

Faculty Innovator Grant 2013
Center for Learning Technologies

Final Report Form

Primary Faculty Name:	Declan De Paor
Department:	Physics
Email Address:	ddepaor@odu.edu
Office Phone Number:	4619
Project Title: <input type="checkbox"/> (10 words or less)	Virtual versus real prisms for optics education

Other faculty:

Faculty Name:	Department	Email Address	Office Phone Number
C. Sukenik	Physics	csukenik@odu.edu	3038
G. Dodge	Physics	gdodge@odu.edu	(now at NSF)
R. Zimmerman	OCEAS	rzimmerm@odu.edu	5991
S. Sechrist	Nuclear Med Tech	ssechris@odu.edu	4702

Faculty Innovator Grant 2013
Center for Learning Technologies

Final Report Form

1. Describe the specific teaching and learning issues being addressed by the proposal.

We tested whether student learn as much from Flash animations of prisms as they do from physical prisms. There are implications for onsite and distance education in multiple disciplines.

2. Describe the revised specific teaching and learning issues being addressed by the proposal (if applicable):

3. Describe the development activities involved addressing the learning or teaching issue.

PI Declan De Paor and graduate assistant Arman Frasier ported prism simulation software from Flash Actionscript to the HTML 5 Canvas in order to make it work on mobile devices.

4. Describe the learning outcomes attained by the project.

Results of IRB-compliant class testing showed that virtual prisms are approximately equal in immediate retention and slightly better in long-term retention versus physical prisms. Six lab sections of introductory astronomy students, four sections of general physics students, and one section of medical students were tested. These students were then subdivided into experimental and control groups, numbering nine each. Students were given an anonymous questionnaire prior to instruction to set a baseline for their knowledge of prisms. The experimental groups were then instructed using a virtual prism, while control groups were given similar instruction using a physical prism. After the lab, the students were asked again to complete the same anonymous questionnaire. Total time for instruction and administering two questionnaires was approximately fifteen minutes. In the case of astronomy students, they were asked two weeks later to complete the questionnaire once more to ascertain long-time retention.

The data show that astronomy students had better long-term retention when using digital prisms; however, their understanding of internal reflection and the path which light takes through a prism diminished when compared to the same-day responses. General physics students appeared to get the most advantage from using digital prisms, with only small advantages to physical prisms for understanding internal reflection and dispersion.

5. Describe unexpected outcomes, if any.

The most important conclusion is that students do not miss out on any significant benefits by using virtual rather than real apparatus.

6. Describe the impact of the completed project on your colleagues, department, college, or community.

This project had a minor influence on a Jan 2013 proposal to the NSF that is currently recommended for funding (but under news embargo until awarded).

Faculty Innovator Grant 2013
Center for Learning Technologies

Final Report Form

7. Describe how the project can be a model, template, or prototype for use by other instructors.

There are innumerable Flash animations and simulations for science education that do not work on mobile devices. This project may encourage others to port to HTML 5.

8. Describe the technology used to help address the issues described in the proposal.

Computer hardware, software, mobile devices.

9. Describe products, if any, that are a result of the project.

<http://www.lions.odu.edu/~ddepaoor/Site/Applets.html>

10. Describe the future plans for this project, if any.

We plan to port other Flash animations for physics and geoscience education to HTML 5. A peer-review paper was submitted and is being revised for resubmission.

11. Attach a financial report with updated Budget Plan Matrix.

I have asked the department business office for this and will forward when I receive it.

Final Budget Matrix

Budget Item (equipment, personnel, software, etc.)	Qty	Total Cost	Source of Funds	
			Amount from FIG	Amount from Other Source
PollEverywhere License	1	\$696	\$696	
BBEdit upgrade	1	\$40	\$40	
Stipend - Arman Frasier	1	\$1,800	\$1,800	
Publication (encumbered)	1	\$464		
Total		\$3,000		