Annotated Bibliography--Multimedia Principle to Enhance Learning

Submitted by Amy Nelson EAC 586

Carney, R. N., & Levin, J. R. (2002). Pictorial Illustrations Still Improve Students' Learning from Text. *Educational Psychology Review, 14*(1), 5-26.

http://proxying.lib.ncsu.edu/index.php?url=http://search.ebscohost.com.prox.lib.ncsu.edu/login.aspx?direct=true&db=a9h&AN=5879037&site=ehost-live&scope=site

From very early in history, pictures have been used as aids in learning or storytelling. More than ever textbooks are including pictures or graphics that connect a learner with the text presented The authors own research into this subject in the 1980's proved that appropriate use of graphics enhanced learning. They also proposed rules to guide the proper use of graphics. More recent research supports the use of representational, organizational, interpretational and transformational pictures to assist memory and learning. Practical suggestions are given to assist educators in integrating pictures and text. The use of pictures with text for learning was, is and will continue to be important.

Clark, R., (2009). Give your training a boost. Retrieved from http://clarktraining.com.

http://clarktraining.com/content/articles/VisualsForLearning.pdf

The author also wrote the book *eLearning and the Science of Instruction*, used in this bibliography. In this article, Clark explains four guidelines to using graphics in your training. She addresses decorative graphics, say they should be avoided. Decorative graphics do not enrich training and most often will detract from learning. Visuals should illustrate the relationships in your content. Your graphics should be explained, either with audio or text in close proximity. They author emphasizes that novice learners seem to benefit most from the appropriate use of graphics. This a quick read for anyone interested in investigating the use of visuals in learning. I think it is targeted to the novice instructional designer or a developer of rapid e-learning.

Clark, R. C., & Mayer, R. E. (2008). Applying the Multimedia Principle: Use Words and Graphics Rather than Words Alone, *E-Learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (2nd ed.). (pp 53-72). San Francisco, CA: Pfieffer.

The authors address instructional designers in this 'how to' guide. The chapter defines and outlines ways to apply the multimedia principle. The authors assert that the use of words and graphics together will enhance the learning experience. Graphics and content are divided into various types and are paired to enhance the learning experience. Improper pairing will not prove effective for learning. These assertions are supported by published studies and psychological theory. Scenarios are introduced to help conceptualize the real life application of the multimedia principle. The authors are both very important in the field of multimedia learning, each have an extensive publication list. Mayer is credited with the creation of the multimedia learning theory.

Davenport, J. L., Yaron, D., Klahr, D., & Koedinger, K. (2008). When do diagrams enhance learning? A framework for designing relevant representations. In the proceedings of the 2008 International Conference of the Learning Sciences.

The authors state that the use of diagrams or graphics is not enough to enhance learning. They emphasize that even relevant representative graphics may not be enough to promote comprehension. While there are models to promote multimedia learning, they do not assist in the choosing of appropriate graphics. The authors offer three considerations when selecting or designing graphics: specific learning objectives, design of diagram and cognitive processing of the learner. They conducted a study in undergraduate chemistry classes to test whether appropriate diagrams could be developed. The authors demonstrate that effective diagrams can be developed when considering the learning goals, the design of visual representations and learner abilities.

Ellaway, R. (2011), Reflecting on multimedia design principles in medical education. *Medical Education*, 45: 766–767

http://onlinelibrary.wiley.com.prox.lib.ncsu.edu/doi/10.1111/j.1365-2923.2011.04064.x/full

Author responds to the Issa article, reflecting on the conclusions drawn. While the results from the Issa paper are helpful in the argument that multimedia design principles should be used for instruction. The author points out that the paper explored results from a redesigned slide deck but seemed to ignore the redesign process. Furthermore, the author would like to see more research on the redesign process. This is an angle I did not consider when reading the Issa paper. I agree wholeheartedly that attention should have been given to the redesign process. It would have been helpful to know how Issa went about redesigning the slides in his study. I would love to know how decisions were made concerning graphic choice and placement.

Issa, N., Schuller, M., Santacaterina, S., Shapiro, M., Wang, E., Mayer, R. E. and DaRosa, D. A. (2011), Applying multimedia design principles enhances learning in medical education. *Medical Education*, 45: 818–826.

http://onlinelibrary.wiley.com.prox.lib.ncsu.edu/doi/10.1111/j.1365-2923.2011.03988.x/full

Many educators in the medical field teach with a PowerPoint full of bulleted text, commonly referred to as ‘death by PowerPoint. Research shows that multimedia learning is more effective. Using words in conjunction with pictures or diagrams engages dual processing. Processing in this manner is preferred because it will alleviate the processing overload that singular media can produce. The authors conduct a study to test the use of multimedia versus text alone. The results showed an increased retention and transfer rate. This article could prove helpful to any instructor or lecturer. In many instances instructors and lecturers are leaders of their field, but do not possess skills in instructional design. They could all benefit from this paper and ones like it.

Jamet, E., Gavota, M. Quaireau, C., (2008), Attention guiding in multimedia learning, *Learning and Instruction*, 18 (2), 135-145.

http://www.sciencedirect.com.prox.lib.ncsu.edu/science/article/pii/S095947520700014X

The authors explore methods of attention guiding in multimedia instruction. A study was conducted to test different methods. A graphic was presented in fours ways, the control being a static image. The image was displayed static with highlights, sequentially and sequentially with highlights. The results showed improved retention when the image was presented sequentially. Showing only a little of the diagram at a time help guide the eye towards the intended part. This study introduces a different approach to the multimedia discussion. This one does not just focus on the principles of multimedia; it explores ways to improve upon it.

Jamet, E., Le Bohec, O., (2007), The effect of redundant text in multimedia instruction, *Contemporary Education Psychology*, 32, 588-598.

http://www.sciencedirect.com.prox.lib.ncsu.edu/science/article/pii/S0361476X06000294

Jamet the same author that would go on to study attention guiding in multimedia, presents a study on the redundancy effect. Redundancy is when spoken information is duplicated as written text. The authors' study tests whether the redundancy principle holds true when text in introduced sequentially on the screen. The screen with spoken dialogue and image was always preferred as expected. The screen with text was least effective in learning. The sequential presentation of text, while better than non-sequential presentation, still overloaded the cognitive channels. This paper and study go to further prove the redundancy principle.

Kartal, G. (2010). Does language matter in multimedia learning? Personalization principle revisited. *Journal of Educational Psychology*, *102*(3), 615-624.

http://proxying.lib.ncsu.edu/index.php?url=http://search.ebscohost.com.prox.lib.ncsu.edu/login.aspx?direct=true&db=pdh&AN=edu-102-3-615&site=ehost-live&scope=site

According to the personalization principle, learning is affected more when informal or conversational language is used. Does this principle still hold true when instruction is presented in another language like Turkish? The author conducts a study to test this theory. The results show that retention was improved with informal language. I think language and the discussion of it in learning is important. Our society is becoming more global in business and education. Are the multimedia principles applicable to more than just English or Anglo languages? Further research on English as a second language (ESL) would prove very interesting. Informal or conversational language can be interpreted by an ESL learner in very different ways than a native speaker.

Mayer, R. E., Hegarty, M., Mayer, S., & Campbell, J. (2005). When Static Media Promote Active Learning: Annotated Illustrations Versus Narrated Animations in Multimedia Instruction. *Journal Of Experimental Psychology. Applied*, *11*(4), 256-265

http://proxying.lib.ncsu.edu/index.php?url=http://search.ebscohost.com.prox.lib.ncsu.edu/login.aspx?direct=true&db=bth&AN=19286938&site=ehost-live&scope=site

Should media be static or animated? Which will promote better learning? The authors conducted studies to test whether static or animated graphics provided a better learning experience. The hypothesis is that static media is more effective due to a smaller cognitive load. The animated media with animation, narration and text provide too much extraneous processing. The audience for this paper would be any educator looking to provide instructional aides to their

students. As the study suggests, flashy animations may be just that, flashy and little else. Many times there is no substitute for straightforward diagrams, maps or graphics to explain processes.

Mayer, R. E., Moreno, R., (2002), Aids to computer-based multimedia learning, *Learning and Instruction*, 12 (1), 107-119.

http://www.sciencedirect.com.prox.lib.ncsu.edu/science/article/pii/S0959475201000184

Mayer, a prominent researcher in the field of multimedia learning, explores computer based multimedia learning. The authors investigate five aids to computer based learning: multimedia, contiguity, coherence, modality and redundancy. A series of test were developed to study the effectivenss of each aid. Contiguity, coherence, modality and redundancy helped students learn more deeply. I think this paper is most applicable to other researchers in the field. It does not contain practical instructional design guidelines to assist designers in their work.

Reimann, P., (2003), Multimedia learning: beyond modality, *Learning and Instruction*, 13, 245-252.

http://www.sciencedirect.com.prox.lib.ncsu.edu/science/article/pii/S0959475202000245

This is a commentary on a special issue of the journal Learning and Instruction. The issue is focused on external and internal representations in multimedia learning. The author reviews each of the contributions. He focuses on the main points of each and the intended audience. He succinctly summarized the instructional design elements in seven research papers. Three common themes are indentified. The first theme is the role of external representations. Second, is the dual coding theory and third are the effects of animation in learning. This is a great article for anyone interested in the application of the research discussed in the special issue but not wanting to wade through all the research.

Robinson, D. H., (2002). Spatial text adjuncts and learning: an introduction to the special issue. *Educational Psychology Review, 14*(1), 1-3

http://proxying.lib.ncsu.edu/index.php?url=http://search.ebscohost.com.prox.lib.ncsu.edu/login.aspx?direct=true&db=a9h&AN=5879036&site=ehost-live&scope=site

This is an editorial introduction to a special issue of Educational Psychology. Published evidence has long proven that a person's memory for pictures is better than a memory for words. This is in direct conflict with how most classes or education is presented. Many pictures in texts serve as decoration and do not enhance retention. Spatial adjuncts, or pictures and words being in close proximity, have a great potential. This is especially true when so much learning is moving online. The opportunities to enhance learning with graphics, pictures, sound and interactive exercises are numerous, they just need to be used.

Shank, P. (2011). Beginning instructional authoring: Why C.R.A.P. is exactly what's needed. Retrieved from http://www.learningsolutionsmag.com

http://www.learningsolutionsmag.com/articles/713/beginning-instructional-authoring-why-crap-is-exactly-whats-needed-part-1 & http://www.learningsolutionsmag.com/articles/727/

Author explores the C.R.A.P. principles to enhance e-learning. These principles help design multimedia e-learning that is aesthetically pleasing. The contrast (C) principle will help create a

focal point around important information and draw the eye to it. The repetition (R) principle will assist in developing a theme in your e-learning and make a course appear polished. The alignment (A) principle will strategically place text and graphics in alignment with each other so it appears they go together. Lastly, the proximity (P) principle sets objects and/or phrases closely together to create a feeling that they are connected. Some may think it is shallow to be concerned with how a presentation looks. But, a poor looking presentation can evoke a strong negative response. As discussed in the Um paper, emotion is important to learning. Making a polished, pleasing presentation may be able to promote a better attitude towards the presentation, therefore enhancing the learning.

Um, E. "R.", Plass, J. L., Hayward, E. O., & Homer, B. D. (2011). Emotional design in multimedia learning. *Journal of Educational Psychology*.

http://proxying.lib.ncsu.edu/index.php?url=http://search.ebscohost.com.prox.lib.ncsu.edu/login.aspx?direct=true&db=pdh&AN=edu-2011-29380-001&site=ehost-live&scope=site

This paper differs from the others in this bibliography as its focus is on how multimedia design can be used to influence emotion. Many educators see emotion in learning as baggage, even though research shows a strong correlation between emotion and learning. The study done by the authors explores the effects of positive emotion inducing multimedia learning. The authors go a step further and also explore the methods to design multimedia instruction to promote positive emotional. Two methods are introduced: color choice and shape selection. This paper will appeal to researcher and instructional designers.