops for UWF students • Check out probeware and kits to UWF students in field placements
Spring 2016	• Use probeware-based lessons in science education courses • Assemble additional kits using UWF student-developed lessons • Conduct workshops for UWF students • Check out probeware and kits to UWF students in field placements • Conduct focus groups
Summer 2016- Project concludes 8/5/16	• Redesign coursework and workshop experiences as indicated by assessment data • Conduct workshops for UWF students • Assemble additional kits using UWF student-developed lessons • Prepare evaluation report

8. Include a plan for sustainability of the project beyond the initial project period if applicable.

The probeware, balances, and kits (with lessons and materials) will be bar-coded and be available for check-out in the Professional Education library. Probeware is designed to be durable to reduce the probability of damage by young students. It is not unusual for a set of probeware to remain in use a full decade after purchase. The cost of any unexpected repair or replacement of equipment will be provided by the Department of Education and Educational Leadership budget, which includes a $500 line item for science materials.

9. Provide any resource matching which might be provided by organizations with appropriate commitment authority documentation.

To indicate their support for funding this project, the Chair of the Department of Teacher Education and Educational has agreed to fund $2,000 of non-technology materials required for the project. Additionally, storage has been secured in both in the Professional Education Library and in the closet in room 107 of building 86 (see attached letter of support).

10. Indicate which individual or group will implement the project (to help determine any additional costs and resource restraints).

Dr. Jennifer Mesa and Dr. John Pecore, assistant professors in the Department of Teacher Education and Educational Leadership, will implement this project.

11. **Indicate a lead person ("Principal Investigator") for the project for all communications and overall responsibility for reporting and fund utilization.** Dr. Jennifer Mesa

12. **Project proposals should be succinct and submitted to the Technology Fee Committee by the deadline with a notice of submission to the chair and the dean or appropriately designated leadership in the unit (Center Director, etc.).**

References:

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