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Let's Get Engaged: The Nexus between Digital Technologies, Engagement and Learning

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Abstract: The nexus between digital technologies, engagement and learning is often cited as being correlational, but is widely misunderstood. Research is clear that engagement can lead to better academic outcomes and improved learning, but less clear about the role of digital technologies in engaging students and the impact of digital technologies on student learning. Recent research suggests that in light of the increase in digital technologies in education that we must recognize the inherent challenges in increased use of digital technologies. In this article a small-scale case study was conducted to ascertain the level of student engagement and distraction during lectures. The study was repeated for two different cohorts of teacher education students to establish consistency of results. The authors sought to determine the level of academic engagement by having students record the number of digital distractions they encountered throughout the lecture. The students self-reported their distractions during a ~100 min lecture. The researchers found consistency between the two cohorts when looking at the number of self-reported distractions per student. The findings suggest that technology was a major distraction and further could be seen, due to the number of distractions, to be causing disengagement. In this article the authors use this case study to start a conversation about the possible perils of digital technologies with regard to engagement and learning and what this means in a future that may be dictated by technology-enhanced learning.

Keywords: media and technology; engagement; multi-tasking

1. Introduction

In recent years the advent of new technologies has reshaped the educational landscape from kindergarten through to university courses and has been linked to increased engagement [1,2], increased learning outcomes [2], and improving education through improved access [3]. Multimedia, information and communication technologies (ICTs) and other forms of digital technologies have all made significant changes in the education landscape over the past couple of decades. Media and technology, which will be used to convey all types of digital media and technology platforms, including social media platforms, have become pervasive features of our daily lives. The use of media and technology has been heralded in educational domains [4,5] and many would agree that the use of such technologies offer many benefits to users [6].

A paradoxical insight comes with the use of digital media and technology platforms in increasing student engagement and how the term is used in educational contexts. Often engagement in the online space is used as a term to simply mean present. This is obvious in research articles where the titles indicate engagement, but in the context of the research the term is used as denoting such varied activities such as participation and or simply logging into a Learning Management System (LMS) [3,7,8], but is rarely defined to signify what engagement means in the context of the study.

This could be because engagement, although a complex and multilayered construct that can have varied meanings depending on context, is also a common term in educational contexts to describe the behavioral, emotional and cognitive components of a student's interaction with learning [9]. Engagement is often used more generally to refer to a mechanism that has the capacity to enhance learning; therefore, it is important that it is defined for a purpose and that purpose is understood by all stakeholders within a given study, i.e., research, participant and reader.

Here within we have multiple forces: multimedia, engagement and capacity for learning. The current paper examines the intertwining nature of multimedia and engagement and how they influence learning. A small-scale simple experiment was orchestrated by an academic in an initial teacher education course in a university in Australia, not to find out the impact of technology and/or engagement on learning, but rather to elucidate to her students and have them reflect on the nature of their multimedia and technology use on their level of engagement and learning during a lecture.

1.1. Engagement

The relationship between students' engagement and their academic performance is regularly reported as not only statistically significant, but has been frequently confirmed as such in empirical research findings [9]. Student engagement, or engagement more generally, was broadly understood in terms of behaviorism and participation in educational settings [10]. However, more recent understanding highlights that it is multidimensional and encompasses areas of behavioral, academic, psychological and cognitive factors [11,12].

In this article we refer to engagement in-line with motivational perspectives as put forth by Skinner, Kinderman and Furrer, who suggest that, "engagement refers to the quality of a student's connection or involvement with the endeavor of schooling and hence with the people, activities, goals, values and place that compose it" [12] (p. 494). While we take the original definition at face value, we would like to replace "schooling", which has connotations to a compulsory activity undertaken in most western countries between the ages of ~5 and ~17, to learning in the context of a tertiary educational environment.

Students learn best when they are engaged in the learning process [13]; therefore, engagement is an important factor in any situation where learning is the intended outcome. This would include schooling at all levels and throughout life. High level engagement is a process in which students make multiple and varied responses, through creative and sustained reflections [14] presumably equating to more fruitful learning. According to Barkley [15], engaged students become more involved in academic tasks and make use of higher-order thinking skills such as problem-solving or information analysis. Therefore, active learning strategies that encourage student engagement are important to enhance higher-order thinking skills of students [16].

In recent times, the increased use of media and technology has been heralded as being able to increase student engagement [8], and student engagement boosts academic performance [9]. At the same time that the proliferation of ICTs was becoming prevalent in higher education institutions and reshaping the educational discourse [17], disappointing levels of engagement have been reported in university courses [18]. Although not unique to the Australian context, the Australian government [19] has recognized the challenge of engagement in higher education.

Although student satisfaction levels remain high, Australia has fallen behind its major competitor countries on key teaching and student experience indicators and drop-out rates remain high at 28 per cent in 2005. Similarly, the dramatic rise in student-to-staff ratios—from about 15:1 in 1996 to over 20:1 in 2006—is probably a significant contributor to the relatively low levels of student engagement.

Students are said to be engaged when they participate in challenging learning activities, specifically those focused on critical thinking and collaboration [20]. Learning then can be seen as an intended outcome of engagement and a precursor to improved academic achievement [21,22]; therefore, finding out what engages students is a critical factor to improve the learning experience.

1.2. Digital Technologies and Multimedia

The rapid development of ICTs has provided vast opportunities for students, at all levels, to explore the social and educational benefits that are afforded by media and technology [23,24]. The perceived benefits of the use of ICTs, specifically in education, are widely reported [2,3]. The purported benefits of media and technology enhanced education are too numerous to count. In an examination of the four regular issues published in the Australasian Journal of Educational Technology in 2018, fewer than 5% of the articles published mention significant challenges or deficits in technology enhanced learning, meaning that 95% are expounding significant benefits. Examples of this can be found in the journals most recent edition, volume 35, number 1. A conclusion such as: "Blended modes of teaching can advance learning by providing more avenues for students to engage with and re-engage with learning materials. Overall, blended learning appears to enhance student engagement; it is more effective when online activities are integrated with in-person classes and assessment" [25].

Another study regarding computer-supported collaborative learning (CSCL) and social network awareness (SNA) concluded that: "the SNA CSCL is a widely used and pervasive e-learning technology that enhances online collaborative learning effectiveness" [26]. The last example proffered here, although there are at least seven others in the journal is another one on social networking sites (SNS), which found that, "by effectively assimilating a SNS into the subject, it had increased capacity to respond to diverse learning styles" [27].

It is not the purpose of this paper to dispute any of the results from these studies, but rather to establish a pattern, wherein much of what we hear in education is that technology-enhanced learning is beneficial to learners, in some way, shape or form, almost unequivocally. The New South Wales Department of Education (NSWDE) reports that "students require a high level of digital literacy in order to thrive and work in the world" and that the "integration of technology . . . can provide opportunities for students to think independently and develop skills that will enable them to flourish in a world driven by technology" [28]. The ubiquitous integration of media and technology into all aspects of education are pervasive and not without their detractors. The Department's own commission reports caution the overuse of technology-enhanced education. Their reports on Digital Writing and Virtual Reality both make similar caveats with regard to technology-enhanced education. With regard to digital writing, which is well established, Howard [29] reports: "New practices, such as blogging, microblogging and ePortfolios have started to change how writing is understood. However, this is a shifting landscape and new digital technologies are coming out quickly. As we have stressed, the most important part of educational innovation is to keep pedagogy in the foreground of change." Similarly, in regards to virtual reality, an emerging technology, Southgate [30] warns: "The age of immersive learning has arrived. However, research on the effects of IVR on children and their learning is still nascent. Large scale longitudinal studies on the effects of immersion are required and rigorous studies on the pedagogical potential of IVR are essential if the affordances of the technology are to be leveraged for creativity, collaboration and deep learning".

The NSWDE adds that, "through the effective integration of information and communication technologies (ICT) across the curriculum, students learn to collaborate, globally connect, construct, apply knowledge and seek timely feedback to reflect on learning" [30]. This is quite a contention to make and, similar to other contentions made in various papers cited above, does so with the insinuation that these outcomes cannot be achieved without technology-enhanced learning. It also avoids the mention of the significant challenges involved in the application and pedagogies around the integration of media and technology in the curriculum.

In the UK higher education sector, there seems to be a disconnect between the rhetoric of the benefits of media and technology and the investment and implementation of those technologies [31]. In their study, Walker, Jenkins and Voce contend that the investment in technology enhanced learning has focused on the delivering efficiencies, sometimes at the cost of improving the teaching and learning environment because the ways in which the tools are being used and employed have not changed in-line with those investments [31].

2. Materials and Methods

This paper reports on a small-scale experiment in two lectures in undergraduate teacher education courses where students would report every distraction/disruption caused by any of their own devices throughout the lecture. The sample size for the first experiment (n = 140), equates to about half of the cohort and is a representative sample. The size of the second cohort (n = 47), equates to roughly 67% of the cohort and is also a representative sample. A limitation of the case study is the small cohort and the non-scientific methods used. We have no way of knowing whether the students were over or under reporting as the study relies on self-reporting. In addition, the case study is bounded by the limits of teacher education students at one university in one of their lectures and therefore the nuances of that particular lecture on those particular days may have played a role. All that said, the experiment was conducted twice with different teacher education students and similar results were found. While we cannot say that the results are generalizable, nor was that the intent of the study, it is relevant, in the current context, for consideration by all teaching academics in higher education institutions, to consider the nexus between media and technology, engagement and learning.

The first of these experiments was ad hoc and not planned. The lecturer simply wanted to see how many times students were being distracted throughout the lecture by their own devices to use as teaching and learning moment for students to reflect on their own levels of engagement in their learning. The second of these experiments was completed by a colleague who wanted to test the experiment with a different cohort of students to see if similar results were found. The first experiment took place in a primary teacher education course (n = 140) and the second in a smaller lecture environment in a secondary teacher education course (n = 47). The purpose of replicating the experiment with a smaller cohort was to test to see if the effect of large numbers was at play. Similar to the law of large numbers in the sense of probability theory, the test was to ascertain whether a larger cohort of students felt anonymous enough, due to the large numbers, not only to report more accurately, but also that they were less known and less seen, and therefore might have a higher probability of using their devices for something other than learning throughout the lecture. It should be noted that while students are encouraged to attend lectures, attendance is not taken. Usual attendance at lectures fluctuates throughout the semester, but on average approximately 70% of students attend regularly. In the lectures in question, there was closer to 80–85% attendance based on estimates of seats occupied; actual attendance was not taken.

3. Results

While the results reported here cannot be generalized, nor is that the intent, what they can illustrate is the dichotomy and ubiquitousness of media and technology use in education. One can use any number of research articles to illustrate the immense benefits of the use of media and technology to enhance learning [32]; however, there is significant evidence, both in the literature and reported here, that illustrates that media and technology can actually have the reverse effect: it disengages students from their learning and negatively impacts cognition. The purpose of this article is to re-examine the relational aspects of learning and teaching in a face-to-face environment and discuss the use and misuse of media and technology as being ubiquitous in formal learning environments.

The results are interesting in that they are fairly consistent across the two lectures. It should be noted that students were asked, once the experiment was disclosed, to not change the settings on their devices. Some students said they forgot to set their device to a silent or do not disturb function, but usually would during a lecture, which may indicate that there are more reports of interactions than there would normally be. However, as can be seen in Table 1 there are 258 interactions noted in approximately 100 min, by approximately 120 students. The experiment did not keep track of how many of these were multiple nor how many students did employ a silent or do not disturb function on their devices. In Table 2 there were 115 interactions noted in approximately 100 min, by approximately 40 students.

Table 1. Digital distractions primary education students.

Site/App	Number of Distractions
Facebook	17
Instagram	16
SMS/Text	68
Calls	7
Emails	27
Messenger	68
Others (i.e., SnapChat)	55

Note: Table 1 represents the results from the first lecture (n = ~140) with primary teacher education students the following was reported by students in relation to the number of interruptions/distractions reported in a two-hour period, with two ten-minute breaks, for a total of ~100 min.

Table 2. Digital distractions secondary education students.

Site/App	Number of Distractions
Facebook	6
Instagram	10
SMS/Text	43
Calls	2
Emails	11
Messenger	25
Others (i.e., SnapChat)	18

Note: In the replicated experiment with the secondary teacher education students (n = 47), the following was reported by students in relation to the number of interruptions/distractions reported in a two-hour period, with two ten-minute breaks, for a total of 100 min.

In both settings, the percentage of interactions, or what may be deemed distractions, is quite low according to how often people in this age range usually use their devices. For the purpose of this study we assume that a distraction is 30 s in duration. This was determined by taking the average time it takes a person to hear a notification on their device, pick up the device, unlock the device, read a message of 140 characters or less, type a quick response, put the device back down and start to listen again. Given that a distraction of this nature takes 30 s from start to finish, on average, there are 200 possible distractions per person in the 100-min lecture. Multiplied by the number of people (n = 120), the maximum number of distractions possible is 24,000 in the first experiment and 8000 in the second. The total number of possible distractions is therefore 32,000 of which only 337 distractions were noted. One way to present these results then is to say that just over 1% of the total time of the lecture was spent on digital distractions. However, another way to present the results is to note that of the 200 min of the two lectures there were 337 distractions. If each of those distractions affected not only the person who was distracted, but also the person to her/his right and left, we could say that three people were being distracted in each instance of the 337 distractions. While it is likely that one student experienced more than one distraction and others had none, it still means that 3 people were affected for a total of 168 min.

Although not part of the original experiment conducted in 2019, a survey was issued as part of the distance learning that was taking place in 2020 as a result of the COVID19 health crisis in regard to the experience of online learning during the period. These results cannot be presented in full here, as they are part of a bigger study due to be released next year; however, a preliminary analysis of the survey found that over 77% of students surveyed (n = 300) reported that they had additional tabs open and were simultaneously doing other things during live online sessions. In addition, if lectures were recorded and students were asked to watch them in their own time, only 12% reported watching and/or listening to the entire lecture. A caveat to this finding is if the lecture was under 20 min, 65% reported watching and/or listening to the entire lecture. What was not asked unfortunately, was whether the students were multi-tasking while listening and/or watching the recorded lectures. Given the number

of students who reported multitasking during face to face lectures, it would not be unreasonable to think that at least a similar percentage of students would be multitasking while watching/listening to a prerecorded lecture.

4. Discussion

It should be noted that in such a limited case study the discussion is a starting point for dialogue with regard to the use and/or overuse of media and technology in learning. The questions raised by this data will form the basis for the discussion of each of the points below, which have been highlighted by the data, but are discussed with regard to previous, and frankly more robust, research into the specific areas. What this discussion intends to accomplish is to challenge, what was before the pandemic, the status quo in the use of media and technology in the learning and teaching environment. This is further contextualized by what may, and in some cases already has, become an expanded technological outlook, specifically within the sphere of online learning, now known as the "new normal" [33].

4.1. Multitasking

There are considerable issues at play when media and technology driven education is the norm and heralded as necessary to build 21st century skills in 21st century learning environments, but when that same technology becomes a major distraction to learning. This is amplified when the use of technology becomes compulsory, for any reason. The results in this study point to an issue about the connection between technology and learning and whether or not the best way no learn is through media and technology. This is to say that the "new normal" of education regarding more media and technology driven learning is being heralded globally [33]. When students are asked, or the current situation obliged, to use media and technology in their learning, whether it be through engaging with LMS, Social Networking Sites (SNS), or even in the face to face environment using their laptops/tablets/phone to take notes or look something up, the temptation to do something else, unrelated to that task, increases exponentially.

In a study in the United States the authors found that university students spend an average of 9 h on their phones per day: with males spending eight hours and women spending ten [34]. The findings amongst American teenagers is the same, engaging with multimedia and technology for just under nine hours per day [6]. The issue here is not the usage per se, but rather what the usage means in the context of a complex learning environment where content and skills are being taught and students' capacity to learn that content whilst engaged in other activities. Those other activities can change; however, the advent of media and technology-based education mean that often students are being asked to use the very same devices for learning that are also a major factor in their distraction. In the current study, the researchers observed that many of the distractions were not from the device being used for learning, but from another device close by, mainly mobile phones. However, even when mobile phones were put away, often times the laptop or tablet, with multiple tabs open can cause the same distractions.

Research has found that students who are asked to use laptops in class spent considerably more time multi-tasking and that the use of that laptop was a considerable distraction to the user and other students [35]. Research has also suggested that even taking notes on a laptop can impede learning, because the use of a laptop requires more shallow cognitive processing than traditional note-taking [36]. These studies focus on the capacity of technology to encourage multitasking, which has been found to have a significant impact on impeding learning. Uncapher and Wagner report that, "the balance of evidence suggests that heavier media multitaskers exhibit poorer performance in a number of cognitive domains" [6].

What can be seen in these data is that students are multi-tasking and, while this study is not concerned with the impact of this multi-tasking, it has been illustrated elsewhere that it can, and often does, have a negative impact on performance cognition, attention, relational reasoning, and can lead to underperformance [6].

4.2. Engagement

What is seen in the results illustrates that students are not fully engaging in their learning, and that does not particularly have to do with whether that learning is face to face or if it is online. While the original aim of this article was to look at the face to face environment and the impact of media and technology on that environment, with a near-universal move to online learning, at least in the short term for many universities, the points made are even more poignant. The contention being that if one is learning online the use of media and technology is no longer a choice. According to Kong, engagement can be defined as, "students' psychological investment in and effort directed toward learning, understanding, or mastering the knowledge, skills, or crafts that academic work is intended to promote" [37]. The definition implies that engagement is beneficial for student learning, which has also been shown in empirical studies [9]. To break down what this means, it is helpful to use the three dimensions of engagement: cognitive, affective and behavioural [38]. Here the article focuses on the cognitive domain, which refers to the extent to which students are applying intellectual effort in their own learning [38].

The cognitive domain of engagement can be further broken down into content engagement [39]; critical engagement [40], on-task engagement [41], self-regulated learning [42]; self-engagement [43]; and substantive engagement [44]. The issues found when students are being interrupted in their learning or their desire to multitask while attending/watching/listening to a lecture is that their cognitive engagement is limited in all of these realms. Students who are purposely or inadvertently distracted in class do not only miss vital content but they also, "create a sense of permission that opting out is OK, and, worse, a haze of second-hand distraction for their peers" [3], which, according to the data presented, is occurring at alarming rates. Shirkey, a teaching academic at NYU, makes the case, which has also been made elsewhere, that the distractions students are "choosing", are not really a choice at all, but rather a determinant of the media and technology [45]. He makes a comparison where he is competing for students' attention against an army with infinite resources, referring specifically to sites, such as Facebook, Google, Instagram and others, who are also vying for their attention [45]. To combat this army, he simply asked his students to put their laptops away. It seems simple enough, except in the current environment, where a pandemic has forced students to learn online. However, are "no laptop" polices the way to teach students to be more engaged? Finnish education expert Pasi Sahlberg does not think so. He contends that these sorts of policies, whether it be banning laptops in university lectures or banning mobile devices for young children in schools, have an equally negative effect on student engagement, because students, regardless of their age, need to learn to self-regulate [46].

In a talk given in late 2020, Sahlberg [47] reported that in Australia, 78% of teachers and principals are finding that media and technology have decreased students' ability to focus on educational tasks. In a tertiary study, in research conducted by the author, one of the findings was that a lack of student engagement could be linked to the depersonalization of learning, which was shown to be an indicator of student success [48]. Another insight from the same research found that de-personalizing learning, and the consequent lack of engagement, illustrates a lack of dedication to student learning on the part of the educator and consequently the university [48].

In the world during and post pandemic we have to deal with the "new normal", a new term that emerged in business realms during the great recession to caution against a return to pre-concession norms in the economy [49]. The phrase has now become part of our regular vernacular regarding the pandemic to describe just about all aspects of society and how it will be different post-pandemic, assuming of course that there is a post-pandemic. In the education realm, it has come to mean a time where media and technology play a bigger role than it might have otherwise. In 2020, during the pandemic, authors such as Sintema [50], have looked at the future of digitalized virtual classrooms in Zambia, while Basilaia and Kvavadze [51] have reported on online education in Georgia; Naciri and colleagues [52] focused on mobile learning in higher education; and Mulenga and Marban [53], on digital learning in mathematics. All of this is to say that there is much to regarding the way that

all aspects of society may change as a result of the pandemic, and education is a big part of that conversation. What we know will not change is that engagement is essential for learning in many different realms, from academic achievement [9] and problem solving, information analysis and higher order thinking skills [15]. Therefore, it is imperative that engagement is a priority in teaching and learning, and where media and technology can enhance that, it should be used, and where it detracts from it, it should be avoided.

4.3. Technology and Learning

Earlier in this article it was reported that fewer than 5% of the articles published in 2018 in the Australasian Journal of Educational Technology mention significant challenges or deficits in technology enhanced learning, with 95% expounding the benefits of technology enhanced learning. While this paper does not intend to contradict the findings in those papers, the Gonski Institute [46] at the University of NSW, Australia has found that 84% of teachers and principals surveyed believe that digital technologies are a growing distraction in the learning environment. Additionally, they found that educators have reported an increase in online bullying and harassment (81%); a decline in readiness to learn (59%); a decrease in students' ability to focus on educational tasks (78%); and that screen time has decreased children's' physical activity (92%).

What makes this data poignant, is not only that the results have important implications for education and schooling in Australia, but that the findings are consistent in Alberta, Canada, where the Growing up Digital study was also conducted [46]. The one difference that was noted was that 67% of teachers in Alberta thought that digital technologies were a distraction, while in Australia it was 84% [46]. However, this could simply be due to the three-year gap between the two studies, Alberta in 2016 and Australia in 2019, whereas, as the authors note, this could be due to the growing worry that digital technologies are becoming a greater concern.

Much of the data in the Gonski Institute study deals with educators' perceptions of children and students, which is important, but not at the heart of the issue raised earlier in this article, which concerns older students, who are not only capable of making their own decisions, but are required to. Even before the pandemic sent university students worldwide online, LMS were a large part of students' university learning experience for well over two decades [3]. LMS have become the vehicle for what is known as blended learning, which was noted as the "new normal" as far back as a decade ago [54]. Blended learning is described as an approach to education that integrates traditional face to face methods and online digital material to supplement [55]. While there are many considerations in either a blended environment or a fully-online environment with regard to teaching, assessment and synchronous versus asynchronous learning, it is imperative that the focus remains on the extent to which we can actively engage students in their learning and provide opportunities for students to avoid excessive distraction and multitasking. This is confirmed by the Organisation for Economic Co-operation and Development (OECD) [56] report on students, computers and learning which found that, "building deep, conceptual understanding and higher-order thinking requires teacher-student interactions, and technology sometimes detracts from this valuable human engagement".

The nature of media and technology is such that often the vast benefits of its use can overshadow the challenges associated with it. In this study we found that the use or availability of media and technology was a distraction to students; however, we also know that it can, when used correctly vastly improve the diversity of educational possibilities available to students including the soft skills that are often expounded as being necessary for success in the 21st century [57].

4.4. Summary

The OECD [56] reports that even in the "most rigorous impact studies" there is little to no effect of "investments in computers on students' non-digital performance". This is compounded by Programme for International Student Assessment (PISA) results in school students that show a "only a weak or sometimes negative association between the use of ICT in education on performance in mathematics

and reading". In universities, much of the same has been found with regard to the use of media and technology and education, where the investment in tools and the encouragement of flexible and on-line deliveries has skyrocketed, without much in the way of results [31]. The Universities and College Information Systems Association (UCISA) surveys, over the past three years have found that the need to have "institutional flexibility' has driven the need to move towards more technology-enhanced learning [31], which has been found to, at times, reduce pedagogical and/or learner flexibility [58]. So, what we see is that the institutional focus on media and technology may be counter-productive to learning and that the investment in computers and technology-enhanced learning is not producing positive impacts on learning. It could be that the investment in technology leads to more use, which in turn leads to more multitasking, which has been shown to place substantial demands on cognitive resources, which subsequently leads to decreased performance [59]. Or it could be that the use or overuse of technology leads to decreased engagement, which in turn leads to poorer academic performance [9]. While this study cannot definitively say which of these, if either, is true, it does raise the concern that when the use of media and technology is compounded by the multi-tasking that is inherent in using technology, that engagement has to be affected and therefore can lead to unfavorable results.

What is needed is a more considered approach to the use of media and technology in learning. It is fair to say that media and technology and its use in education is here to stay; however, how, when and where it is used and the amount of investment that goes into it, needs careful consideration by institutions, teachers and learners. The amount of investment in media and technology have out outpaced the advancement of appropriate pedagogies that can support and improve student learning with those technologies [31]. The OECD [56] says that education systems "can do more to improve the effectiveness of their investments in ICT by both being gradually accepting and skeptical." The OECD goes on to say that the successful integration of technology is more about the teacher's ability to make connections between the students and the technology being used then it is about the nature of that technology or the time spent with it. All this is to say that the connections and the relationships that have always been inherent in successful learning and teaching environments cannot be overshadowed or replaced by a piece of technology with an expectation of success.

5. Conclusions

It is difficult, in the current environment, to know whether and what the new normal might end up looking like. Currently in Australia, school-age children are back in school full-time, while most universities are still in some form of a blended (online and limited face to face) learning. Students in the United States, depending on the state where they live, could be attending school and university full-time, part-time or via distance/online. In the UK, they have just announced a new four-week lockdown of non-essential services, with schools and universities allowed to remain open, for now. The current pandemic has brought about unprecedented change in all aspects of society, and the speed of change and learning required on the part of educators and learners, at all levels, may well change the face of education for years to come. However, the underlying issues presented in this paper, do not change. Whether the education landscape returns to a more traditional face to face modality, remains blended in the "new normal", or in the absence of a vaccine, we may have a continuing situation that we have yet to consider.

Media and technology in education are "ubiquitous elements in our daily lives, and their use offers many benefits and rewards" [6]. While those benefits and rewards are well documented [11], what is equally well-documented are the pitfalls of multitasking, which is facilitated by, and increased through, the use of media and technology in education. Additionally, the correlations between engagement and cognition and the extent to which engagement and multitasking are inversely correlated leaves educators with questions regarding how media and technology can and should be used to facilitate learning. According to Pallas, Eidenfalk and Engel [27], technology is transforming the tertiary environment by, "influencing the ways in which teachers and students communicate, collaborate,

and learn." Given that technology is changing the ways that we interact, specifically in educational environments, it is imperative that we understand how those changed interactions impact on learning and cognition.

The concerns regarding media and technology are not that they cannot boost student engagement, but rather that the engagement encouraged through the use of media and technology, may not be the same kind of engagement that promotes learning. In studies that have shown that digital technologies can enhance engagement, that engagement is usually ill-defined or not defined at all. In many of these cases the term is used in the way it was initially understood: as behavioral indexes of student participation [11], in contrast to a more nuanced view as posited by Finn and Zimmer [9]: academic, social, cognitive and affective. With a more nuanced view one may be able to more accurately qualify the engagement and determine whether it could have an impact on learning. However, what seemingly happens, more often than not, is that the term engagement is used without being defined, which can lead to overgeneralizations. A direction for future research and a future paper by the authors, will examine the actual link between the use of media and technology, engagement and learning, by using an experimental design where one class receives the treatment (media and technology enhanced learning) and the other does not. While that research is currently being conducted and will provide interesting insights, it does not seek to make definitive judgements about the nature of media and technology use in higher education. Instead, similar to this paper, it is to highlight whether there is a benefit or not in the use of media and technology in engaging students more than traditional teaching methods so that teaching academics can make informed decisions on how, when and why they incorporate media and technology into their teaching and learning.

Since research clearly shows that engagement can lead to higher order thinking and improved learning [15,16], and digital technologies can lead to increased engagement [10,60], there is a tendency to correlate digital technologies and learning without proper evidence. What this paper argues is the link between digital technologies and learning not only may not exist, but could be found to be negatively correlated given the tendency for students to multitask and be superficially engaged in their online learning. While this study is small and not generalizable, it can provide some insight into how students are engaging with the online environment, not only when they are learning via online methods, but also how they engage with media and technology as an active distraction in their face to face learning environments.

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