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STS.035: History of Computing  
Reading Response #13

### HyperMedia: Enabling Non-linear Thinking

Over the last century, post-secondary education in the western world has focused increasingly on developing critical thinking in its students. Many universities aim to give their students not only a wide range of background knowledge in a particular field, but also to teach them “how to think” in order to solve the new and different problems they will eventually face. While the development of critical thinking skills is an admirable goal, the the academic system has really only developed mechanisms that allow students to make use of pattern recognition, etc.; students generally only develop the desired critical thinking skills if they choose to figure problems out for themselves instead of looking up answers.

Beeman, et al. performed a year-long study on the ability of “hyper-media” to develop critical thinking skills. Beeman refers to this mode of thought as “non-linear” - instead of following a set of rules to generate some desired solution, students should instead learn to derive the needed rules for themselves and in the process learn how they might use the same sort of derivation process to solve other problems. Beeman's evaluation of linked media concluded that properly designed websites can develop this non-linear thinking by simplifying the process of finding the background information or problem-solving patterns that students would otherwise have to spend a prohibitive amount of time searching for. The successful development of problem solving skills seems to be reflected in course reviews indicating that the average students felt like they learned more and gave “hyper-media-enhanced” classes higher ratings. Beeman argues that these reviews and the quality of student projects indicate that a greater level of “non-linear” thinking was achieved in these classes.

With the advent of the Internet era, some may argue that the presence of a massive, publicly available store of information should enable even greater development of “non-linear” thought. Unfortunately, the mere presence of a vast information store does not imply that students will naturally use that information in order to follow the arduous research process needed to exercise critical thinking skills. To the contrary, the Internet, with its stores of old problem sets and collections of online lectures, can actually make it easier for students to simply find rote procedures for solving problems, or worse, copy answers. Certainly, MIT students have been known to take advantage of these sorts of resources: archives of class websites have now replaced bibles as the reference of choice for many classes.

On the other hand, the Internet does make exercising non-linear

thinking skills easier for those who are motivated to learn for themselves. Online archives of academic papers and projects such as MIT's OpenCourseWare provide society at large with the resources needed to achieve higher learning; such online repositories have certainly made background research more convenient for many academics. Thus, we see that hyper-media, particularly the Internet, has made the development of both lineal and non-lineal thinking easier. No clear evidence indicates that using the Internet encourages one form of thought over the other; consequently, the development of non-lineal thinking skills requires, as it always has, that the student make an active effort to learn from base principles instead of by rote formulas.

## Bibliography

Beeman, William O., et al. "Hypertext and Pluralism: From Lineal to Non-lineal Thinking." Proceeding of the ACM Conference on Hypertext, November 1987, pp. 67-88.