

Mobile Phone Multitasking and Learning

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INTRODUCTION

Although mobile phones were first used for verbal communication, they have evolved into smart devices that allow users to seamlessly text, access the Internet, watch television, play games, listen to music, and a host of other activities (Rideout, Foehr, & Roberts, 2010). In a report by Gallup, smart phones (e.g., iPhones, Androids, etc.) were defined as cell phones with the capability to access the Internet and run applications; 62% of the survey respondents reported that they owned a smart phone, 37% of the youth respondents reported that they owned a smart phone, and one in four reported that they used their phone to go online most of the time (Madden, Lenhart, Duggan, Cortesi, & Gasser 2013). Subsequently, other mobile devices such as tablets and electronic books were introduced and these devices are now often used by students in secondary school, as well as in higher education to access textbooks and other instructional materials (Hu, 2011; Rockinson-Szapkiw, 2011).

When using mobile devices such as phones and tablets, users frequently shift between different activities – for instance, reading their textbook and text messaging on their phone, or reading on an electronic screen and shifting between different applications (Tran, Carrillo, & Subrahmanyam, 2013). Although referred to as multitasking, in actuality, the user is rapidly switching between different activities on one device or on multiple devices/media (Kirschner & Karpinski, 2010;

Subrahmanyam et al., 2013). Recent data suggest that college students multitask with three (Ophir, Nass, & Wagner, 2009) or even four devices simultaneously (Tran et al., 2013), often while reading. Mobile phones afford users the opportunity to multitask at any time and place. In fact, in Tindell and Bohlander's (2012) study, 92% of students reported using their mobile phones during class. Not only do students use mobile phones and other devices in the classroom, they also do so when engaged in out of school learning tasks (Tran et al., 2013). Thus, it is important to consider the impact of such multitasking on learning and academic performance (Levine, Waite, & Bowman, 2012; Tran et al., 2013; Subrahmanyam et al., 2013).

The first studies investigating the effects of multitasking on learning were conducted by Dr. Helene Hembrooke and Dr. Geri Gay (Hembrooke & Gay, 2003) from the Human-Computer Interaction Group at Cornell University and Dr. Carrie Fried (Fried, 2008) at Winona State University. Subsequent studies were conducted by Dr. Kaveri Subrahmanyam and colleagues at the Children's Digital Media Center @ Los Angeles (California State University, Los Angeles/University of California, Los Angeles) (Subrahmanyam et al., 2013; Tran et al., 2013). At the time of writing this chapter, only a few studies had been conducted on multitasking with mobile phones; leading researchers on this topic include Dr. Larry Rosen and colleagues (Rosen, Lim, Carrier, & Cheever, 2011) at California State University, Dominguez Hills and Dr. Amanda Gingerich and Dr. Tara

Lineweaver (Gingerich & Lineweaver, 2014) at Butler University. As research on the effect of mobile phones on learning is limited, we draw from relevant research on multitasking using laptops, tablets, and other digital devices.

OVERVIEW

Questions about multitasking have largely focused on whether multitasking has a disruptive effect on learning (Subrahmanyam et al., 2013; Tran et al., 2013; Fox, Rosen, & Crawford, 2009; Fried, 2008). Although the idea that multitasking negatively impacts learning is consistent with conventional wisdom, the research evidence on this question is largely inconsistent. Fried (2008) found a negative relation between students' laptop use during lecture over the entire course (10 weeks) and their scores on exams that tested the content covered in the course. Similarly, Hembrooke and Gay (2003) also found a negative effect of using laptops during lecture on measures of memory. Findings of studies by Fried (2008), and Hembrooke and Gay (2003) suggest that multitasking when learning may have a disruptive effect, leading students to perform worse during the learning task (e.g., reading, lecture, etc.).

Other studies using out-of-classroom learning tasks have found contrary findings. For example, Subrahmanyam et al. (2013), Tran et al. (2013), Fox et al. (2009), and Bowman, Levine, Waite, and Gendrone (2010) have studied the effects of multitasking in a laboratory-based task involving reading comprehension of expository text. Unlike Fried (2008), and Hembrooke and Gay (2003), Tran et al., (2013) found that multitasking did not lead to poorer performance on a measure of comprehension in a reading task, where the researcher directed the multitasking. Similarly, Subrahmanyam et al. (2013) found equivalent performance on a reading comprehension task among participants who were allowed to multitask

versus those who were not allowed to multitask while reading; note that multitasking in the multitasking present condition was participant-initiated.

Most of the aforementioned studies entailed multitasking on a computer/laptop. Mobile phones have emerged as the principal multitasking device and although research on mobile phones is scarce, researchers have begun to investigate the effects of multitasking with mobile phones on learning. Studies by Gingerich and Lineweaver (2014) and by Kuznekoff and Titsworth (2013) found a negative effect of multitasking with mobile phones. In both studies, participants showed significantly lower scores on a test that measured information presented during a lecture.

The chapter will begin by describing the theoretical frameworks that researchers have adopted to investigate the effects of multitasking on learning. Then we present the results of studies that have examined the effect of multitasking in different settings (lecture versus laboratory), and implications of multitasking for students in the classroom. Future directions for research on multitasking with mobile devices will also be discussed. Finally, after considering the evidence from research on multitasking, we will offer suggestions for students regarding the use of mobile devices and the practice of multitasking.

THEORETICAL FRAMEWORK FOR STUDYING MULTITASKING

In order to understand the potential effects of multitasking on learning, we draw from two theoretical frameworks, the cognitive load theory (Sweller, 1994) and the limited process capacity model (Lang, 2000). The cognitive load theory presumes that working memory is a limited capacity system that holds information while it is being processed; this constrains a learner's ability to process other new information at the same time. Thus, cognitive load is the demand on a learner's

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