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THE STUDENT VOICE: THE STUDENTS OWN VIEWS ON SMARTPHONE USAGE AND IMPACT ON THEIR ACADEMIC PERFORMANCE

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Abstract

The majority of Irish children (90%) will have a smartphone by the time they are 12 years of age [1]. This rise in smartphone usage has meant that mobile technology has become an integral part of our daily lives from a young age. Indeed mobile technologies are so ingrained in the life of college students, that they impact on the manner in which they communicate, socialise, find information, access college resources and spend their time [2] [3]. While students now have greater access to a variety of academic resources, “digital technology can also be a distraction for students from their college work and study” [4]. With the pervasiveness of mobile technologies, college students are increasingly encouraged to multitask, dividing their attention between competing activities such as; texting, gaming, socialisation, web browsing, study and/or absorbing lecture content [5]. However, while the current generation are more frequent media multitaskers than previous generations [6], studies by Ophir et al. (2012) cited in [7] show that today’s students are misled into believing that they are effective multitaskers as they ‘juggle’ socialisation, communication and web browsing without allowing sufficient time and attention for course work and study. Given that we have “limited resources available to attend to, process, encode, and store information for later retrieval” [8], it is not surprising that studies demonstrate evidence of negative correlation between the effects of technological multitasking on learning and academic performance (Wood et al. (2010) cited in [9]). Furthermore, [1] demonstrates a positive correlation between an increase in the amount of technology screen time and isolation/depression. A study in 2017, also showed an increase in Irish students seeking “help with depression, anxiety, relationships problems and academic issues has reached unprecedented levels ... a 40 per cent increase in demand for counselling over the last 10 years, with waiting lists for counselling services at many colleges” [10]. While researchers continue to study how smartphone usage impacts on students’ learning, academic efforts and mental health issues, this study focuses on students’ perceptions (through self-reflection) on what impact smartphone usage has on their academic study and work.

Keywords: multitasking, smartphone usage, academic performance, distraction, social media, anxiety, students views, mobile learning, digital generation, human multitasking, social cognition

1 INTRODUCTION

The rise in smartphone ownership has meant that mobile technology has become an integral part of our daily lives. Indeed, mobile technologies are so ingrained in the normality of student life, that they impact on the manner in which students communicate, socialise, find information, access college resources and spend their time [2] [3]. While students now have greater access than ever to a variety of academic resources, “digital technology can also be a distraction for students from their college work and study” [4]. With the pervasiveness of mobile technologies, college students are increasingly encouraged to multitask, dividing their attention between activities such as; texting, gaming, socialisation, web browsing, study and/or absorbing lecture content [5]. Given that we have “limited resources available to attend to, process, encode, and store information for later retrieval” [8], it is not surprising that studies demonstrate evidence of negative correlation between the effects of technological multitasking on learning and academic performance (Wood et al. (2010) cited in [9]). However as laptops and mobile devices are common place in classrooms [5], the issue of multitasking and its consequences on learning, recall, cognition and academic performance etc. has become a growing concern in education [8].

2 MULTITASKING

The human cognitive system (i.e. the system which enables us to memorise, learn, judge, decide, problem solve, analyse, comprehend etc.) has an “impressive ability” to manage and execute multiple tasks concurrently [11], which is important given people’s natural tendency to multitask [12]. (Delbridge, 200) cited in [13] defines multitasking as “the ability to accomplish multiple task goals in the same general time period by engaging in frequent switches between individual tasks”. Multitasking means we can engage either in more than one activity at the same time or, we can serially switch between activities [14]. For some, the need to multitask is critical to the performance of their job e.g. pilots, designers etc. [13]. However, “multitasking can potentially be life-threatening, as with the complex cognitive demands placed on pilots and drivers” (Loukopoulos, Dismukes, & Barshi, 2009) cited in [15]. While electronic multitasking is not new (people have been listening to car radios whilst driving since the first car radio was introduced in the 1930s [16]), the proliferation of web enabled devices means that it “has become routine to conduct six IM conversations, watch American Idol on TV and Google the names of last season’s finalists all at once” [17]. The extent to which they divide attention between different and sometimes competing activities (i.e. engage in multitasking), has “significant implications for the way young people learn, reason, socialize, do creative work and understand the world” [17], in addition to negatively compromised job and academic performance etc. (Junco (2012) cited in [18]). However not all multitasking affects cognition in a negative fashion; some multitasking activities can be effortless (e.g. talking while walking, or listening to music while running), with others requiring more effortful multitasking (e.g. texting while driving). When we multitask, we switch attention from one activity to another and while this shift in focus can take as little as .1 of a second [19], it also means that attention has been diverted from a previous activity, contrary to the notion, that we are performing both activities concurrently. MRI (Magnetic Resonance Imaging) scans show that when a person starts to listen to music while driving, the “amount of brain bandwidth going toward driving decreases by about 37%” [19]. This shift in focus from one activity to another occurs in the brain’s anterior prefrontal cortex, the fronto-polar cortex (also known Brodmann’s Area 10) which is hypothesised to involve the “selection and maintenance of higher order internal goals while other sub-goals are being performed” [20] i.e. multitasking. Essentially, the fronto-polar cortex (i.e. Brodmann’s Area 10) supports the shift in focus from one activity to another (even if the first activity is incomplete) to later return to the same place of the first activity and continue. A study of 13 patients with damage to their fronto-polar cortex, showed that such damage negatively affected their multitasking capabilities by impairing their ability “to put tasks in pending sequences” [21]. A study by [20] also showed significant correlation between damage to the fronto-polar cortex and the ability to multitask effectively. As Brodmann’s Area 10 (i.e. fronto-polar cortex) was one “of the last regions of the brain to mature and one of the first to decline with aging, young children do not multitask well, and neither do most adults over 60” [17]. Various models have been proposed to explain the influence of multitasking on cognition. As an example, the Theory of Threaded Cognition allows for thoughts as threads, which are processed by a “co-ordinating procedural resource” [11] and executed across a set of available resources (e.g. motor resources etc.). This co-ordinating procedural resource also resolves resource conflicts when they arise (e.g. “certain mental operations cannot be divided, resulting in a bottleneck that allows only one task to pass through at a time” [13]. The Theory of Threaded Cognition assumes that the deployment of resources is parsimonious [11].

Although those who have grown up with easy access to digital technologies and Integrated Computer Technology (i.e. the digital generation [22]) are “wired to multitask” [23], “how well multiple tasks can be carried out concurrently” is limited [8], which essentially means that there is a limitation to the ability to multitask [17].

3 THE EFFECT OF MULTI-TASKING ON STUDENTS

It is envisaged that 59% of the global population will own a smartphone by 2022 (compared to 39% in 2016 [24]). In 2015, facilitated by mobile devices, 24% of American teenagers went online almost constantly [25]. Nearly 75% of these teenagers had access to a smartphone [26]. In today’s media rich world, the age at which children begin to interact with digital technologies is reducing [27] up to the point that “children’s digital footprints often begin at birth” [28]. By the time they are 12 years old, 90% of Irish children will have a smartphone [1]. An EU funded study concerning young children (aged between 0 and 8 years of age) and their families’ experiences with digital technologies was conducted over 6 European countries and Russia. This study found that despite the pervasiveness of digital technology in the home, there was a paucity of digital technology used to support learning and/or education; by

contrast, digital technologies were mainly used for watching videos, playing games, taking photos and messaging [28]. The rise in smartphone ownership [3] has meant that mobile and digital technologies (e.g. laptops) have become an integral part of the daily life of today's college students, impacting on the manner in which they communicate, connect with friends, search for information and spend their time [2]. The pervasiveness of mobile and digital technologies has meant that students are increasingly encouraged to multitask, dividing their attention between activities such as; streaming and watching videos, texting, gaming, socialisation, web browsing, study and/or absorbing lecture content [5]. Regarding academic performance, this division of attention which occurs during multitasking, can "result in the acquisition of less flexible knowledge that cannot be easily recalled and/or applied in new situations" (Foerde, Knowlton, and Poldrack, 2006) cited in [29]. Furthermore, while the shift in attention/focus from one activity to another, can take as little as .1 of a second [19], it still "takes time and effort to refocus" back (Bailey and Konstan, 2006) cited in (Kraushaar & Novak, 2010). A study by (Bowman, Levine, Waite, & Gendron, 2010) cited in [15] found that "students who were simultaneously chatting via instant-messaging took roughly 21% more time compared to those who were not multitasking". The demand that multitasking places on cognitive resources negatively affects both overall performance and the performance of the individual tasks (Broadbent, 1958 cited in [8]. Furthermore, studies have shown a negative correlation between smartphone usage and mental health issues; "teens who spent five or more hours a day online were 71% more likely than those who spent only one hour a day to have at least one suicide risk factor (depression, thinking about suicide, making a suicide plan or attempting suicide). Overall, suicide risk factors rose significantly after two or more hours a day of time online" [26].

While the current generation are more frequent media multitaskers than previous generations [6], studies by Ophir et al. (2012) cited in [7] show that today's students are misled into believing that they are effective multitaskers as they 'juggle' socialisation, surfing the web, communication and gaming without allowing sufficient time and attention for course work and study.

4 METHODOLOGY

While researchers continue to study how smartphone usage impacts students learning, academic efforts and working memory, this study seeks to understand the student's own self-reflections on the impact of smartphone usage on their academic study and work. As such, in this paper, the perceptions of 74 Bachelor of Arts Information Technology (B.A. IT) students (34 first year students and 40 third year students) regarding the academic impact of their smartphone usage are presented. During this study, the authors present the students' rankings (1= no impact, 5 = high impact) on how smartphone usage:

- distracts during lectures,
- distracts from lectures and study,
- prevents/delays them from completing assignments and
- negatively impacts on their resulting academic grades.

The students were also asked if they believed that their academic performance would improve if they reduced their smartphone usage. Whilst students can under-estimate their time on smartphones [7], it does not invalidate their perceptions regarding the influence of multitasking (affected by their smartphone usage) on their academic lives. This study also compares the perceptions of students at the beginning of their college journey with those embarking on their degree year.

5 RESULTS & DISCUSSION

74 informatics students from the B.A. IT programme, were surveyed, of those 46% were first year students, with 44% (n=34) being female. 54% were third year students (n=40) with 38% being female. All surveyed students owned a Smartphone. 27% were aged 19 years and younger, 61% were aged between 20 and 23 years, with the remaining 12% aged over 24 years. Of the time spent on their smartphone, 28% (n=74) spent 0-2 hrs/day (of these 21 respondent, 24% were 19 years and younger, 57% were between 20 and 23 years and the remainder were 24 years and older), 45% spent 3-5 hrs/day (of these 33 respondents, 78% were between the ages of 20 and 23 years) and 27% spent 5+ hours/day. Of these 20 respondents, 50% were 19 years and younger (n=20) whilst 40% were aged between 20 and 23 years). A study by [30] indicated that "high frequency cell phone users tended to

have a lower GPA [academic scores], higher anxiety, and lower satisfaction with life relative to their peers who used the cell phone less often” [30]

The top apps used by those who spent in excess of 5 hours on their smartphones were Snapchat, Facebook, Facebook Messenger and Instagram. Regardless of studies showing that Facebook is primarily being used by the older generation, with Snapchat and Instagram becoming the most popular ‘go-to’ social platforms [31], the most popular apps being used by the respondents in general were Facebook, Facebook Messenger, Snapchat, WhatsApp and Instagram (Fig 1). While the pervasiveness of mobile devices has enabled us to feel more connected, the relationship between an increase in the amount of technology screen time and isolation/depression/mental issues cannot be ignored [1] and it is contended that “more time on social media led to unhappiness, while unhappiness did not lead to more social media use” [26]. Further, a week long experiment involving 1,095 participants provided “causal evidence that Facebook use affects our well-being negatively” [32]. The participants were randomly assigned two groups; one being asked to give up the use of Facebook for a week, whilst the other were allowed to continue using Facebook. “Those who avoided Facebook reported feeling less depressed at the end of the week” [26]. A study in 2017, showed an increase in Irish students seeking “help with depression, anxiety, relationships problems and academic issues has reached unprecedented levels ... a 40 per cent increase in demand for counselling over the last 10 years, with waiting lists for counselling services at many colleges” [10]. [1] contends that teenagers “who spend three hours a day or more on electronic devices are 35% more likely to have a risk factor for suicide”.

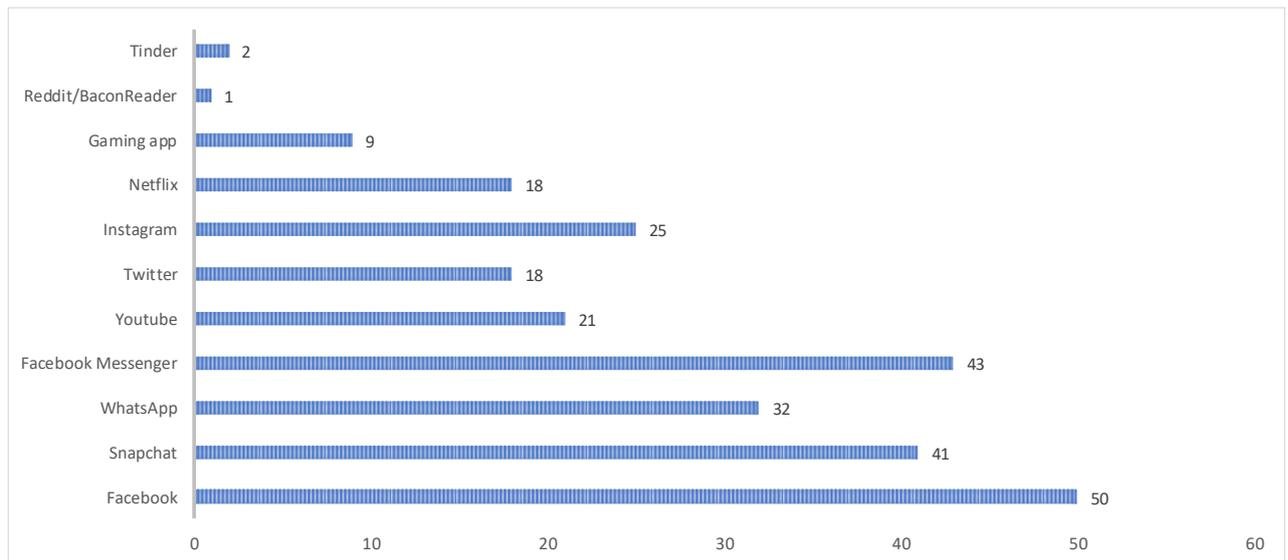


Figure 1: The most popular apps/social media platforms

The findings from this survey are presented and discussed thematically in the following sub sections.

5.2 Theme 1 : Views on how smartphone usage distracts during lectures

Of the respondents (n=74), 74% said that they constantly use their smartphones during lectures. Of these 55 respondents, 82% said that they lose motivation in the middle of a lecture. 67% said that the use of the smartphone greatly distracted them from their lectures. 78% used their smartphones mostly to send text messages/Snapchats etc. during lectures. The 4% of all respondents (n=74) who said that they never lose motivation during the middle of a lecture/study, rarely/infrequently used their smartphone in the lecture/study environment. Of the 34 first year respondents, 100% indicated that they used their smartphone regularly (ranking 3-5) during lectures, with 79% saying that it greatly/strongly distracted them (ranking 4-5). Of the 40 third year respondents 88% indicated that they used their smartphone regularly (ranking 3-5) during lectures, with 57% saying that it greatly/strongly distracted them (ranking 4-5). As distractions cause one to switch focus from one task/activity to another (i.e. from the lecturer speaking, to reading lecture notes, to reading and writing snap chats etc.), this has a resultant impact on cognitive performance; specifically “a reduction in recognition memory performance, and also in the accuracy of metacognitive monitoring of retrieval” (Beaman et al. (2014) cited in [33].

However, Mastroberardino and Vredeveltdt (2014) (cited in [33]) showed that once the visual or auditory distraction was removed, cognitive performance improved significantly.

5.3 Theme 2 : Views on how smartphone usage prevents/delays assignment completion

Because of the fear of missing out, students frequently need to “keep connected to social media and their friends through texting apps while studying and doing homework” (Jacobsen & Forste, 2011; Junco & Cotton, 2012) cited in [9]. 53% of all respondents said that they get distracted easily (ranking 4-5) while trying to study due to messages and apps on their smartphones. Of those 39 respondents, 69% said that they were mostly checking social media instead of studying or completing assignments and 59% said that they often leave their assignments until the last moment (ranking 4-5). Of the 39 respondents who said that they get distracted easily (ranking 4-5) while trying to study due to messages and apps on their smartphones, 54% were first year students and 46% were third year students. Proportionally, first year respondents were more affected by smartphone distractions than their third year counterparts (62% of all first year respondents compared to 45% of all third year respondents).

14% of all respondents (n=74) rarely/never get distracted by their smartphones (ranking 1-2). Of these 10 respondents, 20% leave their assignments until the last moment. 59% of all respondents often check social media on their smartphones instead of studying or completing assignments. Of these 44 respondents, 55% were first year students (representing 71% of first year respondents compared to 50% of third year respondents). A study of 500 students at Kent University found that “on average users would check their phones just six minutes after initiating a study session. This could propel a cycle of anxiety, with users feeling they are missing leading to lower academic performance leading to more worry” [30].

5.4 Theme 3 : How Smartphone usage negatively impacts on resulting academic grades

Of the 74 respondents, 38% perceived a strong relationship (ranking 4-5) between their grades suffering and increased smartphone usage with 50% spending in excess of 5 hours per day on their smartphone. 8% (ranking 1) saw a slight relationship while the remainder indicated a medium relationship between reducing academic grades and smart phone usage. Given that humans have “limited resources available to attend to, process, encode, and store information for later retrieval” [8], it is no wonder that students can recognise that the slicing of attention can result in impaired cognitive performance and lower academic grades. 49% of all respondents indicated that the rate at which they used their smartphone had a strong negative impact (ranking 4-5) on their academic performance. Of those 36 respondents, 58% were first year students (representing 81% of first year respondents), 42% were third year students (representing 38% of third year respondents). Proportionally more first year students than third students indicated a strong negative correlation regarding the impact of smartphone usage (ranking 4-5) on their academic performance.

A study by Wood et al. (2012) (cited in [9]) showed that technological multitasking during the process of learning, results in diminished capability to process and learn information effectively and in the end, negatively impacts on academic grades and performance. Given that distraction, arising from multitasking can result “in reduced fidelity of details retrieved from LTM” [33], it is no wonder that students themselves see a link between increased smartphone usage and diminishing academic grades.

5.5 Theme 4 : Views on whether or not academic performance would improve with reduced smartphone usage?

When asked if their academic performance would improve if they didn't use their smartphone as much, 61% strongly agreed (ranking 4-5). Of those 45 respondents, 53% used their smartphone 2-3 hours per day whilst 33% indicated that they used it 5+ hours per day. 53% were aged between 20 and 23 years, while 33% were aged 19 years and younger. Further, of these 45 respondents, 53% were first year students (representing 71% of first year respondents), 47% were third year students (representing 53% of third year respondents). It is interesting to find that first year respondents seem to be more aware of the impact of smartphone usage on academic performance and that their grades are affected by said

usage. (Rubenstein, Meyer, and Evans, 2001) cited in [29] contend that “many students may believe they can switch back and forth between different tasks with no serious consequences to their academic performance”.

5 DISCUSSION

Proportionally more first year respondents used (76% of first year respondents compared to 73% of third year respondents) and are distracted (79% of first year respondents compared to 50% of third year respondents) by their smartphones during lectures (Figs 2 and 3, Tab. 1). Meanwhile, proportionally more third year respondents (53% compared to 41% of first year respondents) used their smartphones to help them during lectures to access lecture notes. This finding could be explained by the greater time spent by the third year respondents within the academic process and their greater familiarity with the institutional VLE (virtual learning environment), indicating a more effective use of their smartphone. Further, proportionally speaking, a greater number of first year respondents; were distracted more easily instead trying to study due to messages and apps (62%), checked social media on their smartphone instead of studying or completing assignments (71%), left assignments until the last moment (65%) and believed that their grades suffered as a result of their smartphone usage (50%). By the time students transition to third year, their time management and study skills have improved. The results suggest that, by understanding the impact on their academic performance, third year respondents strategically reduce their time being distracted by social media. In general, they did not believe that their grades suffered as a result of their smartphone usage (28%). Although 38% of all third year respondents contended that the rate at which they used their smartphone had a strong impact on their academic performance (compared to 62% of first year respondents), 53% believed that their academic performance would improve if they didn't use their smartphone as much (compared to 71% of first year respondents).

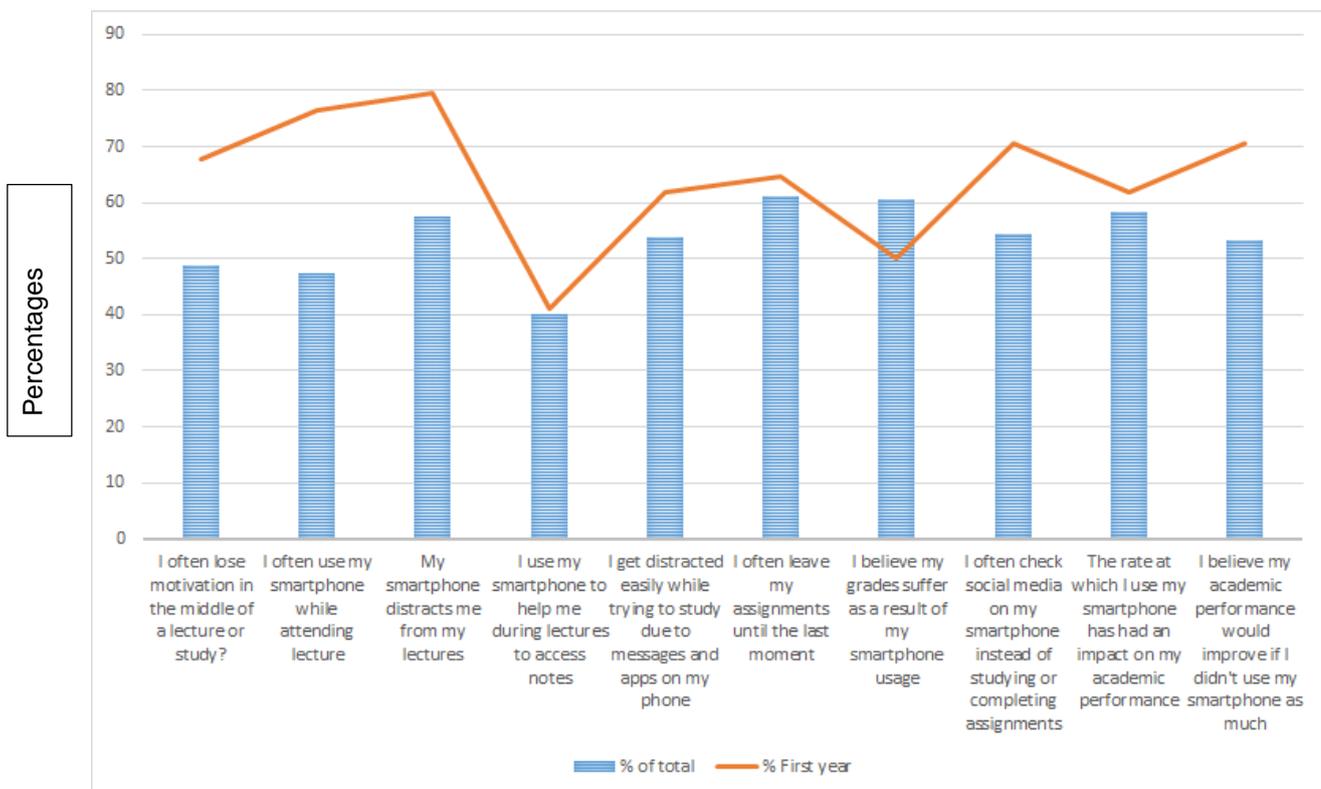


Figure 2: % of all respondents and % of first year respondents who responded strongly (ranking 4-5)

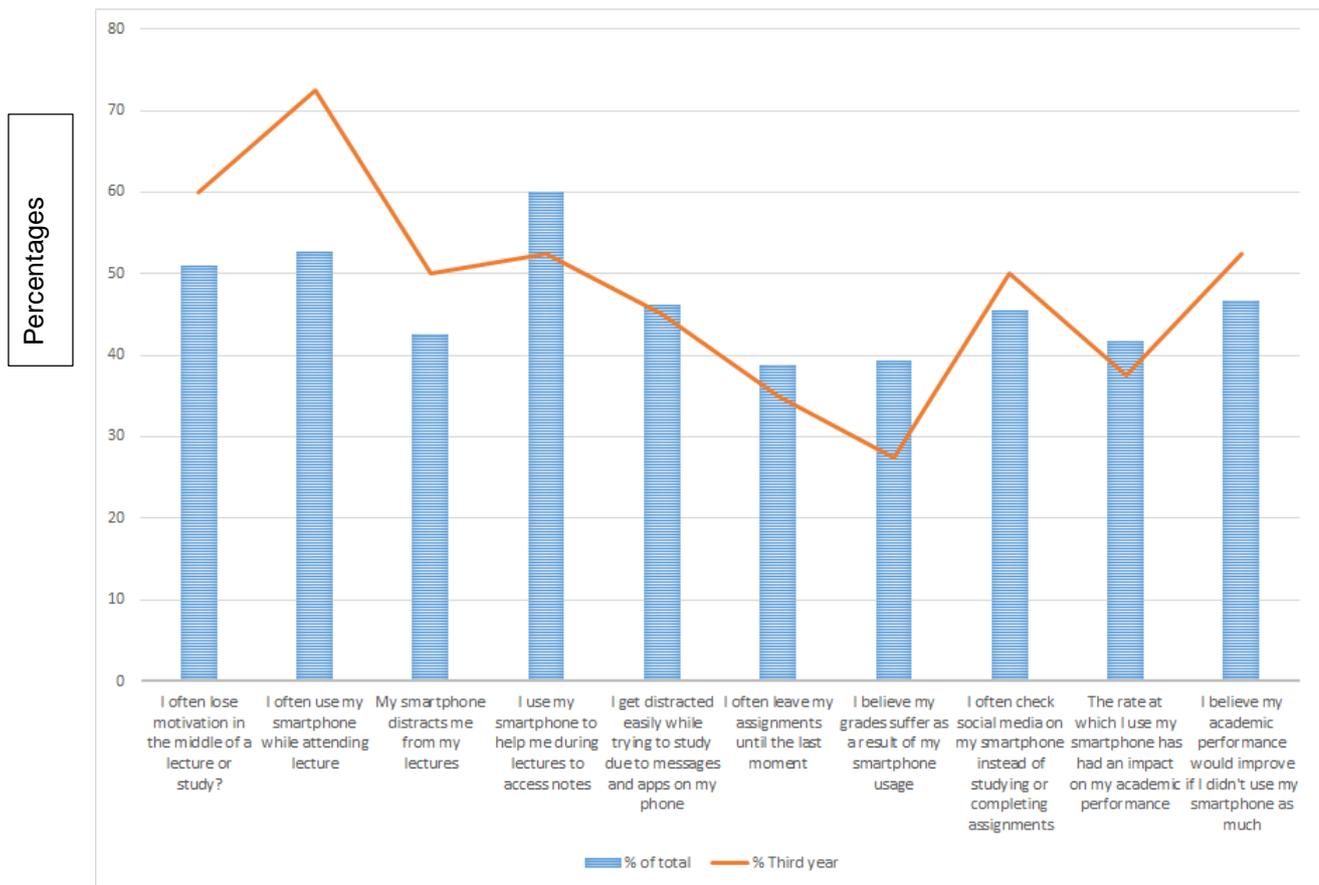


Figure 3: % of all respondents and % of third year respondents who responded strongly (ranking 4-5)

| | Ranking 4-5 | |
|---|--------------|--------------|
| | % First year | % Third year |
| I often lose motivation in the middle of a lecture or study? | 68 | 60 |
| I often use my smartphone while attending lecture | 76 | 73 |
| My smartphone distracts me from my lectures | 79 | 50 |
| I use my smartphone to help me during lectures to access notes | 41 | 53 |
| I get distracted easily while trying to study due to messages and apps on my phone | 62 | 45 |
| I often leave my assignments until the last moment | 65 | 35 |
| I believe my grades suffer as a result of my smartphone usage | 50 | 28 |
| I often check social media on my smartphone instead of studying or completing assignments | 71 | 50 |
| The rate at which I use my smartphone has had an impact on my academic performance | 62 | 38 |
| I believe my academic performance would improve if I didn't use my smartphone as much | 71 | 53 |

Table 1: Summary proportional comparison, 1st & 3rd year student respondents

6 CONCLUSIONS

Smartphones and laptops are now an integral part of a student's life and have changed the way "they communicate, gather information, allocate time and attention, and potentially how they learn" [2]. The proliferation of and easy access to a mobile friendly media rich world has meant that media multitasking has become a natural task for the majority. However, while the human cognitive system has an "impressive ability" to manage and execute multiple tasks concurrently [11], "how well multiple tasks can be carried out concurrently" is limited [8]. The division of attention as we shift focus from one activity to another and back again, has potentially negative repercussions on cognitive performance. While the current generation are more frequent media multitaskers than previous generations [6], today's students are required to 'juggle' socialisation, communication, surfing the web, gaming, information gathering, study and paying attention in lectures in addition to other day to day activities. To overcome the fear of missing out, students frequently need to "keep connected to social media and their friends through texting apps while studying and doing homework" (Jacobsen & Forste, 2011; Junco & Cotton, 2012) cited in [9]). This dependency to be continuously connected "could propel a cycle of anxiety, with users feeling they are missing lead leading to lower academic performance leading to more worry" [30].

This study showed that those who constantly used their smartphones were greatly distracted in class and lost motivation in a lecture. Those respondents (4%) who never lost motivation during a lecture/study, rarely/infrequently used their smartphone in a lecture/study environment thereby highlighting a strong correlation between motivation, distraction and smartphone usage, further validated by Mastroberardino and Vredeveltdt (2014) cited in [33], who showed that once the visual or auditory distraction was removed, cognitive performance improved significantly. In general, distractions can cause students to switch focus from one task/activity to another (i.e. from the lecturer speaking, to reading lecture notes, to reading and writing snap chats etc.). In this study, proportionally more third year respondents, compared to first year respondents, were less distracted while trying to study due to smartphone messages and apps, spent less time checking social media on their smartphone instead of studying or completing assignments and completed assignments on time. They also believed that their grades did not suffer overly much due to their smartphone usage. This suggests that by the time students transition to third year, their time management and study skills have improved. The results also suggest that, by understanding the impact on their academic performance, third year respondents more strategically manage their time on their smartphone. They also use their smartphone in a more academically productive manner than their first year counterparts.

In summary, the increase in student smartphone ownership, has put an onus on academia to investigate how the power of the smartphone can be harnessed and the curriculum revised so that mobile technologies (which have "great potential to enrich the academic experience" [2]) promote and contribute to learning instead of acting in an adversarial manner.

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