



REQUIRED Cover Page

APPLICATION FOR PROFESSIONAL DEVELOPMENT GRANT

\*\*All applicants please complete this cover page.

<b>Choose one:</b> <input type="checkbox"/> Creative activity <input type="checkbox"/> Research activity <input checked="" type="checkbox"/> Professional Enhancement activity	<b>Date of Last PDG Award (Semester and Year awarded):</b> <u>Spring, 2006</u> <b>Date of ATU Faculty Appointment (Semester and Year):</b> <u>Fall, 2003</u>
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1. Project Title: Making Introduction to Physical Science Relevant to Liberal Arts Majors
2. Name of Principal Investigator/Project Director: Daniel Bullock
3. School (abbrev): PLS 4. Department: Physical Science
5. Campus Mail Address: McEver Hall Room 03 6. PI/PD Campus Phone: 968-0230
7. Amount Requested: \$ 5425 8. Total Cost of Project: \$ 5425
9. Does this project involve: 10. Duration of Project: 04/01/07 – 08/01/07

Yes No

- ☐ ☒ human subjects?  
☐ ☒ animals/animal care facility?  
☐ ☒ radioactive materials?  
☐ ☒ hazardous materials?  
☐ ☒ biological agents or toxins restricted by the USA Patriot Act?  
☐ ☒ copyright or patent potential?  
☐ ☒ utilization of space **not** currently available to the PI/PD?  
☐ ☒ the purchase of equipment/instrumentation/software currently **available** to the PI/PD?

NOTE: If the answer is "yes" to any of the above questions, the investigator must attach appropriate documentation of approval or justification for use/purchase.

SIGNATURES

J. W. Raitu 2007 Mar 8  
Department Head Date  
Mahom 3-12-07  
Dean Date

This Section to be completed by the Office of Academic Affairs

PDC Committee Award Recommendation: Yes ☒ No ☐  
PDC Committee Proposal Rank: 1 of 1 Total Proposals.  
Recommendation of VPAA: Yes ☒ No ☐  
Recommendation of President: Yes ☐ No ☐  
Award Date: 4/3/07

## B. ABSTRACT

Introduction to Physical Science (PHSC 1013) is a freshmen level general education course offered every semester. The typical liberal arts student enrolled in this course has a negative attitude to science and mathematics. They are generally disinterested in the topics and are often just “trying to get it over with”. The focus of this project is to try to change the course to fix these negative attitudes by exploiting the success of the CBS television series, “CSI”. This show is extremely popular with students and incorporates some of the most advanced techniques in science today.<sup>1</sup> As a result students are enjoying themselves while learning science. This proposal would focus on only one aspect of the CSI series, accident investigation and reconstruction. There is a plethora of interesting and relevant physics involved in automobile accidents such as forces, momentum, vehicle dynamics, structural deformation of materials, and driver reaction times. This proposal requests funds for the principal investigator to take an online course in accident investigation from Northwestern University and to attend an on campus 10-day workshop offered by Northwestern the goal being to incorporate this training into the Introduction to Physical Science.

## C. PURPOSE / OBJECTIVES

The purpose of this project is to make the Introduction to Physical Science general education course more relevant to our students.

The goal of this project is to use accident investigation to teach our students:

- Kinematics and dynamics
- Newton's three laws of motion, eg. Forces
- Conservation of Momentum
- Conservation of Energy
- Material deformation and failure

## D. SIGNIFICANCE / NEED

Introduction to Physical Science (PHSC 1013) is a freshmen level general education course offered every semester. The typical liberal arts student enrolled in this course has a negative attitude to science and mathematics. They are generally disinterested in the topics and are often just “trying to get it over with”. The focus of this project is to try to change the course to fix these negative attitudes by making the content more relevant to their everyday experiences. Specifically, we would try to exploit the success of the CBS television series, “CSI”. This show is extremely popular with students and incorporates some of the most advanced techniques in science today.<sup>1</sup> As a result students are enjoying themselves while learning science. This proposal would focus on only one aspect of the CSI series, accident investigation and reconstruction. There is a plethora of interesting and relevant physics involved in automobile accidents such as forces, momentum, vehicle dynamics, structural deformation of materials, and driver reaction times. This proposal requests funds for the principal investigator (PI) to take an online course in accident investigation from Northwestern University and to attend an on campus 10-day workshop offered by Northwestern the goal being to incorporate this training into the Introduction to Physical Science.

Northwestern University's School for Public Safety in Chicago, IL is considered to be one of the best institutions for training in accident investigation and reconstruction. Several municipal police departments from around the country send their officers to a four-week on-campus course for learning the techniques of accident investigation.

In this project I would enroll in the first half of the course, Accident Investigation 1 online. This newly developed accident investigation course provides a comprehensive study of the skills needed to systematically investigate traffic collisions. The online course presents the same techniques that are taught in our two-week on-campus Accident Investigation 1 course, using the same textbook and course materials. The online course teaches the investigator to make measurements, sketches, after-accident diagrams and photographs of the accident scene. Additionally, the student is expected to complete similar field projects. Accident Investigation 1 Online is interactive and provides instructors to guide the student through the process and grade your projects and exams.<sup>2</sup>

By successfully completing the online course students will be prepared to attend Northwestern University Center for Public Safety's entire investigation and reconstruction series on-campus beginning with Accident Investigation 2. Topics covered in the online version of Accident Investigation 1 include:

- Preparation for Traffic Collision Investigation
- Information from and about People
- Information from Vehicles
- Information from Roads
- Measuring and Mapping the Collision Scene
- Photographing the Collision Scene and Damaged Vehicles

The student will receive a copy of the new revised edition of J. Stannard Baker's accident investigation manual, Traffic Collision Investigation and instructions on how to access the course. After successfully completing the projects and tests, the student will be prepared to attend the Accident Investigation 2 program. By taking the first course online, we save money on travel and lodging and are then able to afford to continue on in the series of accident investigation courses on campus.

The next course in the series is Accident Investigation 2, which emphasizes vehicle damage analysis and vehicle behavior in accidents. Data collected at the traffic accident scene is useful only if properly interpreted and analyzed, and sufficient to explain events relating to the accident. The objective of this course is to develop skills in technically preparing accident investigation data and collecting follow-up data required by prosecutors, defense attorneys, claim adjusters, fleet supervisors, reconstructionists, and highway safety engineers. Accident Investigation 2 covers the following topics:

- Vehicle Damage Analysis—Description and Reporting
- Vehicle Behavior in Accidents
- Results of the Accident on the Road—Identifying and Interpreting Tire Marks and Road Scars
- Lamp Filament Analysis—Determining Whether Headlamps, Taillight or Turn Signals Were On or Off at Moment of Impact

- Tire Damage Analysis—Role of Tire Failure
- Measurement Methods—Perspective Grid, Photogrammetry, Measurement Techniques, Diagram Drawing, Systematic Methods for Organizing and Illustrating Data
- Interpretation of Data—Use of All Information Obtained Through Investigation
- Specialized Data Gathering—Measuring Devices and Other Testing

### E. PROCESS FOR ATTAINMENT OF OBJECTIVES / GOALS

The group that is offering the professional enhancement activity is the Northwestern University Center for Public Safety located in Chicago, Il. Northwestern's school is considered to be one of the best institutions for training in accident investigations in the country.

I would take the online course once funds were approved. It would take approximately three weeks to complete the required material. After this was completed I would sign up for the on-campus course in the early part of the summer. Once the course have been attended and completed I intend on incorporating the material into my Introduction to Physical Science course. Please find below a Gantt chart of activities:

	May	June	July	Aug.	Oct.	Nov.	Dec.	Jan.	Feb.
Complete online Auto Investigation 1 course									
Attend a two week on-campus Auto Investigation 2 course									
Integrate material in Introduction to Physical Science									
Develop Lab activities based on accident investigations									
Present findings AOK-AAPT meeting									

### F. DISSEMINATION OF RESULTS

I will present a talk at the next Arkansas-Oklahoma-Kansas American Association of Physics Teachers meeting. I will discuss the way in which the students can be engaged in the class by making the material more relevant.

### G. REPEATED REQUESTS

This is not similar to any other request.

## H. BUDGET

Please note that by taking the online course I save almost \$3000.00.

1. Supplies (please list items to be purchased and estimated price per item including taxes and shipping, if appropriate):

Online Accident Investigation 1	1100.00
On-campus Accident Investigation 2	1265.00
Course materials	200.00

**Total estimated supplies \$ 2565.00**

3. Travel (please list travel expenditures by date and estimated costs):

Roundtrip flight from Little Rock to Chicago	400.00
Hotel 14 nights	1800.00
Transportation (taxi, subway, etc)	100.00
Meals for two weeks	560.00

**Total estimated travel \$ 2860.00**

**TOTAL PROPOSED BUDGET \$ 5425.00**

## I. BIBLIOGRAPHY: Provide standard citations for material referenced.

1. CBS website, <http://www.cbs.com/>
2. Northwestern University Center for Public Safety website, <http://nucps.northwestern.edu/>

**J. APPLICATION VITA** (maximum: 3 pages)

**DANIEL BULLOCK**

310 S Waco  
Russellville, AR 72801

dbullock@atu.edu

Home Ph.:(479) 790-1895  
Office Ph.:(479) 968-0230  
Fax: (479) 964-0837

**EDUCATION**

UNIVERSITY OF ARKANSAS  
Ph. D. Physics (Nanoscience)

Fayetteville, AR  
May 2001

UNIVERSITY OF ARKANSAS  
M. S. Applied Physics

Fayetteville, AR  
May 2000

ARKANSAS TECH UNIVERSITY  
B. S. Physics

Russellville, AR  
May 1997

**EXPERIENCE**

Assistant Professor of Physics

Arkansas Tech University, Department of Physical Science, Russellville, AR, 5/2003 – present, Department Head: Professor Jeff Robertson

*Teaching Activities*

- Awarded “Outstanding Professor of the Year” by the Arkansas Tech University Student Government Association (2006).
- Implemented a campus wide teaching initiative using personalized wireless remote control technology to enhance the teacher-student engagement process.
- Averaged 4.50 out of 5.00 from 2004-2006 on all course student evaluations compared to the department average of 4.34 over the same three years.
- Upper division courses taught: Solid State Physics, Statistical Mechanics, Advanced Modern Physics Laboratory, Introduction to Nanoscience.
- Lower division courses taught: Physical Principles I & II (algebra based physics for pre-professional students), General Physics I & II (calculus based physics for engineering students), Physics I & II Lab, Introduction to Physical Science (freshman level introductory physics course for non-majors), Introduction to Physical Science Lab

Assistant Professor of Physics continuedResearch Activities

- Awarded a "Nanoscience Education Initiative" grant from the Arkansas Tech University Office of Academic Affairs worth \$100,000 (2006).
- Principal Investigator on funded Center for Energy Studies proposal titled, "Nanoscale Surface Effects on Biological Solar Cells", worth \$10,000 (2006).
- Principal Investigator on funded Arkansas Tech University Undergraduate Research Council proposal title, "Domain Mapping of Magnetic Nanoparticles" worth \$2,500 (2006). This project includes funding to support one undergraduate student.
- Awarded summer research fellowship with the Materials Science and Engineering Center at the University of Arkansas for, "Cross – Sectional Scanning Tunneling Microscopy of Quantum Dot Arrays", worth \$7,000 (2006).
- Principal Investigator on funded Arkansas Tech University Professional Development Grant entitled, "Cross Sectional Scanning Tunneling Microscopy (STM) Studies of Quantum Nanostructures", worth \$1,000 (2006).
- Co-Principal Investigator on funded Arkansas Space Grant Consortium – NASA proposal entitled, "Autonomous Warehouse Robot", worth \$3,486 (2005). This robot was entered into the South Central robotics competition and won 1<sup>st</sup> place against school such as Louisiana State University, University of Texas – Austin, Texas A & M, and Texas Tech University.
- Principal Investigator on funded Arkansas Space Grant Consortium – NASA proposal entitled, "Sample Preparation Algorithms for Cross Sectional Scanning Tunneling Microscopy Experiments", worth \$4,150 for one year (2005).
- Awarded summer research fellowship with the Materials Science and Engineering Center for "Cross-Sectional Scanning Tunneling Microscopy on III-V Based Nanostructures", worth \$13,000 (2005).
- Principal Investigator on funded Arkansas Tech University Assessment Committee grant entitled, "Real-Time Classroom Assessment", worth \$1,220 for one year. This project, in collaboration with another faculty member, studies the effects of different technologies used in the classroom on learning (2005).
- Co-Principal Investigator on funded Arkansas Space Grant Consortium – NASA grant entitled, "Portable Spectrograph for Astronomical Observations", worth \$18,175 for one year. This project involves three faculty members from two different departments. Additionally, the funds from this project will support two undergraduate students to conduct the research for one year. These students were able to visit Johnson Space Center to review current NASA research projects (2005).
- Principal Investigator on funded Arkansas Space Grant Consortium – NASA grant entitled, "Dynamic Electronic Device Production Software", worth \$2,600 for one year. This proposal was able to fund research performed by two undergraduate students in 2004. Additionally, these students were able to travel to the Stennis Space Center to observe current NASA research projects.
- Attended the 2004 Arkansas Tech University Undergraduate Research Symposium, Russellville, AR. – 04/14/04.
- Attended the 88th Annual Meeting of the Arkansas Academy of Science,

Jonesboro, AR. – 04/02/04 – 04/03/04.

Assistant Professor of Physics continued

*Research Activities*

- Principal Investigator on funded Arkansas Tech University Undergraduate Research grant entitled, "Growth Rate Calculations", worth \$2,500 for one year. This proposal was able to fund research performed by two undergraduate students in 2003.
- Co-Principle Investigator on funded Arkansas Space Grant Consortium – NASA grant entitled, "Practical Solar – Electric Car", worth \$5,350 for one year.

*Service Activities*

- Appointed to University Assessment Committee (3 year appointment).
- Elected to University Library and Media Committee.
- Served on Nanotechnology Group formed by the Vice-President of Academic Affairs.
- Served on the selection committee for the Truman McEver and the Ruben Caudle scholarship awards.
- Served on Faculty Peer Review Committee (2 years).
- Served on Faculty Athletic Committee (elected 2 years, and appointed by the President of ATU one year).
- Chaired Department of Physical Science Machine Shop Committee.
- Taught Upward Bound Math & Science Students during a six-week summer program.
- Principal Investigator on funded Arkansas Tech University Assessment Committee grant entitled, "Real-Time Classroom Assessment", worth \$1,220 for one year. This project, in collaboration with another faculty member, studies the effects of different technologies used in the classroom on learning (2005).
- Guest speaker for Upward Bound Math & Science Winter Program.
- Judged Student Organization Booths for 2006 Homecoming.
- Judged Student Organization Floats for 2006 Homecoming Parade.
- Judge for the Arkansas Junior Humanity and Science Symposium.
- Attended an Assessment Conference, Little Rock, AR – 04/30/04.
- Attended an Assessment Workshop, Little Rock, AR – 05/25/04.