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EDITED BY

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Catholic University San Antonio of
Murcia, Spain
Ana María Aguilar,
University of Burgos, Spain

*CORRESPONDENCE

Seada A. Kassie
✉ s.kassie@mdx.ac.ae

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Educators as agents of breadth-biased learning: using social reconstructionism as rationale for embracing media multitasking and enhancing teaching practices in higher education

Seada A. Kassie*

Department of Psychology, School of Science and Technology, Middlesex University Dubai, Dubai,
United Arab Emirates

This perspective article contends that media multitasking has significant implications on cognitive control processes, particularly in how information is processed and utilized. Contrary to viewing media multitasking as inherently negative, the article argues that it contributes to the evolving nature of cognitive processing, without necessarily improving or degrading it. The discussion draws on theoretical frameworks from contemporary cognitive neuroscience to contextualize these arguments. The article provides a nuanced perspective on media multitasking, acknowledging its enduring presence and exploring its influence on cognitive processes, while also proposing strategies for educators to navigate its implications in educational settings.

KEYWORDS

media multitasking, cognitive flexibility, breadth-biased learning, mindfulness practices, higher education, learning and teaching, pedagogical approaches

Introduction

The philosophy of social reconstructionism challenges the status quo of education and invites educators to take agency of societal change. This prestigious agency is granted to educators based on the notion that every educated member of society is a product of schools, and as such, should be equipped with the right skills and resources to bring about lasting solutions to social problems. In this perspective piece, I use the philosophy of social reconstructionism to critically evaluate the popular notion that, as media multitasking becomes part of everyday life, infiltrating both living, learning, and working spaces, it is bringing with it negative consequences such as superficial mode of acquiring information and knowledge, as well as reducing accuracy and performance of cognitive tasks (Schuur et al., 2015). The article aims to provide a rationale for embracing the here-to-stay nature of media multitasking and endorsing the argument that it in fact influences the evolving nature of cognitive control processes, in that it alters the way information is received and utilized, without necessarily making it better or worse. Theoretical frameworks from recent and current practices in cognitive neuroscience and computational modeling are discussed to provide contextual basis for the key arguments in the article. Primary focus is given to a critical discussion on cognitive processes involved in media multitasking, their direct implications on learning and education, and practical solutions for educators to enhance teaching practices in the new media age.

Social reconstructionism

Social reconstructionism is a philosophy of education founded by [Brameld \(1977\)](#) who advocated for empowering teachers with the tools and resources they need to bring about enduring solutions to fundamental problems at the school level in particular and the societal level in general ([Liston and Zeichner, 1991](#)). The theory aims to understand the historical foundations of social issues and encourages educators to take the lead in reforming the ways in which schools provide education and produce effective generations of leaders. In so doing, social reconstructionism empowers educators to oppose perpetuating the status quo and instead become agents of social change ([Parks, 2006](#); [Ong'ondo, 2017](#)). At the core of social reconstructionism is the belief that the classroom is where educators and students identify social priorities and continuously work toward finding implementable solutions for them. Identifying current day media multitasking as a societal priority and one that is particularly impacting students in higher education, this article encourages institutions to adapt to the way the brain processes information and find congruency between the way educators deliver their teaching and the manner students receive it.

Chronic media-multitasking

Chronic media multitasking is causing structural changes in the brain ([May and Elder, 2018](#)). Given the age we live in, there is a growing body of research on media multitasking and its effect on the way the brain processes information ([Coulacoglou and Saklofske, 2017](#); [Firth et al., 2019](#); [Korte, 2020](#)). As a relatively new area of research, media multitasking is motivating researchers to explore the possible novel ways that the cognitive system is encoding, processing, and utilizing information. Studies have found varying levels of media use across different age groups, where young adults are found to be the heaviest media multitaskers ([Carrier et al., 2009](#); [Courage et al., 2015](#); [Uncapher et al., 2017](#)). They are also the focus of studies due to developmental research showing the brain's malleability and susceptibility to environmental stimuli during this key developmental stage ([Arnett, 2000](#)). It is argued that by virtue of neuroplasticity, emerging adults are at an advantage for increased environmental adaptability; and accordingly, extensive and chronic media use as experienced by this age group may have an association with developmental neuroplasticity, the brain's capacity to rewire and form new neural pathways ([Firth et al., 2019](#); [Korte, 2020](#)).

Breadth-biased information processing

There is growing interest in how chronic media multitasking might be altering the way the brain processes information, from a linear and in-depth cognitive processing to a more breadth-biased one ([Foerde et al., 2006](#); [Poldrack and Foerde, 2007](#); [Lin, 2009](#); [Ophir et al., 2009](#); [Uncapher et al., 2017](#)). Contrary to the former, breadth-biased processing is characterized by engaging the brain in multiple activities and paying attention to several sources of information simultaneously ([Lin and Parsons, 2018](#)). Studies

have found that heavy media multitaskers process information in a breadth-biased manner ([Karpinski et al., 2013](#); [Poplawski et al., 2021](#)), which is quite distinct from the linear and in-depth style. This shift is attributed to chronic media consumption, which is increasingly becoming part of current day learning practices. Breadth-biased cognitive control involves information processing that is characterized by superficial and scattered attention toward several sources of information simultaneously, without focusing deeply on one single task. [Ophir et al. \(2009\)](#) argued that heavy media multitaskers are inclined to pay attention to a wider scope of information instead of focusing on a particular single piece. This may not necessarily mean inefficient use of cognitive resources, but rather a shift in cognitive control processes as chronic media consumption becomes part of everyday life.

Furthermore, in neuro-ergonomics, functional MRI studies have shown changes that occur in active parts of the brain during multitasking. Studies by [Poldrack and Foerde \(2007\)](#) and [Foerde et al. \(2013\)](#) found that the medial temporal lobe region of the brain, associated with declarative memory, is activated when selective and focused single task learning takes place; whereas the striatum, which is associated with procedural memory is activated when breadth-biased dual task learning takes place. In addition, the same studies showed increased activity around the dorsolateral pre-frontal cortex region when dual tasks were performed, which is a functional structure of the brain associated with media multitasking involving working memory capacity, cognitive flexibility, and abstract reasoning. The authors explain how in the presence of a distraction - in this particular case a secondary task - the results indicate that accuracy of performance is not affected; however, a shift occurs in the way the brain acquires learning, corresponding with the argument that multitasking might be altering the way the brain processes information.

Of the types of cognitive processes implicated in learning and the education environment, attention, working memory, cognitive control, and executive functioning are the notable ones ([Clark and Harrelson, 2002](#)). Studies have shown that these same processes are influenced by media multitasking, and alterations in brain regions such as the prefrontal cortex, the anterior cingulate cortex, and the dorsolateral prefrontal cortex have been observed using neuroimaging techniques ([Loh and Kanai, 2014](#); [Verghese et al., 2016](#); [Cao et al., 2022](#); [Luo et al., 2022](#)). While these studies indicate that heavy media multitaskers engaged in specific learning-related cognitive activities showed significantly worse executive function than their counterparts, they had greater prefrontal activation and did not perform significantly worse on cognitive tasks ([Luo et al., 2022](#)). Moreover, experimental studies focused on training in multitasking activities indicate significant training-induced performance improvements in the left prefrontal cortex and the dorsolateral prefrontal cortex, particularly in sensitivity to multitasking demands and heightened neural activity when performing single tasks regardless of variations in input/output modalities ([Verghese et al., 2016](#)). These findings have direct educational implications on higher learning where educators could embrace novel ways of teaching practices that extend beyond the traditional mode of teaching delivery.

Mindfulness

Mindfulness experts argue that chronic media use is a defining characteristic of the modern digital world, hence inescapable, and scientific studies should instead focus on possible ways of enabling the cognitive system to cope with media use in an efficient and conducive manner through the practice of mindfulness (Brown and Ryan, 2003; Case and King, 2003; Carrier et al., 2009; Chiesa et al., 2011; Ie et al., 2013). Whilst trait mindfulness is a dispositional state of being, studies show that it can be enhanced and strengthened through various instructional intervention techniques. This, they argue, could foster cognitive flexibility and creative thinking, which are critical to learning in higher education (Langer and Moldoveanu, 2000; Sternberg, 2000; Hart et al., 2013; Rogaten and Moneta, 2016; Kercook et al., 2017). Moreover, the use of technology to deliver and access education has become increasingly mainstream and students are increasingly engaged in media multitasking to navigate through their education. Studies show that young adults who are also heavy media multitaskers could benefit from short-term mindfulness interventions whereby their attentional abilities are increased (Gorman and Green, 2016). Experimental research findings (Ie et al., 2013; Seddon et al., 2021) measuring cognitive performance on media multitasking activities found heavy media multitaskers who also had mindfulness as a dispositional trait performed significantly better. Arguably, this could be due to frequent media multitasking, resulting in significant improvement in cognitive flexibility.

Cognitive flexibility

Cognitive flexibility is defined as the brain's ability to remain flexible in the face of a constantly changing environment (Cools, 2015; Feng et al., 2020). Advocates of mindfulness suggest that through frequent engagement in mindfulness practices, it is possible to alter the structures of the brain responsible for executive functioning and consequently develop more efficiency in cognitive capacity while engaging in multitasking activities (Moore and Malinowski, 2009; Ie et al., 2013; Seddon et al., 2021). Researchers are increasingly recommending ways of fostering mindfulness practices to increase cognitive flexibility and enhance multitasking abilities, both of which could benefit students' learning and academic performance (Coulacoglou and Saklofske, 2017).

In recent years, studies have focused on investigating the relationship between trait mindfulness and its effects on attention, working memory, and other cognitive functions (Corti and Gelati, 2020; Nassif et al., 2023). Functional Magnetic Resonance Imaging (fMRI) studies on emerging adults show dramatic maturity of the dorsolateral prefrontal cortex region of the brain, associated with cognitive control (Jaeger et al., 2012; Tymofiyeva and Gaschler, 2020). There is also greater functional connectivity of this region with the right hippocampus, posterior and anterior cingulate, and two areas of the prefrontal cortex, suggesting maturity in working memory capacity and cognitive control of emerging adults. What such findings reveal is not only the structural changes this particular age group undergoes developmentally, but also possibly the functional ways in which thinking, learning, and general

acquisition of information are being altered in the face of external environmental stimuli, such as chronic media usage.

General discussion and recommendations for educators

In the context of higher education, the discussion around media multitasking is essential due to its pervasive influence on students' learning approaches and the need for enhanced and evidence-based pedagogical practices. Firstly, educators could benefit from learning about the cognitive and neural mechanisms underlying media multitasking and its effects on the brain. Understanding the concepts discussed in this article, including breadth-biased processing, mindfulness, and cognitive flexibility is crucial for devising effective pedagogical strategies that take into account the effects of media multitasking on learning and cognition. Secondly, aligning pedagogical practices to the neural expectations brought on by media multitasking can play a vital role in enhancing cognitive flexibility and other desirable cognitive processes that aid learning. Educators can implement practical pedagogical strategies that promote engagement and enhance cognitive flexibility, including the following.

1. Provide mindfulness resources: Offer resources such as guided meditation recordings and mindfulness applications that students can access independently. Longitudinal studies have shown the positive and transformative impact of accessing mindfulness resources in higher education (Oberski et al., 2015; Barker et al., 2021; Ergas and Hadar, 2023).
2. Metacognitive strategies: Teach metacognitive strategies such as self-reflection, goal-setting, and strategic planning to help students develop awareness of their own thinking processes and learning strategies. Doing so has been found to enhance the ability to organize and integrate a large body of information, such as what is found when media multitasking, which in turn fosters creativity and cognitive flexibility (Meltzer, 2013).
3. Foster reflective practices and self-regulated learning: Encourage students to reflect on their learning experiences and identify instances in their learning journey where mindfulness practices could be beneficial. Teaching self-regulation strategies such as setting intentions and monitoring attentional focus has been found to augment cognitive flexibility and cognitive control among students (Marcovitch et al., 2008; Orakçi, 2021; Daggöl, 2023).
4. Promote problem-based learning: Implement problem-based learning (PBL) approaches where students work collaboratively to solve complex, real-world problems. PBL encourages students to explore multiple perspectives, consider alternative solutions, and adapt their thinking based on new information, fostering lateral and critical thinking skills (Tursynkulova et al., 2023).
5. Encourage Socratic questioning: Use Socratic questioning techniques to encourage students to critically analyze and evaluate ideas, arguments, and assumptions. By posing thought-provoking questions that challenge students' assumptions and encourage deeper exploration of topics,

educators can promote meaningful learning and intellectual growth (Tursynkulova et al., 2023).

6. Provide experiential learning opportunities: This would help engage students in authentic, real-world experiences. Experiential learning encourages students to apply theoretical knowledge in practical contexts, adapt to novel situations, and learn from failure and iteration, which are at the heart of cognitive flexibility (Durak, 2023).
7. Assign problem-based media tasks: Present students with problem-based tasks that require them to navigate and evaluate information from multiple media sources to solve real-world challenges. For instance, students could analyze conflicting news reports on a current event, assess the credibility of online sources, and synthesize their findings to form evidence-based conclusions. This cultivates cognitive flexibility by challenging students to critically evaluate and integrate information from diverse media sources, mirroring the cognitive demands of media multitasking (DeHaan, 2009; Fjaellingsdal et al., 2021; Green and Rathgeb-Schnierer, 2023).

Conclusion

In conclusion, media multitasking may have an effect on the evolving nature of cognitive control processes. Congruent with the theory of cognitive flexibility within the mindfulness literature, such concepts lend credence to the notion that media multitasking may be promoting a breadth-biased style of information processing. The philosophy of social reconstructionism grants educators the agency for social change, and institutions in higher education carry the responsibility to ensure that teaching methodologies are aligned with the most efficient ways that students can receive and process information. Experimental research findings (Corti and Gelati, 2020; Nassif et al., 2023) show that mindfulness practices and other teachable strategies can be developed without necessarily having prior experiences. The overarching argument here is that fostering mindfulness, and by extension, cognitive flexibility, will enhance breadth-biased learning, which will have a knock-on effect on students overall

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learning experiences and academic achievements in today's media-saturated world.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

SK: Conceptualization, Methodology, Project administration, Resources, Visualization, Writing – original draft, Writing – review & editing.

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The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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