Using Mashups and Multimedia to Provide Online User Independence for all Learning Styles

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Introduction

Research on learning style preferences in the online environment emphasizes the need to provide a variety of methods that include text, aural, visual and kinesthetic modalities (Aragon, et al 2002, Mestre 2006, Tempelman-Kluit 2006, Moreno, R., & Mayer, R. 2007, Mestre 2010). During the past year I conducted usability studies at the University of Illinois with students from different ethnic groups to document how closely matched our tutorials were to their learning preferences. It turn, this information would help us improve the design of our tutorials, learning objects and web pages in order to be more closely matched to the needs of diverse students. We are now creating mash-ups of various learning objects and tools within the webpages and tutorials in order to better accommodate various learning preferences. For the most part, it simply means adding in other learning objects to supplement the information, which also provides alternate methods for students to choose their preferred learning environment.

Brief Overview of Study

In this study twenty students from various ethnic groups were solicited in order to explore how they interacted with various library tutorials and if, after going through the tutorial, they were able to recreate a search. Initially students were asked to take two learning style inventories, each taking about 5-10 minutes. These were the Index of Learning Style Questionnaire (at http://www.engr.ncsu.edu/learningstyles/ilsweb.html) and the VARK

Questionnaire (How Do I Learn Best) at http://www.vark-learn.com/english/page.asp?p=questionnaire). They were then asked to evaluate three tutorials: one static tutorial which was a web page with screen shots; one produced using Camtasia (screencasting software) that included narration and closed captioning options; and part of one that included more interactivity. In each instance they did a pre- and post-test, where they were asked to talk through their actions and what they were doing while their voice and mouse movements were recorded using Camtasia.

Learning Styles

Each of us have learning preferences, and these may shift as we encounter new challenges and experiences. To visualize the various ways some people might approach a problem we can think of how we put the pieces together in a puzzle. Some prefer to use a step by step, linear way to connect the pieces, such as finding the borders (Figure 1).
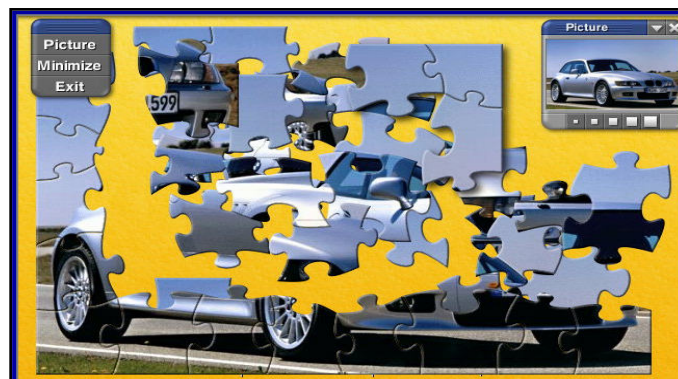

Figure 1

Others may need to see the global picture of what it will look like at the end (Figure 2). They then may look

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for concepts, or colors that work together—or chunk out the information—like here with looking for the roof of the house and then work to finish the house or the sky.
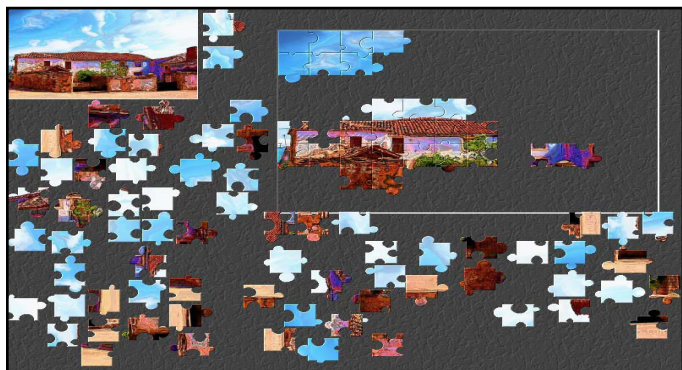

Figure 2

We all have our own ways of processing information. Yet, do educators/librarians design web pages, course pages, tutorials and objects with this concept in mind to present information in multiple ways?

Modifying Tutorials Based on Learning Preferences

Although there are many options for evaluating leaning preferences, for this study two, as mentioned above, were used: The VARK Questionnaire: How do I Learn Best (Fleming, 2001) and the NCSU Index of Learning Style Questionnaire (Felder, 1988).

Vark: Three quarters of the students rated as multimodal learners according to the VARK assessment (see Chart 1). Categories assessed in this approach were: Visual, Read/Write, Kinesthetic, and Auditory. That assessment indicates that they scored high in more than one mode, such as high in visual and high in kinesthetic. During the interviews many commented that it depended on the material for whether or not they wanted the instructions in front of them, if they preferred the information be verbal, or if they wanted to work alongside the information. By having various modes they could then focus on what was useful for them at the time. Some students wanted to just skim the text or image and quickly get to the task at hand. Others wanted to look at the visuals and refer to the text when needed. A third group wanted to sit back and listen to the speaker while viewing the example.
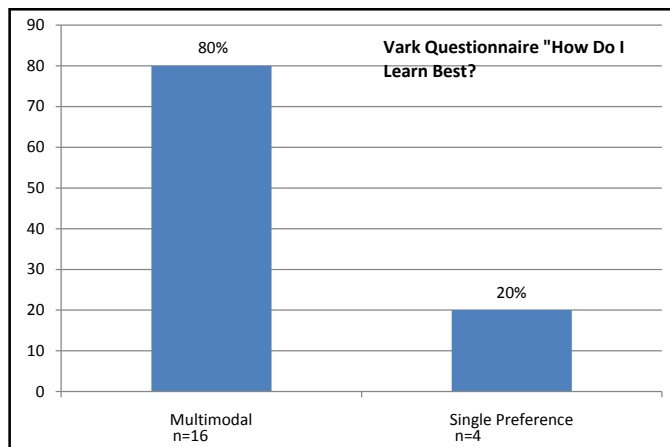

Chart 1: Vark Learning Preferences

Chart 2 indicates results from the NCSU learning style questionnaire. It details results for all instances of a preference. Because it is rare for a student to only have one single preference, if a student's results indicated any rating for a preference it was included here. Note that the predominate preferences are for Visual, Sensing, Sequential and Active. However, it is important to note the prevelance of the other learning preferences, which are often overlooked when designing tutorials and web pages.
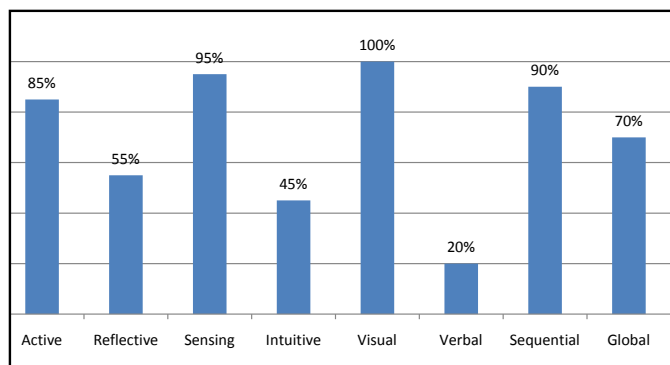

Chart 2: NCSU Learning Styles Characteristics

The majority of students in this study could be classified as multimodal learners in the online environment.

Results of Usability Study

Static Web Page with Screen Shots. The static tutorial was preferred by 80% of the students because they could search along with the tutorial. One of the students commented that this type of tutorial was especially useful if you need to learn how to do something. All but one student was able to go back and recreate the search, referring back to the tutorial from time to time. All of the students commented that they looked at the visual first and then only looked at the text if they needed some clarification. They tended to skim down the page to find relevant images of headings that they thought would help them. Two students mentioned that they wished the text would have been embedded within the image so that they wouldn't have to look in two different places to understand the image.

Camtasia Tutorial. Most of the students felt that video tutorials were good to explain something, but not to have them learn how to do something, unless there was a lot of interactivity, chances for them to work alongside the tutorial and options to pick and choose their paths. They felt the static tutorial was better for that. Only two of the eighteen students, after watching the Camtasia tutorial, were able to recreate a search. Those two students were only able to begin the process and then got stuck.

Students also indicated difficulty in feeling they had to read the text, listen, and look at the images all at the same time. All of the students felt the most useful feature in the tutorial was the periodic pop-ups that highlighted specific steps or information. They diverted their focus to that box because they felt that was important information since it "popped up". However, one student, who scored low on a read/write learning preference, said that when the pop-ups appeared she had to stop listening to the audio in order to focus on the content in the pop-up.

More Interactive Tutorial. Students also viewed part of a tutorial that asked them to choose a character. It also provided scenarios. Many remarked that having a task to work through that was applicable to them helped them to engage with the information that was presented. They felt empathy for the character when the wrong response sent the character to a fire pit. Some of the students chose the Hispanic looking character, some chose the character closest to their own area of study, and one chose the character because of the color of the clothes and because there was a cat. However, one student did not see why she had to choose a character because she did not see how it would help her learn the information. Students, did, however, like the "game-like" quality and knowing that there might be consequences if they chose the wrong response.

SUGGESTIONS FOR MODIFYING TUTORIALS

The following characterisics of learning preferences are offered as background to ways to accommodate various preferences, as well as some suggestions for creating mashups by adding other learning objects into the tutorial.

Active/Reflective Learners

- Active learners tend to retain and understand information best by doing something active with it. They want to try it out. When creating tutorials, consider if there are opportunities to try something, rather than just following along. Tactile kinesthetic learners may appreciate interactive multimedia elements. Internal kinesthetic learners may learn better with examples of real-life scenarios and links to prior content.

  ○ Add in: puzzles, drag and drops, fill-ins, small games, scenarios, choosing paths, and links to "now you try".

- Reflective learners prefer to think about the

material quietly first. They need to reflect on where the material fits. Consider if there are opportunities to think about a situation and then to respond rather than making immediate decisions. These learners may benefit from questions that encourage reflection, as well as a note-taking tool

  ○ Add in: questions that encourage reflection, scenarios, feedback responses, opportunities to go back and repeat the information, and context aware note-taking tools.

Sensing/Intuitive Learners

- Sensing learners (concrete, logical) tend to like learning facts. These learners often like solving problems by well-established methods and dislike complications and surprises. They like to work with real data and like details. Sensors don't like courses that have no apparent connection to the real world. An example of a disconnect for this study was the student (mentioned above) who did not see why she had to choose a character because she did not see how it would help her learn the information.

  ○ Add in: specific examples, and links to how a concept works in practice.

- Intuitive learners (conceptual, innovators) like innovation and dislike repetition. They like to work with theories and like concepts. They often prefer discovering possibilities and relationships. Intuitors don't like "plug-and-chug" courses that involve a lot of memorization and routine calculations.

  ○ Add in: scenarios they need to think about and relate to their real world experiences, video clips to show connections, and rollovers with more information or options to learn more.

Visual and Verbal Learners (Read/Write)

- Visual learners remember best what they see. The study participants wanted to see text represented within the image or in a pop-up that appeared from time to time to highlight a particular point. They mentioned that students are in a hurry so they don't want to waste time reading a lot of information. They want to glance at it quickly and get to the task at hand. The visuals that included arrows, highlights or that drew the attention to a particular aspect were especially effective and students recalled these in the post tests.

  ○ Add in: images, illustrations, pop-ups, flowcharts, time lines, headings, bullets, graphs, animations, video clips (demonstrations), or icons with links (want

to read (see/learn) more?), and note-taking tools.

- Verbal learners get more out of words--written and spoken explanations. Auditory learners may prefer presentations that allow them to see the images and hear a narration, but without the text.

  ○ Add in: images, sound effects, narration (or podcast clips), scenarios, stories, summaries, video clips, icons (want to hear more?), and an option to turn off the closed captioning.

Sequential/Global

- Sequential learners tend to gain understanding in linear steps, with each step following logically from the previous one.

  ○ Add in: sequential list of key points, steps, summaries, periodic check in question (quiz) before they proceed, fill in the steps examples.

- Global learners want to work from the big picture before the individual pieces will fall in place. They tend to learn in large jumps, absorbing material almost randomly without seeing connections, and then suddenly "get it." Global learners may be able to solve complex problems quickly or put things together in novel ways once they have grasped the big picture, but they may have difficulty explaining how they did it.

  ○ Add in: advance organizers, mind maps, table of contents, options to pick and choose content,navigation with chapter markers, and material organized in chunks.

How We Are Modifying Our Tutorials
Based on the Usability Studies

- Incorporating icons at key points that say "Want to see more?" Each of these open up a 30 second video clip of how to do the step.

- Providing an icon that says "Now you try" that opens a new browser window to the appropriate web site discussed to allow them to work along with the tutorial.

- Providing better navigation with an index to let them quickly choose a section of the tutorial.

- Creating an opening scenario or "choose a character" to help them relate to the experience throughout the tutorial.

- Including more reflective examples and prompts, as well as examples and more relevant stories to help make connections.

- Halting the narration when a pop-up appears to allow time to read and reflect on the message

- Including more interactivity to "try it out", such as: "drag and drop" elements, choose an answer, brief quiz questions, and hotspots to create or link to interactive simulations, games, and feedback.

- Reviewing visual cues to make sure it is obvious that users know what they can do (such as arrows, animation cues).

- Incorporating more auditory cues to provide positive and negative feedback through sound, such as dings and buzzes.

CONCLUSION

The pattern for most users in this study was that they have strong tendencies in multimodal learning. Multimodal learners need to have at least two, and sometimes three or four modes involved in learning before they are satisfied. For example, someone with an active and reflective profile would want to read about, and talk about incoming information with others before they would "trust" the information. A single preference learner should "get it" from just their preferred mode—if it was available in that form. What does that mean for educators? By incorporating a variety of options into our tutorials we can help each learner pick the mode of learning that is most effective for them and best compliments their learning style. When designing screencast learning objects it might be good design practice to ascertain that a learner could get equal information if they listened, or read, or just visually saw the information.

Regardless of the learning style, one of the key elements that students wanted was the ability for a hands-on component, so educators should think of ways to intersperse active learning into their objects. Students also performed better when they received feedback after choosing a response, and when there were activities that engaged the mind (using critical thinking) rather than just passively viewing a video object. By incorporating a variety of experiences into tutorials we can provide the opportunities for students to choose how they receive and interact with the information.

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Some Sites To Consult For Objects To Include In Mash-Ups:
- Learning object and tutorial guides with ideas for creating learning objects to use in mashups and portable objects that can be reused, such as games, images, videos:
  - ANTS: Animated Tutorial Sharing Project: http://ants.wetpaint.com/
  - Learning Objects: University of Illinois at Urbana Champaign http://uiuc.libguides.com/content.php?pid=64638&sid=477559
  - Merlot: Learning Object Repositories (http://www.merlot.org/merlot/index.htm);

- Mashups:
  - Mashup Dashboard: http://www.programmableweb.com/mashupsThousands of web Mashups with new updates daily
  - Mashups Tools wiki http://mashup-tools.pbworks.com/w/page/20456689/FrontPage
  - Mashup Tutorials http://www.deitel.com/ResourceCenters/Web20/Mashups/MashupTutorials/tabid/985/Default.aspx *Deitel & Associates*
  - Programmable Web: http://www.programmableweb.com/ "keeping you up to date with APIs, Mashups and the Web as a platform"