

Chatting with Friends Online While Watching a Video: What and How Much Information Is Retained?

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Abstract

The increase in connected devices in today's learning environments places greater control in the hands of students as to how they use their time and attention. The connected devices combined with the popularity of social media and text based chat tools, have made it easier for students to multitask in the lecture-based classes. This paper expands an ongoing study that examines the effects of media multitasking, in particular, chatting while watching a taped lecture, on students' attention, memory and learning.

Keywords: attention, memory, information behavior, media multitasking, education

Introduction

This study is a continuation of work that examines issues related to media multitasking and learning in educational environments. As university professors and k-12 teachers, we have noticed the rise of connected devices in the classroom and the increased level of multitasking during class lectures. We see students taking notes of the lectures while texting friends on the phone or updating their Facebook pages. In fact, we see students performing these types of dual-tasks throughout the day, which seem to have become a natural part of how they function. However, what is the cognitive cost of this practice?

In an earlier study (citation omitted for blind review), we examined the undergraduate student's memory recall under nine conditions in a 3x3 study with three levels of environmental distraction and three kinds of note-taking options. We found significant interactions between environment and note-taking method as the computer seemed to mediate the effect of an auditory distraction during the computer aided note-taking. Additionally we found that students were more successful when taking notes at lower levels of distraction and that those who did not take notes consistently performed poorly on the recall tasks.

The result of the earlier study led to this current one, which sought to examine the cost of multitasking in a more authentic environment. Specifically, we wanted to find out to what extent the students' attention and memory might be affected when they were multitasking between watching a video, taking notes, and chatting with a robot friend.

Theoretical Framework

Poldrack and Foerde (2007) found that people had a harder time learning new things when their brains were distracted by another activity. The Functional Magnetic Resonance Images (fMRIs) used by researchers showed that when people learned without distraction, an area of the brain known as *hippocampus* was involved. This part of the brain is critical to the processing and storing of information. However, the hippocampus was not engaged when people learned the task while multitasking. Instead, the area of the brain called the *striatum* was activated. The striatum is activated by stimuli associated with reward or by aversive, novel, unexpected or intense stimuli (Schultz, 2010). Results indicate that learning

while distracted or multitasking alters the brain's learning processes and changes the way people learn (Poldrack & Foerde, 2007). Foerde, Knowlton, and Poldrack (2006) found that learning new things is dependent on working memory where habit learning is not as sensitive to working memory. Some tasks such as learning new skills may require high cognitive loads, while other tasks familiar and automatic may require lower cognitive loads.

Several recent studies showed that a secondary task might not be detrimental to the primary task (Andrade, 2010; Lin, Lee, & Robertson, 2009). In Andrade's study (2010), the participants in the experimental group were asked to doodle while monitoring telephone messages for the names of people coming to a party while the participants in the control group were not allowed to do anything but monitor the telephone messages. The doodling group performed better on the monitoring task and recalled 29% more information on a surprise memory test than the group that simply monitored the telephone. The author concluded that doodling as the secondary task may have facilitated the primary task by reducing daydreaming. Lin, Lee, and Robertson (2009) discovered that the students performed better on their reading comprehension when they had TV as background than when they read in silence or read with TV on as a competing task. The TV as a background seemed to have helped the students focus better on their reading. Some new media and literacy scholars have examined the changes or new habits that the intensive immersion of technology may have brought to the younger generations (Gee, 2003; Prensky, 2001; Tapscott, 1998). Prensky (2001), for instance, suggested that the younger generation is comfortable with multitasking, random (vs. step-by-step) and parallel (vs. linear) access to information because they have developed the skills to do so. Stated by Hembrooke and Gay (2003), "the ubiquity, pervasiveness and mobility of new technologies encourage a simultaneity of activities that goes beyond anything our culture has heretofore ever known. Indeed, the ability to engage in multiple tasks concurrently seems to be the very essence or core motivation for the development of such technologies" (p. 1). Neurological work over the last few decades shows that the brain changes based on use (Diamond, 2002). Luciana, Conklin, Hooper, and Yarger (2005) found that the brain's ability to effectively self-organize competing information remains in the developmental process until 16 or 17 years of age.

This study was conducted in this context. We wanted to examine to what extent our students are capable of switching between different media activities, and when such switching or multitasking activities become detrimental to their attention, memory and learning. The participants were asked to watch a recorded lecture and take notes under two treatments: not chatting or chatting with an Artificial Intelligent (AI) agent named Cheyenne. The following serve as research questions: 1) Is there a difference in the participants' ability to understand and remember the video content between chatting and not chatting with Cheyenne? 2) To what extent has chatting with Cheyenne affected the participants' attention, memory and note-taking abilities? 3) What are the patterns of notes and chatting activities when the participants were chatting with Cheyenne, if any?

Methods

Procedure and Participants

Participants were from a mid-sized independent high school in the Southwest United States. An *a priori* analysis determined that 40 to 54 participants would allow us to detect a medium effect of $f = 0.25$ with the alpha level set at $p < .05$. At the time of this writing, we have collected data from 14 males and 13 females with a total of 27 participants. They range in age from 15 to 18 with the average being 17 years and are between 9th and 12th grades. Participant consent and assent forms were obtained for each participant.

We utilized a one-factor repeated measure design with each subject participating in both control (no chat) and experimental (with chat) treatments. To do so, we prepared two different 20-minute videos of similar length and level of difficulty. The participants were asked to watch the two video lectures in sequence, and told that they would take a multiple-choice quiz on the content after each video. They were asked to take notes on the computer when watching the videos so that they would better understand and remember the lectures afterwards. They were encouraged to take notes in ways that they would normally do, typing words, drawing diagrams or pictures. With one treatment, they were asked to watch the video and take notes only. With the other treatment, they were interrupted or invited by Cheyenne to chat with her. Since we wanted to examine students' attention and memory of the video lectures in both of the

treatments, one with and one without chatting, we alternated the order of the two videos and chatting options so that the order of videos and chat options would not affect the results of the study. Consequently, we generated four conditions as shown in Table 1 below. The participants were told that their notes, chats, and video lecture quiz results would be collected for research purposes afterwards.

Table 1
*Conditions and number of participants for each condition in the study**

Participant Assignments	First Video	Second Video	Number of Participants
Condition A	Video A (NO Chat)	Video B (Chat)	10
Condition B	Video A (Chat)	Video B (NO Chat)	10
Condition C	Video B (NO Chat)	Video A (Chat)	10
Condition D	Video B (Chat)	Video A (NO Chat)	10

**Note. There are two conditions (Chat/NO Chat) which are presented in an alternate format to help balance any effects of video content and presentation order.*

Instruments and Analyses

The study employed a mixed method and generated several data artifacts. In addition to the participants' notes on the video lectures, their chat transcripts with Cheyenne, their post-lecture quiz results, we also asked the participants to respond to an open-ended questionnaire at the end. The questionnaire asked the participant to inform what his or her experience was like in the process so that we could see from the participants' perspectives to what extent the "chat with Cheyenne" affected or did not affect their ability to take notes and to remember the video. Additionally, the matching video lectures provided a time code that can be aligned with each data type allowing for all data examined across the temporal continuum of the video lectures. Atlas.TI was used to analyze the qualitative data including the participants' notes, chat transcripts, and survey results. SPSS was used to analyze the video quiz results and examine the possible relationship between watching video with or without chats.

Results

The initial quantitative analysis indicated that there were significant differences between the chat ($M = 9.59$, $SD = 2.74$), and no chat treatment ($M = 11.63$, $SD = 1.80$), $t(26) = -3.20$, $p = .004$ (2-tailed) as well as the topic of each video: Video 1 ($M = 11.41$, $SD = 2.50$) and Video 2 ($M = 9.81$, $SD = 2.30$), $t(26) = 2.33$, $p = .028$ (2-tailed). As expected, there were also significant differences in the number of words recorded in notes under the two chat conditions: chat ($M = 169.48$, $SD = 122.63$) and no chat ($M = 254.00$, $SD = 132.46$), $t(26) = -4.97$, $p = .00001$ (2-tailed). The large standard deviation in the finding was likely the result of some students not taking notes at all during the chat condition and the different methods of note taking employed by the participants. Some initial qualitative analyses of the notes and chat transcripts indicated that 1) there were differences in the use of language between notes taking with chatting and without chatting; 2) there were cases of chat transaction ending up in notes; 3) the chat transactions may serve as indicators for the level of engagements. We expect to have the complete data results available and expect to contextualize the quantitative results with qualitative data at the presentation.

Discussion and Scholarly Significance

The initial results showed that performing a secondary task such as chatting during a video lecture 1) may reduce the volume of notes by over 30%; 2) may negatively affect the participants' short-term memory of the video content; 3) may change the notes by adding multiple sources including the chats into the notes on the video content.

The number of portable connective devices continues to increase in classrooms resulting in a need to understand the effects of using these devices while attending to the lectures in the classroom. This includes both educationally designed uses of these technologies for learning as well as the non-instructional student mediated use of these technologies. While the preliminary quantitative results indicate that student's short-term recall was negatively impacted with student mediated use of these technologies, the qualitative data could provide a further window into what is going on behind the numbers and help us understand why some information is retained while others are not as students attend to media multitasking during lectures. We hope that this specific contribution to the field will help provide evidence that can inform the effective use of these technologies as well as lesson design and delivery.

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