DIVIDED ATTENTION IN 140 CHARACTERS: SOCIAL NETWORKING BREEDS SOURCE ERROR

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Today, instead of actively sharing information with a specific person, such as sending an e-mail, students, and people in general, have resorted to inactive, uninvolved sharing with multiple people through social networking sites [1]. Social networks are online services for individuals to collaborate and share information with other individuals with similar interests [1, 2]. Such social networks serve as modern sources of social connectedness, which refers to relationships people have with others and benefits these relationships bring to the individual, such as enjoyment and support [3]. Because many young people rely on these social networking sites, such as Facebook and Twitter, to communicate with peers, some educators have incorporated social networking sites into the classroom [1]. To cater to the current interests of students, educators have utilized these social networking sites to stimulate conversation outside of the classroom to mimic discussion boards, such as Blackboard or Canvas, as an attempt to enhance student learning [4].

To study the effectiveness of reinforcing classroom concepts through social networking, Blessing, Blessing, and Fleck (2012) set up a Twitter account to send messages or "tweets" to students involving a main concept from the discussion in class that day. The researchers hypothesized that reminding students of previously learned concepts would boost memory performance and increase the likelihood of information becoming stored in long-term memory (Blessing, Blessing, & Fleck, 2012). Students were tested under two different assessments. First, students listed up to five items when thinking about a particular chapter and listed its source (e.g., textbook, classroom discussion, or tweet). Second, students completed a multiple-choice test specifically on tweet content. These items also appeared on course exams and were therefore indistinguishable from other course content. Although not significant, the results indicate that students recalled tweeted content more often than non-tweeted content. Additionally, when examining source information, the majority of students falsely reported tweeted information as information presented in class or in the textbook (Blessing, Blessing, & Fleck, 2012). Though the results were not significant, the current study uses this previous research as a basis in testing source error in divided attention through the use of social networking.

Accurately identifying how a specific piece of information was acquired is important to determine its reliability [5]. For instance, information learned from a trusted source is more likely to be accurate than information from a fallible source [5].To recall where an individual has learned information, s/he engages in reconstructive memory through source monitoring, which determines the origin of information by relying on additional source cues [5, 6]. When a person engages in source monitoring, but accredits information to the wrong source, source error occurs [7]. Often general familiarity with an absence of specificity leads to such source error [8, 9].

In the outside world, familiarity is frequently exhibited in law enforcement, specifically with the use of lineups [7]. In a line up, witnesses are encouraged to identify the perpetrator by relying on familiarity and assessing each individual by comparing them to one another [7]. However, even if the suspect is not present, witnesses will still choose a person the suspect resembles most, due to inaccurate

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source monitoring [5]. This misattribution occurs as people fill in the blanks by encoding outside irrelevant information [9]. As a result, individuals falsely remember where these memories come from, but are still exceedingly confident as this familiarity confirms previous judgment [7]. As such, effortful processing and focused attention must be used during encoding and retrieval of source information, otherwise information will be encoded automatically [10].

Often without effort, humans encode information automatically [7]. This automatic processing occurs so frequently that we are seldom cognizant of how much information we actually process at a time [7]. This type of encoding occurs without our awareness and does not necessarily interfere with processing other conscious thought [11]. Humans have difficulty attaining conscious awareness of simultaneous stimuli from multiple sources [12]. For instance, when driving, thoughts of the day ahead do not interfere with the physical ability of driving to work. These lapses in awareness are attributed to temporary losses in attention, which allows an individual to focus on specific aspects of the environment [12]. Though automatic processing allows us to perform mundane tasks with ease, this type of processing often leads to absent-mindedness, causing divided attention [11].

Divided attention occurs when an individual is completing a task without fully encoding and processing what s/he is trying to accomplish [11]. These lapses in attention reduce accuracy in memory recall performance [8]. For instance, when writing a paper in the library, a student's full attention may not be on what s/he is writing because of other distracters, such as other students talking. The student is not only attending to the paper, trying to remember what s/he has previously written, but also attending to the irrelevant information contained in the other students' conversation. Such divided attention or 'multitasking' behavior, causes more frequent mistakes than individually processing that same information [13].

With the development of new media and technologies, people are presented with opportunities to multitask [14, 15]. Multitasking is the simultaneous performance of two or more activities at the same time [16]. When performing a single task, attentional resources are uninterrupted and information is accurately encoded and stored [17]. When a secondary task is added, attention becomes divided and information processing becomes less accurate. During multitasking, encoding is disrupted and the quantity and quality of the information decreases [17]. Multitasking is therefore only successful for automated tasks or tasks developed through practice, such as driving a car and changing the radio station [16]. However, since communicating through social networking has become almost essential in many people's lives, media multitasking, or combining media use with other activities, has become common practice [18, 19].

Ophir, Nass, and Wagner (2009) studied the relationship between heavy and light media multitaskers and their cognitive control abilities. Results indicated that heavy media multitaskers, those who consume media frequently, have greater difficulty filtering out irrelevant information from the environment than those who infrequently consume multiple media streams (i.e., light media multitaskers). Heavy media multitaskers are likely to respond to these irrelevant stimuli through bottom-up processing or perception of the environment, while light media multitaskers interpret information through top-down processing by making sense of presented information from previous experience [20]. Heavy media multitaskers also exhibit increased distraction by irrelevant stimuli and increased difficulty refocusing after changing focus of attention [21]. If one repeatedly practices multitasking while encoding, s/he will not be able to process certain presented information, thus indulging in absent-mindedness and ultimately automatically forgetting [22].

In order to commit information to memory, it is encoded by its meaning [7]. Information is processed either by automatic or effortful processing. As their names suggest, effortful processing

differs from automatic processing in that it requires information to be consciously encoded [16]. Effortful memory processes, such as rehearsal, require attention and are performed deliberately [10]. For example, effortful processing is likely to be used in learning state capitals. However, automatic processing can occur if the student cannot remember the capital of Alaska, but can remember what page of the notes the information was presented. Additionally, even if effortful processing was not used while studying, state capitals can still be remembered through automatic processing. If the student has an associated meaning with the capital of Alaska, such as their favorite movie, "Juno", the student is likely to remember the capital of Alaska as "Juneau" even though the student did not consciously commit it to memory [7].

Though the general public perceives multitaskers as those who can perform multiple tasks with efficiency and ease, studies of media multitasking indicate that people are only successful in task switching [13]. Unlike distractions, or involuntary attention shifts due to unanticipated events, task switching, describes voluntary shifts in attention [23]. Task switching requires a person to balance limited cognitive resources to accomplish multiple tasks successfully [20]. Switching between tasks wastes time as the brain continually restarts and refocuses, making this process counterproductive to the original purpose of multitasking [15]. Each time an individual switches between tasks, there is a period of time in which s/he will not make progress on either task [15, 24, 25]. This balancing act leads to mediocre individual task performances with more frequent mistakes than if tasks were performed individually [20].

Furnham and Bradley (1997) studied the effect of music as a distraction while working. Those who frequently listened to music while working outperformed those who infrequently listen to music while working. The more exposure participants had to music, the easier it was to ignore the distraction and perform the primary task. However, those participants exposed to music performed inferior to participants who studied in silence [22]. These findings indicate that if one repeatedly practices divided attention while encoding, this individual will not be able to accurately process information, ultimately indulging in absent-mindedness and automatically forgetting [22]. Overall, multitaskers do not retain as much information as those focused on one task with full attention [15, 19].

Though divided attention decreases performance on cognitive tasks, researchers have determined that not all information is necessarily lost [7]. This concept has been assessed by distinguishing between recollection and familiarity. Recollection is a more specific type of memory in which an individual remembers specific details about an event, such as where a certain family member sat during this past Thanksgiving [26, 7]. Recollection is a more demanding process, requiring focused attention, while familiarity is an automatic process. Familiarity describes the general picture with less detail and would help an individual understand what likely occurs at Thanksgiving based on years of attending holiday dinners [8, 7].

Memories rich in detailed meaning, such as personal stories and real-life events, are often susceptible to reconstructive processes and frequent errors [27]. Reconstructive retrieval is the active process of filling in missing elements while remembering. Conversely, recalling simple memories, such as word lists, usually involves reproductive or accurate memory, leading to fewer errors [27]. Retrieval of an encoded event is attention-dependent for source recollection [8]. According to previous research, there are three qualifications for remembering false memories. First, the person must believe the event is possible, second, s/he must believe it were likely to have experienced the event, and third, s/he must make a source error and misattribute it as being a real, personal memory [28].

Ost, Granhag, Udell, & Roos af Hjelmsater (2008) studied familiarity in false memories using the terrorist attacks in London on July 7, 2005. Swedish and UK participants completed a series of

questionnaires about their memory of either the aftereffects of the attacks, a non-existent computerized reconstruction of the moment the attacks occurred, or non-existent television footage of the moment of the attacks. The results indicated that forty percent of UK participants and sixteen percent of Swedish participants claimed to have seen a real-life traumatic event impossible to have been witnessed. UK participants who had been exposed to more media coverage at the time of the attacks were more prone to false memories than Swedish participants due to the availability heuristic. Overall, because of repeated media coverage in the UK at the time of the attacks, participants were able to recall familiar information concerning that event, thus increasing participants' willingness to report witnessing non-existent footage years later [28]. As a result, attention is not only important during memory encoding, but in memory retrieval as well.

Successful encoding ensures future remembering leading to long-term memory [8]. In other words, in order to perform many complex tasks, it is necessary to hold information in working memory [11]. Working memory is an active temporary storage system comprised of limited information with immediate relevance to the task at hand [29]. For instance, when reading, one must engage working memory in order to make sense of each sentence. This system involves an attentional controller known as the central executive, and three subordinate systems, including the visuo-spatial sketchpad, responsible for holding and manipulating visual images, the phonological loop, accountable for speech-based information, and the episodic buffer, which integrates information from the aforementioned two subsystems with sense of time. As such, the episodic buffer allows for some memories to occur in a continuing sequence, like a story, instead of separate segments [29, 30, 31, 32].

If the ability of working memory to maintain focus is disrupted, task performance may suffer [33]. Since working memory only embodies a few seconds of information, information is ultimately forgotten unless rehearsal is performed [7]. In addition to holding this information, working memory must prevent distractions from compromising presented information [30]. Considerable attentional interference occurs when primary and secondary tasks involve similar processes [10]. When two tasks involve the same processes, performance is expected to be decreased [34, 14]. In other words, the attentional resources required to process an auditory task and a visual task may be easier to process than two visual tasks [34]. Grimes (1990) tested television news stories manipulated to semantically blend or conflict with their component parts. Viewers fused content of auditory and visual information channels when the channels were semantically complementary. Participants were unable to assign a source to remembered information or assigned it to the wrong source. The more the audio and video semantically separate from each other, the more attentional overload was present [35]. When an individual attempts two or more attention demanding activities at the same time, allocation of attention to tasks is limited and performance suffers [14]. As such, informational overload compromises efficiency of attentional control, leading to decreased working memory and the ability to concentrate [36, 14].

Activities that require focused attention, such as reading, are declining amongst college students while those that require divided attention, such as social networking, are increasing [37, 38]. The ability to multitask with social networking sites involves divided attention, switching between tasks, and keeping track of multiple pieces of information in working memory [14]. Activities similar to social networking create various interruptions and multitasking demands that might put additional stress on cognitive processing [37, 14]. Due to its automated nature, media multitasking has become a growing concern in education as students are commonly found using smartphones during class instead of directing full attention to presented material [17]. Though advances in technology allow people to perform multiple activities at once, users' cognitive capabilities have not increased. As a result, interruptions have been found to cause serious problems for effective functioning, such as the ability to

concentrate, thus having a decreased level of encoding. Habitual multitasking may condition students' brains to become in an overexcited state, making it challenging to focus without multiple stimuli [37].

In an attempt to capture students' attention, some educators have utilized social networking sites to stimulate conversation outside of the classroom [4]. In order to successfully incorporate social networking in educational environments, teachers, as well as students, must assess the effects social networking has on learning [17]. Unlike social networking, classrooms promote distributed control and commitment to generating and sharing new knowledge with other members [38]. Students are motivated and set goals and objectives as well as share ideas, promoting enhanced learning [38]. A social networking site, however, provides an informal environment in which members generate and share information without commitment. As such, members of social networks engage in passive dialogue and interaction as there are no incentives to share information. As a result, it has been argued that social networking is not suitable for learning as it is not an active process [38].■

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