Multiple Dimensions of Multitasking Phenomenon

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ABSTRACT

Multitasking is defined as conducting two or more tasks simultaneously or switching quickly between two or more tasks. While multitasking is not a new concept, it has caught more attention in recent years. Whether one sees it as an illusion, a fad, a new phenomenon, or an evolving human capacity, it is important to establish a baseline of what activities are involved in multitasking for scholarly inquiries and discoveries. This paper examines the multitasking phenomenon through personal stories of 43 undergraduate students (age 21-29) and 30 children (age 6-11). The stories revealed a wide range of perceptions and experiences of multitasking, from walking while breathing, to doing homework while watching TV and surfing online, to texting while driving, and to performing complex professional skills. This vast range of experiences may have contributed to the varied views and debates on human beings’ capabilities of multitasking to date. The purpose of this paper, therefore, is to bring to light the multiple dimensions of multitasking as it relates to attention, ability, expertise, technology, and environment. This endeavor serves as a foundation for further studies on human’s capacity for multitasking.

Keywords: Dual Task, Environment, Expertise, Human-Computer Interaction, Media Multitasking, Qualitative, Switching

INTRODUCTION

Human multitasking, or multitasking, is a human behavior that allows people to handle dual tasks simultaneously or alternate multiple task switches (Baddeley, 1996; Gopher, Armony, & Greenspan, 2000; Lee & Taatgen, 2002; Meyer & Kieras, 1997; Roger & Monsell, 1995). Multitasking has been around for as long as humans have had competing needs, for instance, doing housework while watching a baby.

Hall (1959) introduced the concept of polychronicity based on how cultures perceived time. According to Hall, people who live in monochronic cultures view time as a linear concept and prefer to complete one task at a time. In contrast, people who live in polychronic cultures view time as cyclical and prefer to engage in more than one task simultaneously. Bluedorn (2001) defines polychronicity as the “extent to which people prefer to engage in two or more tasks or events simultaneously and believe that their preference is the correct way to do things” (p. 119). Much has changed since Hall’s work on cultural perception of time and task. The Internet, with its non-linear hyperlinks and sophisticated graphic features, has changed our habits of reading, searching, and obtaining information. Often, we are tempted to follow the hyperlinks and surf information from one...
page to another, rather than completing the information on a single webpage (Zumback, 2006). Switching between various web pages and program screens on the computer is just one example of a multitasking behavior.

Younger generations who have grown up with the convenience and trappings of technologies are surrounded by portable media (Oblinger & Oblinger, 2005; Foehr, 2006; Roberts & Foehr, 2008). Such media provide constant connectivity to friends, schools, and families. As a result of the hyper-connectivity, younger users are layering media in between activities or on top of other activities (Gardner, 2008). Several studies completed by the Kaiser Family Foundation (Foehr, 2006; Roberts & Foehr, 2008; Rideout, Foehr, & Roberts, 2010) reported that children and teens spend an increasing amount of time multitasking and they manage to pack increasing amounts of media content into the same amount of time each day, for instance, surfing online while watching TV. Nearly one-third of the 8 to18-year-old respondents indicated that they either talk on the phone, instant message, watch TV, listen to music, or surf the Web for fun most of the time that they are doing their homework (Foehr, 2006; Roberts & Foehr, 2008). The most recent report showed that 8-18 year olds in the U.S. spend 7.38 hours on media daily and that these young people packed a total of 10.45 hours’ worth of content media into 7.38 hours of media use (Rideout, Foehr, and Roberts, 2010).

Research, however, has been ambiguous about people’s capabilities towards multitasking, especially as they relate to the effectiveness of multitasking on memory and learning. Numerous research from cognition, psychology, information science and neuroscience indicated that our ability to engage in simultaneous tasks is rather limited (Broadbent, 1958; Fisch, 2000; Lang, 2001). Research shows that multitasking over different types of tasks reduces productivity (Just et al, 2001; Rubinstein, Meyer & Evans, 2001), and that our ability to perform concurrent mental operations is limited by the capacity of the brain’s central mechanism (Schweickert & Boggs, 1984). Wickens’ Multiple Resource Theory Model (1984) proposed that humans have limited capability in processing information, although several different pools of resources rather than one single source can be tapped. This is because cognitive resources are limited and a supply and demand problem may occur when an individual performs two or more tasks that require the same resource. Scholars believe that switching between tasks wastes precious time because the brain is compelled to restart and refocus (Meyer & Kieras, 1997). According to Meyer and Kieras (1997), each time one has this alternation, there is a period in which one will make no progress on either task. The result is that it takes longer to finish any one chore, and that one doesn’t do it nearly as well as one would, if one had given it one’s full attention. Johnson (2006) describes one kind of multitasking, “It usually involves skimming the surface of the incoming data, picking out the relevant details, and moving on to the next stream. You’re paying attention, but only partially. That lets you cast a wider net, but it also runs the risk of keeping you from really studying the fish” (p. 61). Jackson (2008) warned that attention, the key to recapturing our ability to connect, reflect, and relax, is missing in our new world.

MULTITASKING AND TECHNOLOGY IN DAILY LIVES

Many new media researchers, however, hold that the skills promoted by the convergence of new media, including creativity, peer-to-peer learning and multitasking are becoming necessary for success in today’s world. Prensky (2001) claims that the younger generations or digital natives, growing up with new media and technologies, are operating at faster-than-normal speeds, are comfortable and capable of parallel rather than sequential or linear access to information, are operating at faster-than-normal speeds, are comfortable and capable of parallel rather than sequential or linear access to information, are capable of accessing information randomly, and are capable of multitasking. Zimmerman (2007) presents the concept of “metatasking,” a focused multitasking behavior. According to Zimmerman, metatasking involves simultane-
ously undertaking any number of tasks that ultimately accomplish one primary objective (2007). Zimmerman states that as we continue to seek information online and encourage online collaboration, it makes sense to encourage metatasking, that is, deep, focused multitasking. In our information-rich and information-gathering world, it simply makes sense for us to want to accomplish as much as we can and to use these technologies to our advantages (Zimmerman, 2007). Stated by Hembrooke & Gay, “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” (2003, p. 1).

It is obvious that this research area, in particular as multitasking behaviors emerge with new technologies, is ripe for investigation. In addition, much research on multitasking has been done in the lab experiments and takes a strongly positivist stance with controlled experiments to identify the optimum distribution of tasks across input and output modality. Clearly, what happens in lab experiments does not often represent a complete picture of what happens in real life. For instance, the media multitaskers in real life may be more internally driven or directed on what to focus and when to switch between the tasks than those who are told what to focus and when to switch in a lab environment, and as a result, may be better at multitasking (Lin, 2009).

Such discrepancies naturally lead to disconnection between research and practice, and reduce the impact of research on practice. Therefore, the goal of this study is to look into people’s daily experiences so as to better understand the complexity involved in people’s daily multitasking activities and to better understand human’s capacity for multitasking in natural settings. A qualitative method is thus incorporated to explore the complexity of this phenomenon.

**METHODOLOGY**

This study is qualitative and interpretive in nature (Creswell, 1998; Patton, 2001). The researcher is interested in what the young people do when they multitask. The phenomenological approach is primarily an attempt to understand the young people’s experiences from the perspective of those being studied. According to van Manen (1990), phenomenology serves as the rationale behind the efforts to understand individuals by entering into their field of perception in order to see life as these individuals see it. In order to ascertain the experiences of multitasking, it would be desirable to learn directly from those who tell their stories.

Phenomenological researchers agree that three research processes compose the phenomenological method: investigation of the phenomena, identification of general themes/essences of the phenomena, and comprehension of essential relationships among themes (Spiegleberg, 1982; van Manen, 1990). In phenomenology, the researcher first details the individual statements of informants about experiences with the phenomenon before moving to meanings and clusters of meanings. This inductive approach to developing the qualitative narrative shows that the process is one of an emerging design. The purpose of phenomenological inquiry is to discover the essential meaning or existential experience of what it is like to live through a certain experience, although the “meaning or essence of a phenomenon is never simple or one-dimensional. Meaning is multi-dimensional and multi-layered” (van Manen, 1990, p. 78). According to van Manen:

> *In order to come to grips with the structure of meaning it is helpful to think of the phenomenon described in the text as approachable in terms of meaning units, structure of meaning, or themes. Reflecting on lived experience then becomes reflectively analyzing the structural or thematic aspects of that experience.* (p. 78)

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This study focuses on describing and interpreting young people’s perceptions and experiences of multitasking. An important part of this research is devoted to discovering the reasons behind multitasking. To find the reasons, it is best to allow the participants to speak for themselves. The following questions led the researcher to start the inquiry: 1) what is involved when one multitasks? 2) why do people multitask? and 3) what role does technology play in multitasking?

The researcher collected stories from 43 undergraduate students majoring in education (ages 21 to 29) at a southern university in the US, and 30 elementary school students (ages 6 to 11) close to the university in the same state. The population selection was decided by availability and relevance (i.e., the younger generations who are relatively more immersed in new media and technologies). Of the 43 undergraduate participants, there was one Caucasian male student. The rest were female students, composed of 40 Caucasian and two African-American female students. All the undergraduate students plan to be K-12 teachers in subjects such as math, science, English, art, and music after they graduate. Of the 30 elementary school children, there were 15 boys and 15 girls.

All the participants contributed their stories to the following questions: “Reflect on an incidence when you were sure that you were multitasking. What were you doing?” In addition, the researcher had discussions with the undergraduate student participants about characteristics of multitasking, senses involved in multitasking, and the relationship between multitasking, learning, and technology. The collected stories were initially grouped by activities and contexts, for instance, with all stories about watching TV while doing homework in one category. Afterwards, the patterns, meanings and themes behind the activities were identified and consolidated. Bracketing experiences enabled the concepts found in the data to be clarified and the categories to emerge. It helped to create an understanding based on the participants’ own descriptions.

**FINDINGS**

**Multitasking and Attention: Distraction, Switch, or Split of Attention**

Obviously, multitasking has a lot to do with how we dedicate or divide our attention: does one multitask because one splits one’s attention or shifts one’s attention between tasks? To what extent does one have control over the attention splits or attention shifts during multitasking? That is, does one multitask because one cannot focus one’s attention on one task for a long period time, because one lacks self discipline, or because one does this intentionally in order to focus or meet certain needs at a particular time? Anna, an undergraduate, gave this story:

*Often, I try to watch TV while I’m doing homework. This usually doesn’t work and I end up watching TV; especially if it is a program that I am really interested in. If I don’t really care for the program, and someone else is in the room watching it, then I can focus on the homework. I usually tend to focus on whatever sounds more appealing; most of the time TV is more appealing than school work. I also focus on how major the assignment is. If it is something that has to be done now, then I will usually do it. Either way, I cannot accomplish both at the same time. I can’t finish my assignment and know everything that happened on a show at the same time.*

In the above story, Anna shifted her attention between her dual tasks: doing homework and watching TV. Anna often found herself paying attention to the more appealing – TV. This was a little different from Barbara’s story as Barbara, also an undergraduate, indicated that she multitasked because she did not need to pay full attention to any of the tasks that she simultaneously carried on:
The times when I have the best multitasking skills is when I do something like watch TV, be in a conversation and do an assignment. I was able to do all of these at once because I only needed to focus on one thing at a time. I could tune out the conversation while writing a paper or focus on what is on the TV while still getting information from all other sources. I need background noise to work most of the time. When I multitask I am able to do all 3 very effectively because my mind can switch tasks quickly and effectively. I also am more used to it since I have been multi-tasking for many years now probably since the 6th grade.

Both Anna and Barbara switched or split their attentions when multitasking, although Anna felt less in control of the situation than Barbara did. Neither Anna nor Barbara, however, were in a dangerous situation as in the story told by Carrie, who was Anna and Barbara’s classmate. While driving, Carrie was distracted from paying attention to the traffic and caused an accident when she changed the radio channel:

I remember a multitasking situation where I was driving my car but I got stuck behind a stopped truck. I was going to go around the truck but a car was on the other side so I couldn’t. The truck started moving again so I also started moving. At the same time I looked at the radio to change the song and the truck in front of me had stopped again and I ended up rear-ending him. From now on I just keep my eyes on the road as I change the radio! Lesson learned!

What is interesting, however, is that several participants indicated that they needed to multitask in order to focus, particularly when they were doing school work or housework. David, an 8-year-old, said that he would either listen to music or have the TV on so that he wouldn’t be bored doing his homework. Dana, an undergraduate says:

I prefer having background noise and an occasional distraction when I’m focusing... I personally find it difficult to focus for extended periods of time on a single task – it becomes monotonous, and I sometimes feel discouraged at a lack of progress.

This phenomenon is also described in the Kaiser Family Foundation studies, which reported that teens claimed that they cannot tolerate the silence when they do homework, and that they must have something to tune out in order to concentrate (Foehr 2006; Roberts & Foehr, 2008). About half of the participants from both age groups in this study talked about doing homework while watching TV, text messaging, or surfing on the web. In fact, other researchers have pointed out that performance can be affected by workload being too high or too low (Nachreiner, 1995). Sustained low workload (under-load) can lead to boredom, loss of situation awareness and reduced alertness (Andrade, 2010). Also as workload increases performance may not decrease as the operator may have a strategy for handling task demands. It is, however, difficult to conclude whether these activities distract the participants from getting their homework done or help them remain awake and interested in completing their homework.

Multitasking and Choices: Priority, Impulse, Pressure, or Preference

Often one decides to multitask because one cannot choose which task to do first. Emma, a 10-year old girl said that she had to multitask because she didn’t want to miss her favorite show on TV, but she had to finish her homework before she went to bed. She thought she was very good at multitasking because she understood everything that was going on during the show and also received an A on her homework.
Ellen, an undergraduate, found herself constantly surfing online, responding to emails, or looking for something to eat while writing a paper. As much as she wanted to focus and complete the paper before doing anything else, Ellen found it almost impossible not to change her attention to other things in the process. She called her behavior impulsive. Edward, an undergraduate, mentioned that he felt it a waste of time in meetings when he could only listen to the speaker without simultaneously doing other things such as surfing online, chatting with friends using Instant Messenger or replying to emails on his computer. Edward’s comment was echoed by many, although Edward and other students mentioned that this kind of multitasking behavior was sometimes perceived as inattentive and rude to the speaker and others.

People who work in this fashion may tune in and out their focus on different things at different times. While they may increase their probability of sensing something from multiple channels, they may not delve deeply into any one area unless they make a conscious decision and take action to focus on a particular task, often times to its completion. Different individuals have varying degrees of situational awareness and may be affected differently while eating, listening, seeing, texting, and playing. As it is not easy to do two or more tasks at the same time, certain planning and skills are necessary as articulated by Elizabeth, an undergraduate:

I tend to try to get a head start on things, so in the process of that I try to do more than one thing at a time. Sometimes I’m successful, but other times I find myself overwhelmed, but not defeated. I get it done. Multitasking to me requires skill, time, and patience. I can watch television and do work while talking on the phone. I can cook and wash at the same time, but other than that I think that I would have to do each task individually. I’m not the best at multitasking, but in certain situations I’m good at it.

Experience tells Elizabeth that she can do more than one thing with some tasks but not with others. Such differences may be due to the nature of the tasks and to her familiarity with the tasks at hand.

Not only may one’s task priorities and familiarities influence one’s ability or decision to multitask, but one’s learning style and natural intelligences may also have impacts. Gillian Lynne, who is a choreographer and has created some of the most successful musical theater productions in history, was seen as hopeless and having a learning disorder at school because she could not concentrate (Robinson, 2006). After seeing a specialist, Gillian was advised to go to a dancing school, where she met people who were like her, people who needed to engage their entire bodies in order to think (Gardner, 1993; Robinson, 2006). The kinesthetically inclined Gillian found her formula for success. Personal preferences and learning style differences account for many of our inclinations when it comes to dedicating our time and engagements with our environments.

Often, what drives people to do multiple things at the same time is the perceived efficiency, effectiveness and productivity. Yolanda, an undergraduate, states:

I try not to multi-task because I tend to lose focus of what I’m actually doing. I suppose I’ve had instances where I’ve had the TV on while studying before. I have also eaten while driving, which is probably not too smart, but I’m always on the go and it saves me time.

Yolanda eats while driving to save time. While it is unclear whether Yolanda truly saves time by doing so, Zack’s story seems more convincing. In schools, we are all asked to take notes while listening to the teacher. Zack, an undergraduate, says:

"I try to get a head start on things, so in the process of that I try to do more than one thing at a time. Sometimes I'm successful, but other times I find myself overwhelmed, but not defeated. I get it done. Multitasking to me requires skill, time, and patience. I can watch television and do work while talking on the phone. I can cook and wash at the same time, but other than that I think that I would have to do each task individually. I'm not the best at multitasking, but in certain situations I'm good at it."
I feel like I always multitask when I’m trying to take notes and listen to a teacher at the same time. It gets a little hard sometimes; depending on how fast she goes through the notes or how fast she talks.

Taking notes while listening to the teacher is generally accepted as a good practice in schools. Zack’s story led us to the concept of doing multiple tasks or involving one’s multiple senses for one particular learning goal: to learn the subject matter of the lecture. This possibility, afforded by our technological extensions such as the notebook, the pen, or the computer, seems to create a synergy and affect the outcome or the quality of the goal (Zimmerman, 2007). This is important to note in teaching and learning. In the best of all worlds a teacher would situate the learner in a position to pull from multiple sources to learn from them all in a synergistic and often times recursive manner.

**Multitasking and Ability: Innate or Acquired Surviving Skills**

Carol, an 8-year-old girl indicated that everything is multitasking, like walking and breathing, or talking and listening, or eating and listening. If we agree with Carol, then most of us are born with multitasking skills, except that we need to sharpen and expand our innate abilities as we grow in order to survive in an increasingly complex and competitive world.

Helen, an undergraduate, stated:

_I believe that I multitask on a daily basis. As a student, mom, and wife I am constantly doing two or more things at once. For example, I cook dinner every night while watching my 10 month old to make sure she will not get hurt crawling around the house. I feed my daughter while eating and talking with my husband during dinner. I use note cards to study while doing the laundry, playing with my little girl, walking the dog, feeding my daughter a bottle, and watching TV. I listen to music while I study. I chat with friends on the phone while checking emails, looking up information, and doing errands outside the home. If it were not for my multitasking abilities I would not be able to get an ounce of work done in any given day._

Inez’s story described a similar pattern although Inez’s multitasking was pressured by the immediate need at work:

_WHEN I AM AT WORK I DO A LOT OF MULTITASKING. I am a receptionist, so I have to be answering phones, writing down notes and messages, trying to answer questions, and making sure everyone is helped and greeted when they walk in the door. There are many times when I am helping out a client, and the phone rings. I have to try to help the client with their questions and still manage to answer the phone and try to also help the person on the phone. So I have to switch my focus around throughout the entire time I am at work. One person could need one thing and I have to concentrate on that need, then all of a sudden I have to put my focus on an entirely different task. It can get very stressful dealing with different people’s needs and different tasks that are needed to be done. There are many distractions that make it hard to concentrate on any single task, therefore multitasking takes place._

Several undergraduate participants told their experiences of working at restaurants or offices where they had to keep several tasks (e.g., customers’ orders) in their head while physically doing other things including talking on the phone, working the counter, and refilling coffee cups. The participants tended to make little to no differentiation when it came to holding multiple tasks in queue in their minds and actively processing them. Holding multitasking tasks in mind was perceived as multitasking even when one was not actively carrying out the tasks. This is probably because one experiences an equal amount of mental stress holding tasks in mind as when one conducts a number of tasks physically at the same time.
What is unknown, however, is to what extent we are capable of juggling several tasks at the same time, switching them in a short period of time, or holding them in mind for a long period of time. Or is it simply reality that any type of expertise requires multitasking ability?

Gloria, a 10-year-old girl told her multitasking story about playing basketball. She said that she was using her hands to dribble, while trying to protect the ball from getting stolen, looking for an open person under the basket, and weaving in and out trying to get closer to the basket. It is easy to take away from this story that one must be good at splitting and switching their attention constantly and rapidly between all the tasks in order to be a good basketball player. Common knowledge tells us that anyone can be a better player through practice, which can lead us to believe that one can be a better multitasker through repeated practices.

Frances, an 8-year-old girl said that she normally looks up her math homework before class and relates the problems for homework to the examples the teacher provides in class. This way she can ask questions about certain problems in the homework not mentioned in the lecture. The fact that Frances was able to think ahead allowed her to ask additional questions while listening to the teacher, which further made her a good multitasker and a good student in math. Gus, a 10-year-old boy indicated that he had to multitask when he was playing video games. He had to focus on different aspects of the game and had to press different buttons on the game controller at the same time. Through repeated practice, challenges, and play, Gus has become a good multitasking video game player.

One similarity between Gloria’s, Frances’ and Gus’ stories is that the multitasking skills involved in the tasks – basketball, homework, and video games – can be improved through preparation and repeated practice over time. Preparation and thinking ahead are skills possessed by chess masters and gifted pianists. Abby, a music teacher indicated that she would isolate the components of music and get these components to be “automatic” for her students. Then as the students learned the next component, they would not have to “think” of the automatic ones. Abby described this practice as doing several things at once, one consciously and one or more subconsciously.

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 imaging (fMRIs) used by researchers showed 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 while habit learning is not as sensitive to working memory. Cognitive load plays an important role in both hindering performance and enhancing experience (Ang, Zaphiris, & Mahmood, 2007). Some tasks such as learning new skills may require high cognitive loads while other tasks familiar and automatic such as cooking and driving may require low cognitive loads. In addition, task can be transferred from high cognitive loads to low cognitive loads by repetition (Ang, Zaphiris, & Mahmood, 2007). Just, Keller, and Cynkar (2008) found that novice drivers need all the brain participation they can get for driving, but the level of focus required changes with experience. Over time, the brain rewires itself. Driving becomes automatic. Scientists call this phenomenon “automaticity” (Just, Keller, & Cynkar, 2008). It lets us do one thing while focusing on something else. In other words, learning to do one task automatically helps us to multitask. The executive processes of our brains allow us to exert some sort of voluntary control over our behaviors, and help us achieve a goal by ignoring distractions (Weissman, Gopalakrishnan, Hazlett, & Woldorff, 2005). For instance, “if we’re performing a task where we want to watch TV and ignore voices that are coming from, say, our children nearby, our frontal region brain may configure the brain to prioritize visual information and dampen down auditory information,” said Weissman (NPR,
According to Bransford et al (1999), experts are able to flexibly retrieve important aspects of their knowledge with little attentional effort.

**Multitasking and Technology: Technology as Extension or Amputation**

Sixty out of the 73 stories mentioned some form of technology, whether the technology was TV, radio, cell phone, iPod, computer, or other kinds of machines. The following are some examples:

...I will get home; get the internet up as I’m thinking about the order of what to do. At the same time I’m getting paper to print my time sheet and bringing up iTunes. Then lo and behold someone will IM me so I’ll start talking to them while pressing print and switching over to check my e-mail. But I’m only able to juggle all of these things because none of them requires my constant attention.

... I work on homework for my online course; have a few instant messenger boxes open, constantly checking email, either listening to my iPod or listening to online radio, and working on a developer program to create 3-D models for a 3-D gaming environment.

I think my multitasking usually involves the computer. We don’t have cable at home, but we rent tons of movies from Netflix and the public library. When I am at home I am usually reading blogs or other websites or playing on Neopets on my laptop while watching a movie and chatting on instant messenger or talking to my fiancé if he’s home. I have no trouble carrying on a conversation orally with him while typing in a conversation on instant messenger.

As awful as it sounds, I was once driving, talking on the phone, and trying to play my favorite song on my iPod all at once. I got where I intended to go safely, but I couldn’t remember at all how I arrived, because I was involved in too many other things besides driving. It’s scary to think of what could have happened due to my lack of attention.

Clearly, access to and use of multimedia and technologies provided opportunities to multitask. Media multitasking is reported as particularly prevalent among teenagers (Roberts & Foehr, 2008). Because it’s mostly a visual environment, teenagers tend to keep a number of channels open and simply switch back and forth between what interests them.

The large numbers of demands that are made on our time each day seem to be expanding as well. Technology has been a boon, but also a bust in some regards. We can easily list the collective number of daily events that soak up our time in undesirable ways, things like junk mail, pop-up windows, telemarketer phone calls, commercials on TV and in movie theaters, to name a few. These assaults on our attention have at least two major negative impacts on us every day. First they steal our precious time through distraction and second, they have the larger affect of collectively desensitizing us to our environment.

Each media adds itself on to what we already are, creating both “amputations and extensions” to our senses and bodies, shaping them into a new technical form (McLuhan, 2002; Ong, 2002). McLuhan stated that “by continuously embracing technologies, we relate ourselves to them as servomechanism” (McLuhan, 2002, p. 235). It is this dependency and linkage to technology that makes it an integral part of our lives. As such, whether intentional or not, we become one large “bio-mechanical” system of sorts (McLuhan, 2002). This includes our teaching and learning systems.

**CONCLUSION, IMPLICATIONS, AND FUTURE RESEARCH**

The purpose of the paper was to provide an overview of the concepts of performing multitasking tasks by exploring people’s perceptions and experiences of multitasking, reasons behind
multitasking, and roles that new media and technologies play in multitasking. Although the conventional definition of multitasking – switching rapidly between tasks or conducting multiple tasks at the same time – seems to be straightforward, the findings of this study show that the phenomenon itself is far more complex. The complexity of the phenomenon means that researchers should not claim whether human beings are capable of multitasking without specifying what tasks, activities, and situations are involved in the multitasking process.

In this study, all the participants were asked to tell their stories. As a result, one limitation of the study could be that the participants were only able to speak for their conscious multitasking activities while not being able to speak about the unconscious multitasking activities (i.e., autonomous multitasking activities). However, the 73 stories told by the participants provided rich and diverse multitasking experiences. The perceptions and experiences of multitasking were closely related to how our attention, whether that is attention focus, dedication, distraction, switch, or split, to our personal preferences and priorities, to our innate and acquired abilities through experience, and to the extension of our physical bodies – the media and technologies. The connections of multitasking to attention, preference, priority, ability, technology, and environment indicated that it would be difficult to make claims about whether or not human beings are capable of multitasking without knowing what is involved in a particular multitasking activity. Many of us can handle some multitasking situations easily while having difficulty or risking our lives multitasking in other situations, as well stated by Salvucci & Taatgen (2008, p.101):

*In some situations, multitasking can seem nearly effortless (e.g., walking and talking); for other situations, it can seem extremely difficult if not impossible (e.g., reading and listening to two distinct sentences); for still others, multitasking performance may depend heavily on the individual and/or the environment (e.g., singing while playing an instrument or dialing a phone while driving).*

In their most recent book, Salvucci and Taatgen (2011) further presented the concept of “threaded cognition” as a unifying theory of multitasking. They indicated that the key to our multitasking ability is “the ability to take single-task skills and combine them as needed to accomplish a higher-level goal” (p. 7).

The participants’ stories in this study also revealed that our multitasking activities do not all remain in our brains. Our abilities to multitask are not only decided by our innate capacities, but also influenced by our experiences, environments, and technologies. The brain or cognitive ability is important; yet, our interaction with the environment may play an equally important, if not more important role in our ability to multitask. Therefore, this study provides food for thought and leads to the inquiries for further investigations such as the following: 1) When does multitasking help attention and when does it impede attention? 2) When do new media and technologies enable us and when do they impede us from multitasking? 3) To what extent are multitasking skills required in one developing an expertise or professional capacity? 4) How can we transfer our multitasking abilities in our daily lives, if any, to teaching and learning environments?

As the stories indicate, many students watch TV or use other media when they do their homework. In this case, homework is held as mundane and boring, and hence is hard to execute without other motivational stimulation taking place simultaneously. If this is the case for some students, then the long-held practice to get students to focus on a lecture may be an unproductive effort. The stories about playing basketball and video games indicate that we, especially the younger generations, are good at multitasking in extra-curricular activities, especially when technology is involved. The mastery and use of technology such as remote
control units, cell phones, iPods, game controller devices, digital recording and imaging devices are occurring at progressively earlier ages as children appropriate conventions much earlier than some adults, largely due to their sense of play and free time to investigate these functions. Individual differences in attentional control have a significant impact on student learning in a multimedia instructional environment (Doolittle & Mariano, 2008). Personalization can bring benefits such as increased learning, greater enjoyment, enhanced motivation, and reduced learning time (Kelly, 2008). As educators, we bear the responsibility to look into the motivation and skills and help appropriate and transfer that motivation and those skills to learning environments.

With the knowledge explosion, multitasking has become an expected skill. In today’s world, we are all pressured to complete as many tasks as possible rather than give our full attention to perfecting one thing in a limited time frame. Multitasking will continue to be a concern and significance for human beings. This study points out the delicate interplay between dual task performance measured objectively and individual perceptions of their performance and choices over multitasking. It is hoped that this study and future investigations on the topic will help us better understand the technological promises for multitasking and learning.

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