Park, J. (2010). Editorial: Preparing teachers to use digital video in the science classroom. *Contemporary Issues in Technology and Teacher Education*, *10*(1), 119-123.

Editorial: Preparing Teachers to Use Digital Video in the Science Classroom

John Park, Science Education Editor
North Carolina State University

This special issue of *Contemporary Issues in Technology and Teacher Education* is devoted to digital video use in the classroom. The topic was chosen as a result of discussions that were held by special interest groups at annual meetings of the Society for Information Technology and Teacher Education and at meetings of the National Technology Leadership Coalition in 2007 and 2008. As discussions progressed, it became evident that digital video was being used in a variety of ways across content areas in respective teacher education courses and that its use in K-12 classrooms needed to be more rigorously examined.

Moving images have served as tools for science teaching since the early 1900s. Although movie storage and method of presentation have evolved from film to videotape to laserdisc to DVD to online digital video, the underlying event is still the same: a sequence of images and sound that tells a story. These stories are useful to science teaching and learning in many ways, including in instruction, exploration, and assessment.

Instruction

The main use of moving images in the first half of the 20th century was the self-contained instructional film. Once the film was turned on, the film's production team controlled the flow of instruction. Teachers would try to make the event more interactive by providing outlines to complete, but one of the most important capabilities of the experienced teacher was minimized: the ability to respond immediately to the questions and ideas of the students.

The quality of self-contained instructional film improved as commercial motion picture studios moved into the education market. For example, *Hemo the Magnificent*, directed by Oscar winner Frank Capra, was a high quality motion picture featuring live action and animation. Today, selections from other high-quality documentary films can be used for science instruction, as well, such as *March of the Penguins* (2005).

In the early days of film use, the schools either had to purchase or rent educational films. Today, most self-contained instructional films are found on cable or broadcast televisions. Networks such as PBS, The Discovery Channel, The History Channel, and National Geographic produce programs that focus on nature, earth/environmental science, and technology. Programs in the physical sciences are more limited. Classic self-contained instructional television programs that have an exploratory nature can be found on the Internet. Examples include Julius Sumner Miller's *Demonstrations in Physics* (1969; see Video 1), and Don Herbert's *Mr. Wizards World* (1983; see Video 2).

Video 1. Julius Sumner Miller's *Demonstrations in Physics*
(http://www.schoolwax.tv/physics-julius-sumner-miller-archimedes-part-1)

Video 2. *Mr. Wizard's World* clip
(http://www.youtube.com/watch?v=2sIAVV5HKjc&NR=1)

Exploration

As early as 1924 Frank Freeman, an advocate and researcher of using film in education, saw the advantage of having motion picture film in small units. He suggested that film "should be so designed as to furnish to the teacher otherwise inaccessible raw material of instruction, but should leave the organization of the complete teaching unity largely to the teacher" (p. 79). His advice generally went unheeded until the 1960s, with the advent of the single concept film loop. In 1971 Franklin Miller, Jr., listed 14 reasons for using short films that promote science explorations.

Watching digital video can capture students' attention and engage them in the topic being introduced (Park, in press). If the digital video is carefully crafted, it can also be used to help students explore concepts and gain understanding through explanations within the video. Viewers can compare what happens as variables are changed in sequenced scenes, or they may be challenged by questions in overlaid titles or voice-overs.

Other videos can be used to elaborate or to apply concepts discussed in class to new situations. For example, after doing activities related to average velocity, a video could be viewed that shows the velocity of a car traveling at 55 mph as viewed from a car next to it traveling at the same velocity. A sequence of these types of shots would introduce the students to the concepts of relative velocity and frame of reference.

Computing technologies combined with digital video allow students to conduct analyses that once were limited to scientists. Motion and time measurements can be made using video of events. Video of a specific event can be synchronized with related data. Students can take measurements and make inferences from popular Hollywood movies to see if the scenes are probable or even possible. Stop-motion animations can assist students in understanding scientific processes or mechanisms.

Assessment

In the featured science education article in this special issue, Dickinson and Summers describe their use of "(re)anchored" videos intended to blend with other resources to establish a rich, believable problem-solving environment. The resulting environments were used to assess pupil success in using data to solve authentic problems.

Other manuscripts have encouraged prospective science teachers to create videos displaying their knowledge of a specific concept (e.g., Hoban, McDonald, & Ferry, 2009; Yerrick, Ross, & Molebash, 2005). Based on the results of the videos, teacher educators can measure preservice student understanding of the science concepts.

Some science education professors use vignettes of science teachers in action to assess various aspects of their teaching, questioning, and laboratory management (see, e.g., the InTime website, http://www.intime.uni.edu; also Krueger, Boboc, Smaldino, Cornish, & Callahan, 2004). Other uses include the videotaping of student teachers for assessment and improvement or videotaping of teachers used as evidence of high quality teaching for National Board certification.

Implications for Science Teacher Education

In his 1934 text, *Science Teaching at Junior and Senior High School Levels*, Hunter devoted about 15 pages to self-contained instructional film. Heiss, Obourn, and Hoffman (1950) dedicated eight pages to motion picture use, but also included a page on the use of film cameras. Brandwein, Watson, and Blackwood (1958) included four pages on instructional film, and stated that one fifth of classroom time in physics should be devoted to using film. Most modern science education methods texts, however, include only a cursory mention of video.

Clearly, science teacher educators should be preparing teachers to incorporate digital video in science learning. An increasing amount of science digital video is easily available on the Internet. Software for editing digital video has become simpler to use. Hardware to capture digital video is affordable and easily obtained.

Capturing, editing, and posting digital video content that can be used by any science teacher is easier than ever. Merely having access to digital video does not mean it will make a difference in student exploration and learning, however. We cannot forget the "P" in TPaCK (technology, *pedagogy*, and content knowledge). Having access to technology tools and products is the beginning of pedagogy. Knowing how to enable students to build knowledge using the tools is of prime importance.

When I attend professional conferences and present some of the digital movies that I have created for science lessons, many of the conference attendees are unimpressed—until I move into instructional mode and begin to teach using the digital movies. The movies in themselves do not provide much venue for exploration and learning, but the way science teachers use the movies can promote an inquiry environment where student ideas are generated and tested. Pedagogy is the key to effective use of digital video.

Therefore, time should be devoted to the preparation and use of digital video in science methods classes. Areas of practice should include

- Identifying sources for effective motion pictures for instruction and analysis,
- Making best use of existing short videos, as suggested by Park (in press) and Miller (1971),
- Providing instruction on how to shoot, edit, evaluate, and post science video explorations that can be used by the science education community, and
- Involving students in the variety of inquiry methods to explore science using digital video.

When it comes to educational technology, some educators tend to be attracted to the latest development. Technologies such as moving images have been around for over a century, but the format and delivery systems have enabled new capabilities for innovative teaching. We should continue developing and researching the methodologies for using these moving images that engage students to explore science topics in both school science and in topics that are of most interest to students.

References

Brandwein, P.F. Watson, F. G., & Blackwood, P.E. (1958). *Teaching high school science: A book of methods*. New York, NY: Barcourt, Brace & World, Inc.

Freeman, F. (1924). *Visual education: A comparative study of motion pictures and other methods of instruction*. Chicago, IL: University of Chicago Press.

Heiss, E.D., Obourn, E.S., & Hoffman, C. W. (1950). *Modern science teaching*. New York, NY: The Macmillan Company.

Hoban, G., McDonald, D., & Ferry, B. (2009). Improving preservice teachers' science knowledge by creating, reviewing and publishing slowmations to Teacher Tube. In I. Gibson et al. (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2009* (pp. 3133-3140). Chesapeake, VA: Association for the Advancement of Computers in Education.

Hunter, G. H. (1938). *Science teaching at junior and senior high school levels*. New York, NY: American Book Company.

Miller, F., Jr. (1971). A long look at the short film. *American Journal of Physics, 69*(1), 4-8.

Park, J. C. (in press). Digital video in science education. In G. Bull & L. Bell (Eds.)., *Teaching with digital video: Watch, analyze, creat*. Eugene OR: International Society for Technology in Education.

Yerrick, R., Ross, D., & Molebash, P. (2005). Too close for comfort: Real-time science teaching reflections via digital video editing. *Journal of Science Teacher Education, 16*(4), 351-375.

Callahan, W. (2001). *InTime: Integrating New Technologies Into Methods of Education*. Retrieved February 3, 2010, from http://www.intime.uni.edu/

Krueger, K., Boboc, M., Smaldino, S., Cornish, Y., and Callahan, W. (2004). INTIME impact report: What was INTIME's effectiveness and impact on faculty and preservice teachers? *Journal of Technology and Teacher Education*, *12*(2),185-210.