Chapter 4
Dividing Attention and Metacognition

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ABSTRACT

Students increasingly control their learning as university instructors shift away from lecture formats, courses are offered online, and the internet offers near infinite resources for student-controlled informal learning. Students typically make effective choices about learning, including what to learn, when to learn, and how to learn, but sometimes make less-than-optimal study choices, including trying to study while multi-tasking. Dividing attention among various tasks impairs both learning and learners' control over their learning because secondary tasks divert cognitive resources away from learning and metacognition. This chapter reviews recent studies explaining how dividing attention affects students' metacognition, including their assessments of their own learning and the study choices that they make. This chapter reviews the fundamentals of metacognition, describes the impact of dividing attention on the effectiveness of learners' metacognition, and provides suggestions about how to enhance the efficacy of metacognition when students' attentional resources are limited.

INTRODUCTION

Digital technologies are prevalent in college classrooms and, consequently, they easily and increasingly distract learners from classroom activities. Digital devices, like laptops, smartphones, and tablets, can support learning; for example, they can help students take and store notes and keep deadlines organized in calendars. However, digital technologies can also allow students to perform various course-unrelated activities, including texting friends, posting and viewing social media, checking email, browsing videos on TikTok, reading news and current events, shopping online, and playing video games. A vast majority of students describe being distracted by their digital technologies during face-to-face classes: over 95%

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of students report sending text massages at least once per class, and over 19% of undergraduate students report constantly texting while in class (le Roux & Parry, 2018). Similarly, when internet use was tracked during a lecture, undergraduate students spent an average of 37% of class time on non-academic tasks (Ravizza, Uitvlugt, & Fenn, 2017). In online classes, which have experienced huge enrollment growths recently (Allen, Seaman, Poulin, & Straut, 2016), distractions happen even more frequently than in traditional face-to-face classes (Lepp, Barkley, Karpinski, & Singh, 2019). Several reasons contribute to the high rate of digital distractions in class, including learners' needs to build and maintain social connections (David et al., 2015), reduce anxiety and boredom (Wang & Tchernev, 2012), and seek out information about tasks unrelated to the central learning task (Bellur et al., 2013).

Digital distractions are increasing in college classrooms, as younger generations report attempting to divide their attention between the primary learning tasks and digital technologies more frequently than older generations (Carrier, Cheever, Rosen, Benitez, & Chang, 2009; Carrier, Rosen, Cheever, & Lim, 2015). Digital distractions may be increasing for several reasons. First, younger generations have been saturated with digital technologies from young ages (i.e., they are digital "natives"), such that they can navigate through digital technologies easily (Thompson, 2013). Second, the development and proliferation of attention-grabbing and attention-demanding digital technologies may enable and prompt students to be distracted at an increasing rate. The continued advances in digital hardware afford students the ability to combine multiple digital activities easily; stronger CPUs allow several computer programs to run simultaneously and provide quicker response speeds to switch smoothly between tasks, and increased screen resolution helps show multiple viewable windows at once (Gibson, 1979; Wijekumar, Meyer, Wgoner & Ferguson, 2006). Finally, the algorithms used by social media companies to prioritize posts are constantly evolving so that they more effectively attract users' attention and make their platforms even more difficult to ignore (Agrawal, 2016; Stern, 2021).

A central concern with digital distractions in the classroom is that they cause students to divide their attention between their technology and the ongoing lesson. Students have limited cognitive resources (e.g., Baddeley, Chincotta, & Adlam, 2001). As they allocate some cognitive resources to digital distractions, fewer resources can be devoted to their classroom activities. Dividing attention between multiple tasks significantly impairs students' classroom learning (e.g., Kuznekoff & Titsworth, 2013; Lau, 2017; Mendoza et al., 2018) because students have fewer cognitive resources to encode, manipulate, and integrate information (e.g., Mangels, Picton & Craik, 2001; Moscovitch & Umilta, 1991). *This chapter examines how digital distractions (or dividing attention between digital technologies and ongoing instruction) influence learners' monitoring and control of their own learning in college classrooms.*

Inside and out of traditional classrooms, students need to monitor and control their own learning effectively in order to achieve their learning goals. Students make countless choices about their own learning inside the classroom. For example, students decide what information they pay attention to, what lecture material to write down in their notes, whether to ask a clarifying question to the instructor, when to look up the definition of an unknown word online, and how often they check their phone for new text messages. The number of choices that students have during learning is even greater in asynchronous online classes, as students even choose when and where to learn (Tullis, 2020). Learners make effective choices about their learning in many settings because they have unique insight into their own mental processes. In other words, students know whether they have processed information well or poorly (e.g., Tullis & Fraundorf, 2017). Students can base their learning decisions on this personal knowledge of their own cognitive processes; honoring their choices can yield superior learning (Finley, Tullis, & Benjamin, 2010; Tullis, Fiechter, & Benjamin, 2018). For example, in laboratory studies, allowing learners

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