Using iPads to Make Physics Videos

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Abstract

I am describing the development of Buffalo State’s iPad video physics project. Beginning in summer 2015, graduate students and in-service teachers were tasked with examining concepts or experiments through the creation of shorter, multimedia content presentations. These have many similarities to videos on the YouTube channel minitutephysic and Verbatim, but are not meant to achieve the same production quality. Conceptual learning is the intended outcome of the assignment, not a professional video. Videos are produced on the iPads using filming, editing, and voiceover features of apps like Movie and iMovie. I am presenting and discussing suggestions, rubrics, guidance, and lessons learned for teachers desiring to assign and evaluate expository videos produced by students for credit. This work was supported by the NSF, SUNY ITG and the University of Cologne as well as SUNY Buffalo State Physics.

Physics Content Multimedia Presentations

By combining the measurement and multimedia capabilities of the iPad, it is possible to produce the types of science videos popularized by minitutephysic and Verbatim. These are not slide presentations, lab reports, or compilations of raw experimental footage. Instead, they explain physical phenomena with narration, scripted scenes, experiments, illustration, and animation. 

At the University of Cologne, Germany, physics students are assigned projects in which they use iPads to create multimedia presentations. The purpose of the assignment is not for students to contribute new or improved science videos to the YouTube community. Instead, they are expected to learn about a physical phenomenon through the process of video production.

The assignment promotes a high level of engagement by allowing students to use the familiar technology of handheld devices. More importantly, all students must gain a firm conceptual understanding in order to create an effective video. The project is a much better learning tool than the resulting video, making it an appropriate assignment in college and university settings.

iPads in Graduate Courses

During the months of July and August 2015, Buffalo State held two of its annual summer courses for physics teachers: PHY 510 Physics for High School Teachers: Content & Pedagogy, and PHY 622 Powerful Ideas and Quantitative Modeling: Electricity and Magnetism. For the first time, both courses included a physics video project. Students were provided iPads for use on the project and were given guidance and support by instructors from the University of Cologne.

During the Fall 2015 semester at Buffalo State, myself and another student in PHY 520 Modern Physics also completed an iPad physics content media presentation. We created a video as a resource for educators teaching about radioactive decay.

Videos created at Buffalo State are available on Dan MacIsaac’s YouTube channel. (Simply search Dan MacIsaac on the homepage of YouTube.)

Two students from PHY 520 are shown working on an iPad video.

Reflection and Revision

I have personally worked on iPad video projects in both of the summer courses and PHY 520. As part of an independent study this semester, I have been refining the video creation process and identifying realistic goals for its use in physics classrooms.

The diagram on the right gives a roadmap for educators who would like to assign physics content multimedia presentations. It should be noted that the first reflection stage is appropriate end to such projects. The initial productions will inevitably contain mistakes, but learning and reflecting on physics content is the chief goal. This can achieved in the first cycle.

The second cycle is for those who would like to improve their videos and achieve a YouTube-quality final product. Time restraints prevent us from being feasible in most physics courses. Part of my work this semester has been to produce a second version of the video created in PHY 520. Both versions will be available on Dan MacIsaac’s YouTube channel.

Assessment and Rubrics

When assigning a video project in a high school or college physics setting, it is important to keep students focused on learning content rather than perfecting their video. To reflect these goals, a sample rubric is shown below.

References & Links


Notice that the emphasis is on ensuring accurate physics content, creating a multimedia tool, using multiple representations of phenomena, time-management, and reflection on learning.

This rubric was created using Rubistar. It is available at:
http://rubistar.4teachers.org/index.php?screen=ShowRubric&rubric_id=2622788

Discussion & Lessons Learned

Physics Content Multimedia Presentations are a particular type of high school or college physics content courses for students who are becoming physics teachers. However, the fun, professionalism and attention to detail are required of making quality physics videos – especially a final draft video with accompanying notes for improvement does seem appropriate for future physics teachers. While making a video, future physics teachers learn simple video planning, shooting, editing and voiceover skills that call upon their abilities to research physics content and prepare a clear, concise and appropriate presentation, visualizations, footage, language and mathematics. This serious, enlightening and intense attention to detail and deliberate refined practice is similar to Japanese lesson study and not at all typical of North American STEM teacher preparation. As part of the process future teachers improve their own subject matter knowledge and refine rigorous articulate language, clarity of thought and representation skills they can call upon to guide student discourse in their own classrooms. The participants’ physics videos (while highly motivational) are almost an afterthought to the process, and we strongly believe that attempting to follow through to produce a professional grade video is best left to a follow up project, independent study or capstone project.

Our Advice: Have students start as early as possible with multiple researched topic explorations (including critiques of other literature and videos), a storyboard and checked mathematics. Students have not generally been exposed to professional level outcome expectations and usually strive to produce a last minute highly imperfect school-level draft outcome that most classroom instructors accept. For a physics course final project, we suggest you plan on a solid draft video with extensive guidelines for improvement as an acceptable outcome.

Expect much student humor, creativity and lots of “inside jokes” along the way.

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