

The Relationship between Visual Stimuli on Learning and Memory

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This study focused on the effects of visual stimuli on information retention. Previous research findings have provided much insight into the effects of visual stimuli on the process of retention. Visual stimuli aids in how much information will be absorbed as well as the process of gaining knowledge through the process of vision (Dake, 1999; Rogoff, 2005). Researchers believed there would be a difference in information retention, as measured by a comprehensive quiz, between participants who receive text with pictures and those who receive text only. This study presented 34 participants with an information source that was either text only or one that included the presence of pictures. They were then given a content related quiz regarding the information on the text. The results indicated there was a slight difference in average scores. The participants who received the text with pictures scored slightly higher than the other participants. The data collected can certainly be generalized to many areas of education and the formation of better textbooks and curriculum. The presence of visual stimuli and the effect on information retention is pertinent to the formation of better strategies in improving student performance.

As humans, much of what we perceive comes from our sense of sight. Visual stimuli not only affects our learning of our surroundings, but also our judgments and conclusions made about those surroundings. In effect, visual stimuli trigger specifically what is referred to as the

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automatic cognitive process (Lakin, 2006). Additionally, the cognitive process allows for humans to gain knowledge or create their own ideas based on what they are seeing (Dake, 1999). In consideration of learning, this concept may allow for a cognitive connection between the presence of visual stimuli, the perception of images, and the ability to gain knowledge, information retention.

As 80 % of perception comes from vision, it is a natural human instinct to look at and examine images (Barry, 1994). This sense of vision is used to create seamless connections between these images and their meaning (Burnett, 2004). The connection between visual stimuli and the cognitive process are seen most saliently when images are generated through the physical eye. In this process, there is an integration of intuitive, visual knowing, and as it is combined with cognitive processes, generating subsequent cognition (Williams, 2006). Furthermore, images can also be used to determine how much information will be absorbed based on the information conveyed and the perceived pleasure and displeasure for the visual stimuli (Rogoff, 2005). Therefore, the amount of information retained should be able to be controlled based on the presence of visual stimuli.

How then can visual stimuli be related to reading comprehension? Skilled reading comes not only from one's ability in word recognition, but rather it comes from when this is combined with the ability to recognize main ideas and supporting details in text (Jitendra, Burgess & Gajria, 2011). Different styles of text may influence the impact of visual stimuli on the reader's comprehension of the text. For instance, in fictional, narrative text, the presence of images may

not be necessary in order to influence comprehension of the intended main ideas. This may be because the types of language used in narrative writing. This style is much more detail oriented in the use of imagery, and allows the reader to use personal experience and prior knowledge to create their own images and visual stimulus in their mind. On the other hand, comprehension of informational content such as a textbook, may be more complimented by the presence of images because of the style of language used (Burgess, Gajria, & Jitendra, 2011). When readers are presented with new information, their comprehension may be enhanced if they are given a visual trigger that they can make those cognitive connections between the text and the image (Burnett, 2004; Burgess Gajria, & Jitendra, 2011). Therefore, if informational content is presented with visual stimuli, then a reader's comprehension should be enhanced when compared to comprehension from text without visual cognitive connections.

Method

Participants

Subjects who took part in this study were recruited participants using the Lindenwood University Participant Pool (LPP). The LPP is a collection of students in certain general education classes that have voluntarily chosen to participate in our study as opposed to other opportunities provided by the LPP for extra credit. We collected data from 15 women and 19 men. These students ranged in age from 19–31 years old.

Materials and Procedure

We used all participant recruitment materials provided by the LPP office. The LPP has two basic Sign-up sheets for experimenters to use in order to recruit participants. Sign-up sheet A is used solely for experimenters who wish to schedule individual appointments with participants.

Sign-up sheet B has a general use in which participants can sign up for a study based on prearranged, specific times designated by the experimenter. For this study, Sign-up sheet B was used in order for participants to sign up for a specific time and room. The Sign-up sheets contain the time, date, location of study, and slots for the participants to provide their name and contact information. The actual rooms utilized for the study varied with each day of research conducted; however, the classroom environment remained very consistent throughout the research process. Research was conducted in various psychology labs on the first floor of Young Hall. These labs were quite small and often contained only one or two desks and a table for the experimenter. Also, the labs are not as well lit.

The necessary materials for this study included our information article, our pictures, comprehension quiz, data collection notebook, and our demographic survey. The information source we used was chosen from <http://history1900s.about.com> and the comprehension quiz, used to measure the amount of learned information, was a collection of multiple-choice, fill in the blank and true false questions. A single notebook of data was kept for all information collected together and organized. A demographic survey was created with general questions regarding age, year in school, and hometown, as well as questions about the participant's learning style.

After the approval from the IRB was received, an article was chosen from <http://history1900s.about.com>. The article selected did not contain any pictures and was used as simply referred to as Article without Pictures (See Appendix A), or Information Source A. Pictures were manually added to the article to create the Article with Pictures (see Appendix B), or Information Source B. The article selected contains a generic topic that the researchers believed to be "not common knowledge." This topic was selected in order to try and avoid any

flawed data by previous knowledge. Participants were then recruited using the LPP and were tested one participant at a time in 10 min increments. A between-participants design was used in the study. One participant received Information Source A and take the comprehension quiz (see Appendix C) and the next participant would receive Information Source B and would then be given the same comprehension quiz.

When participants arrived to the location of research, they were asked to sign in to verify attendance, in addition to receiving a participant receipt which was turned into the LPP for the extra credit the participant received through the study. The participants were also given an informed consent (see Appendix D) form and given information regarding the study. Participants were then given the demographic survey (see Appendix E) and either Information Source A or Information Source B when the demographic was completed. Each participant was given five minutes to read the information source and they were informed to tell us when they were finished reading the source. When completed, participants were then given the same comprehension quiz, no matter which form of the source they were given. At the top of the quiz, the experimenter marked which Information Source was used. When participants completed the quiz they were then debriefed about the study. Participants were given a feedback letter (See Appendix F) and informed that if interested, they could contact the researchers to receive more information regarding the results of the study.

The comprehension quizzes were then scored and data collected in a Microsoft Excel Spread Sheet. The scores for each information source were then compared and used to examine the results of this study.

Results

We hypothesized the presence of a visual stimuli in an information source will have an influence on quiz scores. In effect, there would be more correct answers on content-related quiz over information that presented the participant with images. However, the results of our analyses revealed that participant scores after reading Information Source A showed an $M=7.25$ ($SD = 1.672$). Conversely, the calculation for quiz scores after the participations read Information Source B showed an $M=7$ ($SD = 2.226$). Also, a two-tailed, independent t -test was used to determine a significant difference between test scores. With $t(33) = -.048$ and Significance = .962, we fail to reject H_0 . This showed a slight significant difference between test scores. These results did support our hypothesis but not to the degree the researchers anticipated.

Discussion

We were intent on determining if the presence of visual stimuli helped in information retention. As research from Jitendra, Burgess and Gajria (2011) suggests, the presence of images compliments information, such as in a textbook. Our hypothesis coincided specifically with this notion as we believed that the presence of visual stimuli would increase retention and subsequent scores on a content-related quiz. The presence of images within an information source was a specific variable in which we were intent on manipulating to show the influence on information retention.

The results revealed the presence of images did not attribute to better information retention. The results were not as significant as anticipated; however, the results can still be used for application in many capacities.

There were a few instances of confounds within our study. In consideration of our two sources of information, the presence of images did not directly relate to the questions being

asked but rather just the article as a whole. As each participant is different, they may have reacted different to the information source with pictures. Also, we decided to use black and white pictures. The use of color is a two-fold issue. In one instance, the use of color has potential to visually connect readers in a greater way. However, the use of color may not be a salient advantage if the image itself is the sole determinant in the influence of information retention. For future studies, a counterbalance of color pictures and black and white pictures could certainly show great significance in which condition actually showed more influence. We found that some readers were visibly affected by the nature of the information source. A pre-existing sensitivity to animals and their safety had great potential to affect their emotions and influence their performance on the content-related quiz. This confound is not easily determined but for future research, the subject matter of the information source could focus on a topic which does not have such potential to evoke so much emotion. Further, directly related to the foundation of our study, we found that 4 of 34 participants were not self-reported visual learners. The nature of learning styles created a confounding variable within the study. Truly, there are minimal options to minimize this variable but the potential to affect the retention of information is certainly present. In consideration of future research, a strong focus could be on a distinction between visual learners and non-visual learners. In our study, we did focus on differentiating between learning styles in terms of administering specific information sources.

In terms of future research and the design of the study, any replication of this study could be benefited by adjustments and changes. In our study, we found it to be disadvantageous to have multiple participants in the research room at one time. Given the nature of this study and the use of multiple information sources, it is to the advantage of the results to keep participants separate.

The presence or lack of a visual stimuli and the combination of different learning styles creates great opportunity to create educational opportunities for students. If images are present, it can be predicted that students will succeed and if images are absent, students are still able to pursue great education success as well.

References

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Appendix A

Laika: First Dog in Space

The Cold War was only a decade old when the space race between the Soviet Union and the United States began. On October 4, 1957, the Soviets were the first to successfully launch a rocket into space with their launch of Sputnik 1, a basketball-sized satellite.

Approximately a week after Sputnik 1's successful launch, Soviet leader Nikita Khrushchev suggested that another rocket be launched into space to mark the 40th anniversary of the Russian Revolution on November 7, 1957. That left Soviet engineers only three weeks to fully design and build a new rocket.

The Soviets, in ruthless competition with the United States, wanted to make another "first;" so they decided to send the first living creature into orbit. While Soviet engineers hurriedly worked on the design, three stray dogs were extensively tested and trained for the flight.

The dogs were confined in small places, subjected to extremely loud noises and vibrations, and made to wear a newly created space suit. All of these tests were to condition the dogs to the experiences they would likely have during the flight. Though all three did well, it was Laika who was chosen to board Sputnik 2.

Laika, which means "barker" in Russian, was a three-year old, stray mutt that weighed thirteen pounds and had a calm demeanor. She was placed in her restrictive module several days in advance and then right before launch, she was covered in an alcohol solution and painted with iodine in several spots so that sensors could be placed on her. The sensors were to monitor her heartbeat, blood pressure, and other bodily functions to better understand any physical changes that might occur in space.

Though Laika's module was restrictive, it was padded and had just enough room for her to lay down or stand as she wished. She also had access to special, gelatinous, space food made for her.

On November 3, 1957, Sputnik 2 launched from Baikonur Cosmodrome (now located in Kazakhstan near the Aral Sea). The rocket successfully reached space and the spacecraft, with Laika inside, began to orbit the earth. The spacecraft circled the earth every hour and forty-two minutes, traveling approximately 18,000 miles per hour. As the world watched and waited for news of Laika's condition, the Soviet Union announced that a recovery plan had not been established for Laika. With only three weeks to create the new spacecraft, they did not have time to create a way for Laika to make it home. The de facto plan was for Laika to die in space.

Though all agree Laika made into space and successfully lived through several orbits, there is a question as to how long she lived after that. Some say that the plan was for her to live for several days and that her last food allotment was poisoned. Others say she died four days into the trip when there was an electrical burnout and the interior temperatures rose dramatically. And still others say she died five to seven hours into the flight from stress and heat.

However, she certainly did not live beyond six days into trip, because on the sixth day, the batteries in the spacecraft died and all life-support systems failed. The spacecraft continued to orbit the earth with all its systems off until it reentered earth's atmosphere on April 14, 1958 and burned up on reentry.

Laika proved that it was possible for a living being to enter space. Her death also sparked animal rights debates across the planet. In the Soviet Union, Laika and all the other animals that made space flight possible are remembered as heroes.

<http://history1900s.about.com/od/1950s/p/laikathedog.htm>

Appendix B

Laika: First Dog in Space

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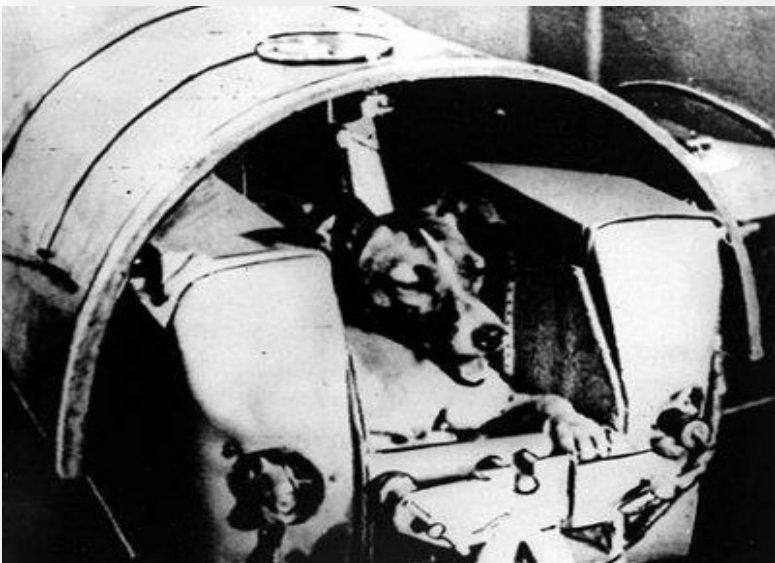
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Appendix C
Sample Comprehension Questions

Please Circle: TEXT ONLY PICTURES

1. Who was the first country to successfully launch a rocket into space?
 - a. _____

2. The second planned launch was to mark the 30th Anniversary of the Russian Revolution.
TRUE FALSE

3. What was the name of the satellite Laika was trained to be on board?
 - a. A: Sputnik I
 - b. B: Kliper 3
 - c. C: Sputnik 2
 - d. D: Soyuz I

4. Please list the three theories as to how Laika died during her trip to space
 - a. _____
 - b. _____
 - c. _____

5. Please finish the sentence:
Laika didn't live beyond six days into the trip because on the 6th day, the _____
in the spacecraft died and all failed. _____

6. Why was no recovery plan created in order for Laika to safely return home?

7. How often did Laika's spacecraft orbit the Earth?
 - a. Once a day
 - b. Every 3 hours 22 minutes
 - c. Once every week
 - d. Two times every 5 hours
 - e. Every 1 hour 42 minutes

8. In Russian, Laika means “Canine”
TRUE FALSE

9. Why were sensors placed on Laika during her trip to space?

10. Why did the Soviet Union send Laika into space?
 - a. To test and study the condition of space travel on animals
 - b. To prove that living animals could survive the launch and orbit into space.
 - c. In order to test a new spacecraft, a living creature was sent into space in place of a human.
 - d. In order to beat the United States and be the first to send a living creature into space

Appendix D
Informed Consent Form

I, _____ (print name), understand that I will be taking part in a research project that requires me to read a short article and complete a content-related quiz. I understand that I should be able to complete this project within 15 minutes. I am aware that my participation in this study is strictly voluntary and that I may choose to withdraw from the study at any time without any penalty or prejudice. I should not incur any penalty or prejudice because I cannot complete the study. I understand that the information obtained from my responses will be analyzed only as part of aggregate data and that all identifying information will be absent from the data in order to ensure anonymity. I am also aware that my responses will be kept confidential and that data obtained from this study will only be available for research and educational purposes. I understand that any questions I may have regarding this study shall be answered by the researcher(s) involved to my satisfaction. Finally, I verify that I am at least 18 years of age and am legally able to give consent or that I am under the age of 18 but have on file with the LPP office, a completed parental consent form that allows me to give consent as a minor.

(Signature of participant) Date: _____

(Signature of researcher obtaining consent) Date: _____

Student Researchers' Names and Numbers:

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Appendix E
Demographic Survey

1. Age _____
2. Gender (circle) Male Female
3. Ethnicity: White/Caucasian Hispanic/Latino Asian/Pacific Islander
African American
- Other _____
4. Year in School: Freshman Sophomore Junior Senior Other
5. Major (s) _____
6. Are you a Visual Learner? YES NO

Appendix F
Feedback Letter

Thank you for participating in our study. The purpose of this study will be to determine if there is a significant influence from images on information retention, as measured through a content-related test over given material. There were two information sources given in this study. One source was absent of images and the other source included the presence of images to supplement the text. The content-related quizzes were consistent for both information sources.

Please note that we are not interested in your individual results; rather, we are only interested in the results of a large group of consumers, of which you are now a part of. No identifying information about you will be associated with any of the findings.

If you have any questions or concerns regarding any portion of this study, please do not hesitate to bring them up now or in the future. Our contact information is found at the bottom of this letter. If you are interested in obtaining a summary of the findings of this study at a later date, please contact us and we will make it available to you at the completion of this project.

Thank you again for your valuable contribution to this study.

Sincerely,

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