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COMMENT Multimedia — Hype Or No?

Robert G. Fuller

Commonly, multimedia is used as a modern name for interactive video. It simply means using a computer to control the presentation of video images to an audience. It facilitates glitzy presentations of boring data. In my view, this is hype.

However, there is a more profound sense of the term. Multimedia can be seen in an historical context that places it in the tradition that began with Vannevar Bush, director of the U.S. Office of Scientific Research and Development, who in 1945 published an article, "As We May Think" in the *Atlantic Monthly*. In that article he suggested a "future device for individual use, which is a sort of mechanized private file and library." Multimedia also belongs to the tradition based on the work of Douglas C. Engelbart, who, while working at the Stanford Research Institute, began to develop a system for augmenting human intellect. Additionally, multimedia is the present day representation of "hypertext," a word coined by Theodor H. Nelson in 1965 for nonlinear, or nonsequential, writing and reading. He envisioned a multidimensional text with junctions for burrowing into the material for details, definitions, and background information.

For me, multimedia is the extension of hypertext to include graphics, video, animation, and sound to offer nonsequential learning. I believe this use of the term multimedia is not hype. Multimedia offers us wonderful new possibilities for knowing and teaching physics.

For us to know physics as we currently do, we had to gradually change our patterns of reasoning and advance to another level of understanding. This is a lifelong process of change. It occurs when what we think we know about nature is not substantiated by our experiences, that somehow nature does not quite make sense. "Knowing" is rooted in our innate desire to understand ourselves and our environment. Hence, the primary task of hypermedia in knowing physics is to facilitate these on-going changes in our mental processes as related to concepts in physics. The appropriate function of multimedia is not to try to make physics superficially easy, but to reveal its appropriate level of complexity. Thus, the multimedia task is to provide a credible reality and a challenge to our existing mental processes — in short, to provoke us into an appropriate level of cognitive conflict and motivate us to continue the process of learning.

Some of us were motivated, in the beginning, to become physicists because we loved story problems. We liked the fantasy world built around physics problems. Fantasy can make learning environments more interesting and more fun. A good fantasy helps us to apply old knowledge to new situations. By provoking vivid images, fantasy can help us to remember. We are fortunate in physics. We have a wide variety of visual images from which to select that can be interesting. Multimedia can enable us to offer physics stories in which different students can choose different fantasies, or story problems, that may include text, sound, animation, graphics, and full-motion video.

Many of us were intrigued by physics because the goal of understanding nature is challenging. This challenge became personally meaningful for us. Physics used the skills that we were being taught. Understanding nature was a good goal, because it allowed us to develop a sense of power; once we had accommodated some new knowledge, then we could do more. Multimedia, I believe, provides us with some wonderful new approaches to this aspect of intrinsically motivating learning. Multimedia enables us, as physics teachers, to provide our students with experiences of variable difficulty and randomness, simulating nature.

An appropriate challenge is captivating because it engages our self-esteem. Our students should have higher self-esteem at the end of our physics courses than at the beginning. Proper multimedia experiences can help us to empower people and enhance their self-esteem.

Curiosity also helped to draw many of us into physics. A learning task needs to provide an optimal level of informational complexity for us to be attracted to it as learners. If a task is too simple we are not interested. It should be surprising and novel, but not completely incomprehensible. We are made curious by both sensory and cognitive stimuli. Multimedia with images and sound allows us to provide both of these. Multimedia needs to present just enough information to make our existing knowledge seem to be incomplete or inconsistent. Then our natural human curiosity helps to motivate us to learn more.

Drawing these threads together, I believe that multimedia can be useful in disseminating physics when we use it to encourage active learning, develop cooperation among people, enhance people's self-esteem, respect diverse talents and ways of learning, and encourage contacts between novices and experts. Once we learn how to use multimedia properly, we can offer people in every situation, from a classroom to an airport kiosk, a bit of physics, which they will complete with a heightened interest in the natural world and an increased sense of self-esteem. That is my dream.

Robert G. Fuller is a professor of physics at the University of Nebraska in Lincoln. He was honored at the August 1992 meeting of the American Association of Physics Teachers for his work in the use of multimedia in physics education.