

The Use of Graphics in an E-Learning Environment

Michelle Podulka
Abington Friends School

Abstract

As education explodes in the online community, it is important to better understand how graphics can be used to enhance the learning process. Teachers are facing new hurdles as they attempt to create an educational landscape that departs from the traditional method. This often necessitates the re-tooling of the curriculum and the creation of new methods to help students master new information. This paper synthesizes a broad range of literature on the effective use of graphics for the virtual classroom, including research supporting the use of images in the learning process as well as research, which explain how to incorporate graphics for maximum learning

1. Introduction

Online learning opens new frontiers for all aspects of education. From the non-traditional adult college student who needs flexibility to the pupil in rural Kentucky participating in courses not offered at the local high school, online courses are creating new opportunities. However, with these opportunities come new challenges for the instructor, particularly how to present information in this evolving educational format. This paper seeks to synthesize research relevant to presenting information in a graphic format as used in online instruction. Are graphics necessary in an online environment? How will graphics affect learning? What is the best way to present information? Are there issues to consider specific to the delivery of graphics over the internet?

2. Design Standards

Mayer (2001) explains that using more than one delivery system significantly improves learning in both the areas of retention and transference. Mayer explains this as the multimedia effect: "Presenting an explanation with words and pictures results in better learning than does presenting words alone" (p. 78). Yaverbaum reaffirms this message in the research conducted with graduate students studying information resource management (1993). Yaverbaum explains that "images and picture environments play a role in creating the learning environment and strengthening the learning process" (p. 1). Shih and Alles (1993-1994) found that computer graphics and animation stimulate the formation of mental models. Recent research presented by Park and Lim (2004) reinforces the use of graphics to enhance learning through their study of graphics on the motivation and achievement of online learners. This base of

research highlights the role that graphics play in the teaching and learning process. Therefore it can be assumed that when creating an online learning environment it is important to consider the use of appropriate graphics to help illustrate concepts.

Teachers creating visuals to integrate into their lesson plans are entering a new domain and many will have little or no experience in graphic design. Just as a well planned lesson is necessary for creating an environment conducive to education, a well planned graphic will contribute to a student's overall learning.

Teachers creating lessons for an online learning environment must master two new fields: creating informative graphics and manipulating these graphics for maximum effect to be viewed on a computer screen. Simonson, Smaldino, Albright and Zvacek (2003) delineate key graphic design principles for creating educational graphics for the Web. Simonson, et al. explain the importance of letter size, font, alignment, and capitalization. It is important that text be a minimum of 24 point (one-third inch) but a 32-36 point is preferred for view on a computer screen. Texts should be displayed in sans serif fonts and the same fonts or font families should be used throughout. (Times New Roman, and Times New Roman bold are examples of fonts in the same family.) Color and contrast on computer screens should adhere to the same rules as those of television, which means colors should be bold and of high contrast. Simonson, et al. warn that some color combinations do not work well together such as red and green; and saturated colors such as red should be avoided. Contrast helps information stand out, so it is best to use dark lettering on a light background or vice versa. Readability requires that texts conform to standard writing rules, using both upper and lower case text appropriately as opposed to using only upper or lower case (2003).

As stated earlier, multimedia presentations produce greater learning outcomes than do text or graphics alone. So it is important to understand how to combine both the text and the graphic for maximum effect. Mayer's research (2001) supports the use of text and graphics simultaneously, as opposed to sequentially. Therefore pictures or graphical representations should be presented on the same page or screen and in close proximity. An article in the *Journal of Research Computing* by Knupfer and McIsaac (1992) further supports this research by urging instructors to limit

the use of white space between the graphic and text to less than one-half inch reporting a significant learning increase when this rule is followed (1992). This study also investigated the use of three different types of texts and graphics including: wrap around text, run around text, and transparent text. Wrap around text - text that conforms to the shape of the graphic and has irregular borders - significantly increased both the retention and transference of information. Run around text - text that is boxed around the graphic with straight borders - fared the poorest in the study, while transparent text - text that is displayed directly over the graphic - also seemed to hinder rather than enhance learning. Finally, when creating graphics for instructional environments, Moreno and Mayer (2000) report that graphics along with narration produce increased retention and transference as opposed to the use of graphics and text. The use of graphics and narration allows the learner to focus on the subject using two senses, ears, and eyes, while the use of graphics and texts forces the student to decode the information with one sense, the eyes. Interestingly, Zhu and Grabowski (2006) reported no difference in learning when using static graphics as opposed to animated graphics.

Two final considerations unique to the creation of graphics to be presented over the Web are file size and browser capability. It is important that an instructor remember that all graphics will not appear the same on all Web browsers. Students who have older browsers may not see the graphic exactly as the teacher intended or may not be able to view the graphic at all. The larger the graphic and the more colors it contains, the larger the file size and thus the longer it may take some students to receive and view the graphic. For this reason it is important that teachers make themselves aware of the technical capabilities of their students to ensure that each student has access to the full learning opportunity. It is also advisable for teachers to make use of a software program which allows for the optimization of graphics for viewing on the Web.

Summary

Graphics can greatly enhance learning in all environments. However, it is necessary that the use of educational graphics be appropriate to the content and follow specific research based guidelines to ensure maximum learning. Teachers creating lessons for use over the Web and for view on a computer screen have additional considerations. The use of narration over text when possible, text and graphics in close proximity, proper font choice, and font size and color

considerations will help teachers to build better instructional pictures.

References

- Knopfer, N. N., & McIsaac, M. S. (1992, Fall). Designing instructional materials with desktop software: The effect of white space. *Journal of Research of Computing in Education*. Retrieved October 6, 2003, from EBSCOhost database.
- Mayer, R. E. (2001). *Multimedia learning*. University of California, Cambridge University Press
- Moreno, R., & Mayer, R. E. (2000). A learner-centered approach to multimedia explanations: Deriving instructional design principles from cognitive theory. *Interactive Multimedia Electronic Journal of Computer-Enhanced Learning*. Retrieved September 7, 2003, from <http://imej.wfu.edu/articles/2000/2/05/index.asp>
- Park, S., & Lim, J. (2004). The effect of graphical representation on learner's learning interest and achievement in multimedia learning. Paper presented at Association for Educational Communications and Technology, Chicago, IL. (pp. 688-695). (ERIC Document Reproduction Service No. ED 485 050)
- Shih, Y., & Alessi, S. M., (1993-1994, Winter). Mental models and transfer of learning in computer programming. *Journal of Research on Computing in Education*, 26(2). Retrieved October 6, 2003, from EBSCOhost database.
- Simonson, M., Smaldino, S., Albright, M., & Zvacek, S., (2003) *Teaching and Learning at a Distance Foundations of Distance Education*, Upper Saddle River, NJ: Merrill Prentice-Hall.
- Yaverbaum, G. J. (1993, June). A multimedia learning environment: experiences in the classroom, *Journal of Information Systems in Education*, 5(2). Retrieved October 6, 2003, from EBSCOhost database.
- Zhu, L., & Grabowski, B. (2006). Web based animation or static graphics: Is the extra cost worth it? *Journal of Educational Multimedia and Hypermedia*, 15(3), 329-347.

Author Information

Michelle K. Podulka
Computer Teacher, Lower School
Abington Friends School
575 Washington Lane
Jenkintown, PA 19046
215-514-1356
mpodulka@abingtonfriends.net