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A New Generation of Students: Digital Media in Academic Contexts

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Abstract. *The growing presence of digital media in the lives of university students signals a change in how use of such media in educational contexts should be viewed. Institutional focus on technologically mediated education and the promotion of blended learning initiatives further serve to encourage media use in academic settings. Scant attention has been afforded to the potential negative consequences arising from heightened media engagement. This is especially the case in areas of study where technological artifacts are often the medium and the subject of interest, for instance the computer and information sciences. In this study a survey methodology (n=1 678) is employed to investigate students' use of media, as well as the behavioural beliefs, norms and motivators surrounding such use. Findings suggest that demographic factors are irrelevant as predictors of media use — off-task media use during lectures is the norm for all students. Furthermore, no link has been found between institutional attempts to curb off-task media use and changes in students' behaviour. In terms of beliefs, our findings suggest that even students who believe use in academic contexts to be unacceptable, still frequently engage in media use in such contexts. While we acknowledge the value of, and certainly encourage continued blended learning initiatives, our findings raise a red flag regarding their implementation.*

Keywords: Media Multitasking, Beliefs, Norms, New Media, Students, Behaviour

1 Introduction

With the growing hype surrounding *Blended Learning* and the potential benefits of digital technology in tertiary institutions, the prospects of negative implications associated with the use of personal digital media in educational settings are seldom considered. We regard this position to be particularly tenuous in light of the growing body of knowledge suggesting the potential for negative consequences associated with digital media use in academic settings [e.g. 31, 5, 20, 17, 28, 11].

Mobile digital media devices such as laptops, tablets and smartphones have become ubiquitous on today's university campuses [9]. The ubiquity of media, as well as the characteristics inherent in modern digital media have contributed

to the growing prevalence of continuous media use among the current generation of university students. In describing members of this generation, which includes current university students, as the 'net generation' [29] or the 'digital natives' [26], the significant role media plays in shaping their lives is further highlighted. Increasingly, students are engaging in media multitasking behaviour, rapidly switching between numerous ongoing activities. Such behaviour has been shown to reduce the ability to pay attention to individual tasks [13, 16]. These outcomes suggest that media multitasking implies cognitive costs, impeding the processing and encoding of information into long term memory — key functions necessary for learning to take place [16]. Studies in this area indicate that there exists a negative correlation between media multitasking frequency in academic contexts and academic performance [31]. Owing to the ubiquity of extensive media use and media multitasking behaviour amongst contemporary student populations, the development of a deeper understanding of the beliefs, norms, motivations and nature of student media use is of substantial importance.

In addition to the ubiquity and presence of media in students' lives, the increased institutional focus on technologically mediated education and the continued promotion of blended learning and e-learning initiatives imply that the opportunities for students to use media whilst in academically focused situations are greater now than ever before. Blended learning typically involves the integration of physical, face-to-face, lecture-based learning opportunities with online learning experiences [14]. Through blended learning, digital media use in academic settings is not specifically discouraged, rather, it is explicitly *encouraged*. This is especially noticeable with the structural interventions in many academic institutions such as Wifi access points in lecture halls and the increasing prominence of e-learning environments. Furthermore, the use of digital media technologies is particularly commonplace in areas of study where technological artifacts are often the medium *and* the subject of interest, for instance the computer and information sciences. Within these academic subjects students typically conduct assignments and projects on devices such as desktop computers, laptops, tablets and even smartphones.

University students are characterised as being members of the 'net generation' [29], a cohort displaying an unprecedented propensity for engaging and interacting with digital media, both throughout their everyday lives, as well as in the course of their academic experiences [8, 17]. Exemplifying this line of reasoning, a recent EDUCAUSE Center for Applied Research (ECAR) study (N = 50,274 respondents, 11 countries, 161 universities) indicates that 98% of students posses a mobile computing device (laptop, smartphone or tablet), capable of Internet connection [9]. While one may reason that these statistics are reflective of students in developed economies, a study by North et al. [24] of mobile phone use by South African university students found that only 1% did not own a mobile phone, or had not owned one recently [24]. Similarly, an earlier study of low income South African students by Kreutzer [19] shows extensive use of mobile devices amongst this demographic.

In addition to extensive engagement with media in their general lives, many studies show that media use within academic settings has become increasingly common [15, 28, 20, 6, 13]. This is both the case in structured as well as self-regulated academic contexts. For the purpose of this study a structured academic context is defined as a *classroom based environment within which students observe and record material provided by a facilitator*. Correspondingly, a self-regulated academic context is defined as *a student or group of students undertaking academic work without direct supervision by a facilitator, either within a personal or public study environment*.

From the aforementioned definitions it is clear that structured and self-regulated academic environments are distinguished by different physical properties as well as distinct social, and behavioural norms. In a structured academic context the presence of a facilitator is the key element distinguishing such an environment. The facilitator is responsible for presenting material to the students. In addition to this, he/she regulates the behaviour of the students within this context through the establishment and maintenance of order [2]. However, students' behaviour within this environment is not only a function of the facilitator, but is also modulated by the behavioural and social norms established by their peers [3]. While structured lecture contexts might constitute the primary academic environment experienced by students, students spend a far larger amount of their time engaged in informal, self-regulated study environments outside of scheduled class times [21]. These environments are defined as being self-regulated, because the behaviour exhibited within them is not dependent on external rules imposed by a facilitator. For the most part, the nature of these environments is determined by the individual's personal choices [32].

1.1 Research Questions

We believe that academic staff in technical domains such as Informatics, Computer Science and Information Science have an important role to play in shaping the outcomes of blended learning initiatives at universities. It is our perception that staff with limited knowledge of the inner-workings of computer-based systems often operate under naïve assumptions of the affordances of digital technologies for learning, leading to misguided application efforts. While we acknowledge the potential of digital media in learning, we argue for a balanced perspective which acknowledges both the positive and negative consequences of digital media use in academic contexts.

In this study we investigate data collected through a survey conducted at a large, public South African university (n=1 678). The survey concerns, primarily, respondents' online media use in general and in structured academic settings and, in addition, considers the beliefs, norms and motivators surrounding media use.

Specifically, the study aims to answer these questions:

1. *Which media do students generally use and how frequently do they use them?*
2. *Which media do students use in structured academic contexts and how frequently do they use them?*

3. *What beliefs do students hold in relation to their media use in structured academic contexts?*
4. *What triggers media use in structured academic contexts?*
5. *Does media use in structured academic contexts influence academic performance?*

In the next section we briefly review existing literature on students' use of media and beliefs surrounding media use. Following this, the research methodology employed in this study is outlined. We then present the data analysis and findings made. Finally, we conclude by discussing the implications of these findings for teaching and learning at tertiary educational institutions within South Africa. Specifically, attention is given to the implications of these findings for the teaching of computer and information sciences.

2 Literature Review

In this section we present a review of literature addressing university students' use of digital media, commencing with a brief overview of studies focusing on use of media in general, non-academic contexts, followed by a review of studies regarding use in academic contexts. Finally, consideration is afforded to studies focusing on students' behavioural beliefs and norms with regards to media use in academic settings.

2.1 Students' Digital Media Use

Over the preceding decade a number of studies have focused on the growing prevalence of students' media use [13, 18, 17, 16, 5, 4, 20]. These studies reveal that media use is commonplace for students whether they are engaged in academic study (structured or self-regulated), or in non-academic activities.

In a study focusing on the variety and frequency of media used by students Thompson [30] classifies students' media use into nine distinct categories. Of these nine categories, the two categories referred to by Thompson [30] as 'rapid communication technology' and 'web resources' were used most frequently by a majority of the students surveyed. Combined, these categories include activities such as: calling or texting on a mobile phone, using social networking sites, watching online video, and web-searching. Using an experience sampling method, Moreno et al. [23] conducted a real time examination of students' Internet behaviour. This study reveals that on average students spent 56 minutes online per day [23]. This result represents a significantly smaller amount of time than suggested by studies relying on self-reported data. For instance, Junco and Cotten [17] survey a large sample of American students about their digital media usage habits. Results from this survey indicate that on average students spend over two hours per day engaging with online media (social networking, instant messaging and emailing).

Over and above media use in the course of their everyday lives, numerous studies support the argument that students' media use within academic settings

has become increasingly common. For instance, Jacobsen and Forste [15] use online questionnaires to gather data about media use during academic study, finding that two-thirds of the sampled students reported media use either while in class or in self regulated study. Similarly, Rosen et al. [28] research students' media multitasking habits in their own personal study environments. This study employed a mixed-methods research design, combining survey results with observations of students' media multitasking behaviour within their learning environments. Rosen et al. [28] show that students averaged less than six minutes on task before switching to another task. The most frequent causes of task-switching were observed to be technological distractions such as social media and texting. Furthermore, Rosen et al. [28] determine that students who indicated a preference for task-switching behaviour studied in an environment possessing a greater number of distracting technologies potentially available to them. Consequently, these students were found to be more likely to engage in off-task mediated activities.

In a later study, Calderwood et al. [6] use an experimental approach to determine the number of media interruptions students experience, the duration of these interruptions as well as the proportion of study time devoted to media multitasking behaviour. While studying, participants' actions were observed using remote surveillance cameras, a head-mounted point-of-view camera and a mobile eye tracker. In terms of media multitasking behaviour, Calderwood et al. [6] found that students engaged with an average of 35 distractions of six seconds or longer, with an aggregated mean duration of 25 minutes. Cellphone and laptop use constituted the largest frequency and duration of distraction from academic work. The specific media which the students were found to engage with (instant messaging, off-topic browsing, video streaming and email) are commensurate with other studies in this area [13, 28, 10]. Interestingly, Calderwood et al. [6] note that their data was non-normal in nature with students in the 75th percentile devoting four times the amount of time to distracting interruptions than those in the 25th percentile.

Following a survey of 1839 students, Junco [16] classifies in-lecture media use into three categories: high, moderate and low frequency media use. Of the categories examined, texting on a mobile phone was found to be the only media activity which could be classified as high-frequency, with 69% of the sample indicating in-lecture texting activity [16]. Engaging social media services, emailing and online searches for off-task content were found to occur with moderate frequency. In a survey based study examining the nature of students' in-class laptop use, Fried [13] found that students spend a substantial amount of time multitasking on laptops within a lecture. Over the 20 week period of the study students reported using their laptops for non-lecture related activities for an average of 17 minutes out of each 75 minute lecture [13].

In another survey study conducted in the United States, McCoy [22] found that 92.1% of respondents used a digital device during a lecture for off-task activities at least once during a typical day. Similar to the results seen in Junco [16], texting was found to be the most frequently engaged in activity, with email,

social networking and web-browsing following. In this study over 80% of students indicated that multitasking with a digital device in class caused them to pay less attention [22]. Finally, building upon prior research into students' use of digital media in university lectures Roberts and Rees [27] investigate students' use of mobile devices such as smartphones, laptops and tablets whilst attending lectures. Following both quantitative as well as qualitative research procedures Roberts and Rees [27] find that 66% of respondents used a mobile device whilst in lectures. Of those who used a mobile device, 45% used a phone and 38% used a laptop [27]. Focusing on the specific activities which students engaged in on each device Roberts and Rees [27] find that laptops were primarily used for non-academic purposes.

The literature reviewed thus far reveal that there is an extensive body of research focusing on students' use of digital media conducted at institutions around the world, little work in this regard has been conducted at South African tertiary institutions. However, what research there is within the South African context is generally congruent with the aforementioned studies. For instance, North et al. [24] study mobile phone usage by South African university students, finding that in their sample of 362 students only 1% did not own a mobile phone, or had not owned one recently. Moreover, in an earlier study Kreutzer [19] surveys 500 low income South African students, showing extensive use of mobile devices amongst this demographic. Kreutzer [19] finds that for low income students in South Africa, a mobile device constitutes their primary connection to the Internet, with 83% of participants accessing mobile Internet applications on a daily basis. Similarly, in a survey-based study conducted at a South African university Leysens et al. [20] found that the dominant class of media in use by South African students in a lecture context is non-academic in nature. Specifically, Leysens et al. [20] show that instant messaging and social networking are the most frequently used media during a lecture, with over 95% and 57.7% of respondents indicating at least one instance of use in a lecture, respectively.

It is clear from the research reviewed thus far that for students, as members of the net generation, media plays a ubiquitous role in their lives. It has been found that students spend a significant amount of their time engaging with media in many varied forms and contexts, in general as well as throughout formal, structured educational settings. The research reviewed in this section lends credence to the notion that students' lives are in fact mediated by the digital technology through which they engage many aspects of the world.

2.2 Students' Beliefs and Behavioural Norms

Research focusing on students' perceptions of media use, social norms and beliefs about media use in academic settings is limited. Normative beliefs are defined as an individuals' perception of social normative pressures on them to perform a certain behaviour [12]. Similarly, behavioural beliefs are described as an individual's beliefs about the consequences arising from a particular behaviour [12]. In the context of students' media use, normative beliefs relate to social pressures to engage with digital media in academic settings. Correspondingly,

behavioural beliefs relate to perceptions about the implications of media use for their academic performance.

While there may be limited research within this area, two focus-group based studies provide some level of insight. At a medical university in the United States, all students were required to use laptops for study purposes. Annancoultas [1] employed a number of focus-groups to investigate the benefits and drawbacks of the required laptop program at this university. Students in the focus groups reported frequently using laptops in lectures for off-task activities. They explained that they commonly engage in social media and web browsing when they become bored with the lecture [1]. Despite reporting the use of laptops for off-task activities, the students explained that from their perspective, laptops improved their communication abilities, access to learning material as well as increased the flexibility of education [1]. However, the most frequently reported drawback of laptop use was distraction. This outcome is in agreement with [13], who reported that students perceive their own use of a laptop as well as that of those around them to be the single greatest distraction to learning in the classroom setting.

In a later study Parry [25] conducted a series of focus groups at a South African university, focusing on students' behavioural beliefs, the triggers underlying their behaviour and, the nature of their behaviour with media in academic contexts. Through a thematic analysis of these focus groups he finds that students are cognizant of the impact that media multitasking has on their cognitive functioning and, as a consequence, their academic performance. This is especially the case when in structured lecture contexts. Interestingly, this study indicates that students view self-regulated study in a different light. In explaining this finding, Parry [25] describes how students base their media use on a rational evaluation of the impact of such behaviour. This finding highlights how contextual differences determine behavioural differences between structured lecture contexts and self-regulated contexts. It was found that students attach a different level of academic significance to each of these environments. In terms of social norms, Parry [25] indicates that students believe that the behaviour that they exhibit with digital media is shared by their peer group and that off-task media use in academic settings has become a normal mode of functioning.

2.3 Summary

From the literature reviewed, it can be concluded that as members of the net generation, mobile digital media play a central role in students' everyday lives. In addition to this, numerous studies have found that this media engagement continues into students academic experiences, both in structured as well as self-regulated academic environments. Specifically, research shows that students are aware of the potential negative consequences associated with continuous media engagement. In this regard, students evaluate the costs associated with media use in particular contexts, choosing to engage if the benefits of use outweigh the potential costs. Furthermore, media multitasking within structured academic contexts is broadly considered to be the norm.

While many aspects of students' media use have been extensively studied, there remains many unanswered questions within this domain. Few studies have been conducted in the South African higher education context and little is known of the role demographic factors play in moderating media use. In addition, the influence of subjective norms and beliefs on media use frequency in structured academic contexts has yet to be investigated.

3 Methodology

This study set out to investigate online media use among university students, both within and outside structured academic contexts. To this end a survey-based approach was followed, enabling the collection of data from a large population through a series of Likert-type questions. The sections which follow address the survey design and data collection.

3.1 Survey Design

A web-based survey consisting of three sections was utilised to collect data relating to the research problem. The first section of the survey concerned subjects' media use behaviour in and outside of structured academic contexts (i.e, lectures, practical classes or tutorial classes). Six forms of online media typically used by the target population were selected. These included:

1. Social Networks (SN)
2. Micro-blogs (MB)
3. Encyclopedic (or structured data) browsing (ENC)
4. Instant Messaging (IM)
5. Search (engine) activities (SE)
6. The university's e-learning platform (EL)

For each medium general use frequency was elicited through a five-point Likert-type question with indicators for "Not at all", "Sometimes (at least once per month)", "Often (at least once per week)", "At most once a day" and "Multiple times per day". For use frequency in structured academic contexts (which we refer to as *in-lecture use*) the indicators were"Not at all", "Once or twice", "Every 10 minutes", "Every 5 minutes" and "Constantly".

The second section of the survey concerned, firstly, subjects' beliefs about social norms regarding the use of smartphones in structured academic contexts and, secondly, their beliefs about the motivations or triggers underlying smartphone use in these contexts.

In the third and final section of the survey demographic variables were elicited. These included age, gender, language, highest qualification of parents and area of study (i.e. the subject's home faculty). In addition to these subjects were asked to report their general level of academic performance through a scale ranging, in 5% intervals, from "Below 40%" to "96%-100%".

3.2 Data Collection

A single round of invitations to complete the survey was sent, via e-mail, to 14 122 undergraduate students across all programmes at a large, South African university. Because the survey contained questions concerning subjects' academic performance in the previous academic year, first-year students were excluded from the list of recipients. Completion of the survey was incentivised by offering subjects that have completed the survey a chance to win a R 1 000 gift voucher through a separately-managed lucky draw. A total of 1 678 completed surveys were submitted within a three-week period following the invitation.

4 Data Analysis

The data analysis is presented in five sections. The first provides a descriptive overview of the sample population based on the following demographic variables: age, gender, language, highest qualification of parents and area of study (i.e. the subject's home faculty). This is followed by the analysis of the media use patterns (in general and during lectures) in relation to the six demographic variables. We then consider data relating to students' beliefs and norms about in-lecture media use, followed by data concerning the reasons/triggers underlying instances of use in-lecture use. Finally, we briefly consider the relationship between media use and academic performance.

4.1 Sample Population

Just over 82% of the 1 678 students that completed the survey are between 20 and 23 years of age. Of the remaining subjects 7% did not disclose their age while the rest are older (mostly 24 or 25 years of age). The sample included slightly more female (51%) than male (49%) respondents. In terms of first language, 47,6% of respondents indicated Afrikaans, while 42,5% indicated English. The remaining 10% indicated isiXhosa (2,3%), Zulu (1,9%), Sepedi (0,8%), other African language (3%) or other European language (1,9%).

Almost 60% of respondents indicated that at least one of their parents has a university qualification. This includes Bachelor's degrees (31,1%), Honours and/or Master's degrees (24,6%) and Doctorates (4,2%). However, a large section of respondents' parents' highest qualification is a high school certificate (38,4% or 644 of the 1 678 respondents).

The university's 10 faculties were generally well-represented in the sample with the exception of the faculties of Education (40 respondents), Theology (19 respondents) and Military Science (10 respondents). Table 1 provides a summary of the respondent count for each faculty.

4.2 Media Use

In the two sections which follow we consider, firstly, general online media use frequencies for the six media tested for and, thereafter, in-lecture use frequencies of these same media.

Table 1. Respondents per home faculty.

Faculty	Count	Percent	Cumulative Percent
Engineering	402	24.0	24.0
Economic and Management Sciences	353	21.0	45.0
Medicine and Health Sciences	263	15.7	60.7
Arts and Social Sciences	223	13.3	74.0
Science	196	11.7	85.7
Agrisciences	107	6.4	92.1
Law	63	3.8	95.9
Education	40	2.4	98.3
Theology	19	1.1	99.4
Military Science	10	0.6	99.9
Missing	2	0.1	100
Total	1678	100	100

4.3 General Media Use

The medium used most frequently among the sample population is instant messaging (IM) with a mean frequency of 4.93 (on a 1 to 5 scale) and 97% of respondents indicating that they use IM multiple times per day. Only 12 respondents indicated that they don't use IM at all. This is followed by search engines with a mean use frequency of 4.73 and, perhaps surprisingly, the university's learning platform with a mean frequency of 4.5. Social networks are used only slightly less frequently (4.36) while encyclopedias (2.97) and micro-blogs (2.23) are used with substantially lower frequencies.

Comparison of general media use frequencies based on gender reveals that female students tend to use social media more frequently than male students. This is the case for instant messaging (4.96 vs 4.91), social networks (4.5 vs 4.21) and micro-blogs (2.49 vs 1.96). Male students are more frequent users of encyclopedias (3.1 vs 2.85), search engines (4.77 vs 4.68) and the university's learning platform (4.54 vs 4.47).

The data offer little evidence that the age difference between subjects in the sample has a substantial influence on media use behaviour. When considering use across all media there is a slight drop in frequency between the ages of 20 and 23. Respondents aged 20 have a mean frequency of 24.0 across the six media while for those aged 21 and 22 it is 23.9 and 23.5 respectively. However, this figure increases to 23.6 for respondents aged 23.

Much like the respondents' age, the data indicate that neither first language, home faculty or parents' highest qualification influence general media use frequency in any substantial way.

Table 2. Mean in-lecture use frequency of different media for male and female respondents.

Gender	SN	MB	ENC	IM	SE	EL
Male	1.99	1.27	1.53	2.81	2.14	1.98
Female	2.07	1.36	1.48	2.83	1.98	1.94

4.4 Media Use During Lectures

We now consider media use during lectures. The sessions (i.e. lectures, practical classes and tutorials) at the university where the data were collected are all 50 minutes in duration. We customised the Likert items and their indicators to elicit a respondent's use frequency during a single session. The resulting five-point scale had indicators for "Not at all", "Once or twice", "Every 10 minutes", "Every 5 minutes" and "Constantly".

As is the case for media use in general, IM is the medium used most frequently during lectures with a mean use frequency of 2.82. 16% of respondents reported that they IM constantly during lectures with another 30% indicating that they do so at least every 10 minutes. Search engines (mean=2.06) closely followed by social networks (mean=2.03) were the second and third most used media, while the e-learning platform (mean=1.96), encyclopaedia (mean=1.51) and micro-blogs (mean=1.32) were used less frequently.

In terms of gender differences the same pattern observable for general use repeats itself for in-lecture use. Male students reported slightly higher use of search engines, encyclopaedia and the e-learning platform, while female students reported slightly higher use of social media. The mean scores are presented in table 2.

Finally, the data offered no evidence that students' in-lecture media use frequencies differ based on their parents' highest academic qualification. This suggests that socio-economic status is not a determinant of in-lecture use.

With the exception of instant messaging, there is a slight but consistent decrease in in-lecture use of *social* media for older respondents. Table 3 presents the mean use frequencies for our four primary age cohorts (20-23 years). The data suggest that older students tend to use social networks and micro-blogs less during lectures, but encyclopaedia more. The mean use across all media, calculated as a sum of the six media, drops from 12.08 for 20-year olds to 11.7 for 23-year olds.

As indicated in table 4, Military Science emerged as the faculty with the highest in-lecture use across all media. However, the number of respondents from that faculty (only 10) is too low to justify conclusions to be drawn. The other nine faculties are bunched between 12.33 (Education) and 10.94 (Law). A more detailed breakdown of in-lecture use per faculty is presented in table 5 which shows mean frequencies for each media.

Table 3. Mean in-lecture use frequency of different media for age groups.

Age	SN	MB	ENC	IM	SE	EL
20	2.14	1.37	1.46	2.97	2.08	2.06
21	2.05	1.32	1.47	2.85	2.03	2.01
22	1.95	1.31	1.53	2.77	2.01	1.84
23	1.98	1.26	1.61	2.88	2.14	1.82

Table 4. Mean in-lecture use frequency across all media for faculties.

Faculty	Mean	N
Agrisciences	11.02	107
Arts and Social Sciences	12.16	223
Economic and Management Sciences	11.87	353
Education	12.33	40
Engineering	11.4	402
Law	10.94	63
Medicine and Health Sciences	12.25	263
Military Science	14.6	10
Science	10.97	196
Theology	11.89	19

4.5 Beliefs and Norms

We now turn our attention to students' beliefs and norms regarding in-lecture media use. Respondents were asked to indicate their level of agreement with two statements using a five-point Likert scale. The provided statements were:

1. It is acceptable to use my phone during lectures.
2. In-lecture mobile phone use negatively affects my studies.

Close to 30% of respondents either agreed (20%) or strongly agreed (9%) that it is acceptable to use their phones during lectures. 39% of respondents felt neutral about the statement while the remaining students either disagreed (24%) or strongly disagreed (8%).

Stronger agreement was found in relation to the second statement with 44% of respondents either agreeing (27%) or strongly agreeing (17%) that in-lecture phone use negatively impacts their studies. Only 15% of respondents disagreed and 9% strongly disagreed with this statement.

In the case of both statements students' beliefs were found to correlate significantly with their in-lecture use frequencies. Correlation tests revealed that belief about the acceptability of in-lecture phone use is a stronger predictor of

Table 5. Mean in-lecture use frequency of different media for each faculty.

Faculty	SN	MB	ENC	IM	SE	EL
Agrisciences	1.95	1.18	1.46	2.77	1.90	1.77
Arts and Social Sciences	2.13	1.49	1.59	2.79	2.10	2.05
Economic and Management Sciences	2.19	1.32	1.37	2.93	2.05	2.01
Education	2.03	1.35	1.53	3.10	2.20	2.13
Engineering	1.97	1.23	1.44	2.79	2.04	1.94
Law	2.14	1.25	1.29	2.84	1.70	1.71
Medicine and Health Sciences	2.03	1.41	1.75	2.90	2.23	1.93
Military Science	2.30	1.50	2.10	2.90	3.10	2.70
Science	1.77	1.26	1.49	2.63	1.92	1.90
Theology	1.95	1.21	1.63	2.47	2.32	2.32

use ($\rho = 0.33, p < 0.01$) than belief about the impact of in-lecture phone use on academic performance ($\rho = -0.10, p < 0.01$). These correlations are illustrated in figures 1 and 2.

Despite the existence of these correlations, it is worth noting that students often act in contradiction to their beliefs. For example, 339 respondents indicated that they disagreed that it is acceptable to use phones during lectures. However, 257 of these respondents indicated that they used their phones at least once or twice during lectures to send instant messages. Similarly, 60 of the respondents who indicated that they used their phones once or twice per lecture to access a social network strongly disagreed with the acceptability of in-lecture phone use.

The same pattern is observable for beliefs about in-lecture phone use and academic performance. Of the 285 respondents who strongly agreed that in-lecture phone use negatively affects their studies, 49 constantly used IM during lectures and another 74 did so at least every 10 minutes. Only 24 of the 285 indicated that they did not use IM at all during lectures.

Respondents were also asked to indicate how frequently in-lecture media use is discouraged by lecturers and peers. A five-point Likert scale ranging from "Never" to "Always" was provided in relation to the following two statements:

1. Lecturers discourage mobile phone use during lectures.
2. My classmates discourage mobile phone use during lectures.

33% of respondents reported that lecturers always discourage in-lecture phone use (12.4%) or do so most of the time (20.5%). The largest portion of respondents (39%) indicated that this happens sometimes. 57% of respondents reported that their classmates never discourage in-lecture phone use and only 19% indicated that this happens sometimes (16%), most of the time (2%) or always (1%). Our analysis revealed that neither of these items are predictors of the level of in-lecture use frequency reported.

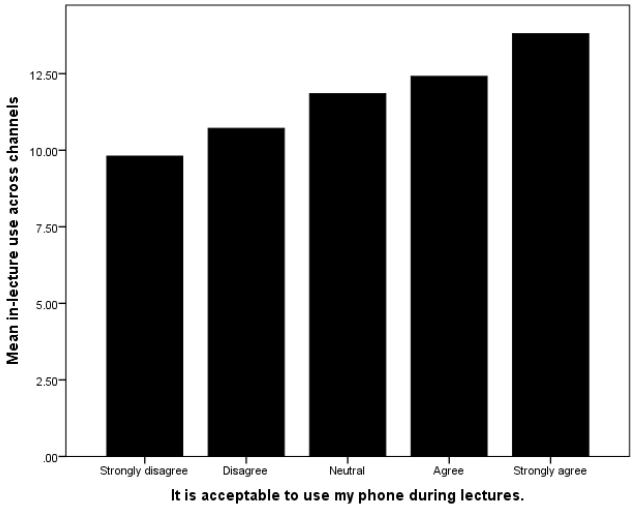

Fig. 1. A bar chart showing the frequency of in-lecture media use in relation to beliefs about its acceptability.

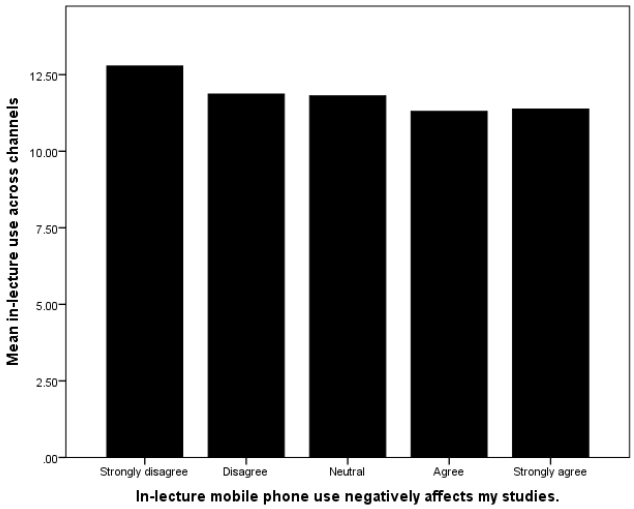

Fig. 2. A bar chart showing the frequency of in-lecture media use in relation to beliefs about its effect on academic performance.

4.6 Reasons for Use

The survey tested for five reasons for use using five-point Likert questions with frequency indicators ranging from "Never" to "Always". The five items tested for were:

1. Use as a response to boredom. (RU1)
2. Use to chat with friends.(RU2)
3. Use to stay up to date with current events.(RU3)
4. Use to find information relevant to the lecture.(RU4)
5. Use after receiving a notification.(RU5)

As shown in figure 3 respondents indicated that the receipt of notifications is the most frequent trigger of in-lecture phone use (3.39), followed by experiences of boredom (3.03) and the desire to chat with friends (2.9). Use triggered by the desire to find information related to the lecture (2.73) or about current events (2.69) were reported to occur less frequently. Our analysis further indicated that the demographic variables tested for did not influence these figures in any noteworthy manner.

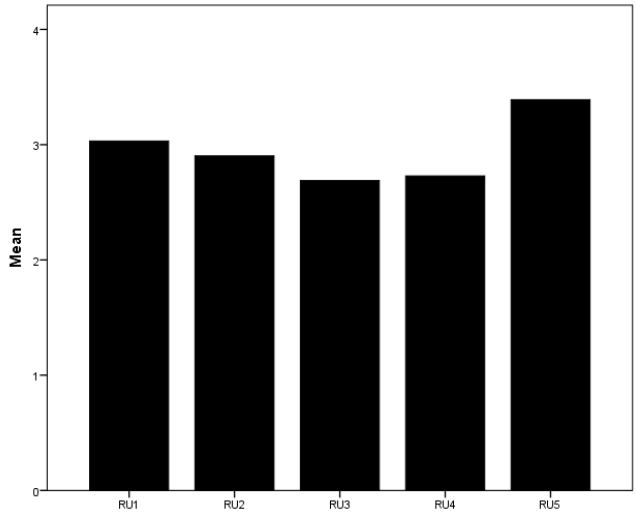

Fig. 3. A bar chart showing the mean frequency of reasons for in-lecture media use.

4.7 Use and Academic Performance

In this section we briefly consider the variables tested for in relation to respondents' self-reported academic performance.[1] Our data indicate, firstly, that media use in general does not correlate with academic performance across the sample. However, media use during lectures (calculated as the sum of frequency of use of all media tested for) was found to correlate negatively with self-reported academic performance ($\rho = -0.07, p < 0.01$).

A counter-intuitive finding was made upon analysis of the relationship between the general use of individual media and academic performance. The only medium for which correlation was found is the university's e-learning platform and, interestingly, the correlation is *negative* ($\rho = -0.09, p < 0.01$). Explanation of this finding requires further investigation. However, we believe it may suggest that students who consider the e-learning platform as a replacement of lectures and, as such, over-rely on it, tend to perform worse in assessments.

Analysis of the relationship between in-lecture use of individual media and academic performance revealed that social networks ($\rho = -0.07, p < 0.01$), and instant messaging ($\rho = -0.06, p < 0.01$) were the media responsible for the negative correlation observed between in-lecture use and academic performance reported earlier in this section.

5 Discussion

In the section which follows we discuss our findings in relation to five themes. Firstly, we consider our findings in the context of the recent hype around blended learning. We then consider demographic variables as predictors of media use. This is followed by consideration of our findings regarding students' beliefs about media use and, thereafter, the role of institutions in managing this behaviour. Finally, we briefly reflect upon the findings made regarding media use and academic performance.

It is our opinion that the recent popularity of blended learning initiatives in higher education environments have, perhaps inadvertently, cultivated social norms around media use in structured academic contexts that may be obstructive, as opposed to conducive, to learning. This, we believe, is primarily a result of naïvity about the distractions contemporary technology introduce to learning environments. Our data, accordingly, clearly indicate that high levels of off-task media use has become the norm in structured academic contexts. While there is evidence that students still perceive this as unacceptable behaviour, the greatest majority engage in multiple instances of off-task media use in a single 50-minute lecture.

These findings should be contextualised within the rapid development of both mobile devices themselves and the applications they afford. Students have, at

[1] The scope of this paper does not allow for a detailed analysis of the relationship between media use and academic performance. Our findings in this regard will be published separately.

their fingertips, an increasingly wide range of entertainment and social attractions. Institutional infrastructure like Wifi-enabled lecture halls not only enables in-lecture media use but serves to establish such behaviour as the norm among students. Lecturers, in turn, are placed in the difficult position of having to compete with media for students' attention. Their challenge is exacerbated by, what seems to be, a decrease in the value students attribute to lectures as learning opportunities [25].

While we acknowledge their value and strongly encourage the continuation and expansion of blended learning initiatives, our findings raise a red flag regarding the range of implications resulting from their implementation. The successful harnessing of this double-edged sword requires thoughtful management. As the attention economy becomes more competitive facilitators of learning should emphasise and enable attentional control among students, something which might imply limiting rather than maximising media use in learning environments. This is perhaps best illustrated by the finding that higher levels of use of the e-learning platform correlates with lower academic performance. Though this finding requires further investigation, it should serve to encourage careful, balanced deliberation about the role of technology learning.

In terms of demographics our findings suggest that high levels of media use in and outside academic contexts are not limited to particular subpopulations. However, slight variations in use behaviour are detectable. Female students use social media slightly more frequently than their male counterparts, while male students use encyclopedia and search engines more frequently. Likewise, older students tend to be more frequent users of encyclopedia and search engines and less frequent users of social media. We emphasise that these differences are not substantial and provide little ground for conclusions to be drawn.

In accordance with prominent technology use theories [12], our data indicate that students' subjective norms concerning in-lecture media use influence their in-lecture media use frequency. Similarly beliefs about the negative effects of use on academic performance were also found to be a statistically significant predictor of in-lecture use frequency. It should be noted that our data did not afford an in-depth understanding of the role beliefs and norms play in this regard. While Parry [25] has made notable progress in this area, we encourage future research to provide, particularly through qualitative data, insight into the subjective factors that determine media use.

Our data suggest that lecturers at the institution where the study was performed do, at least sometimes, discourage in-lecture media use. This, however, does not seem to be a broadly accepted/enacted policy. Furthermore, students' perception of how regularly this occurs was found not to be a predictor of their in-lecture use frequency. In accordance with these findings it is our position that institutions will achieve little success if they attempt to manage in-lecture media use through top-down control mechanisms.

Finally, our study confirmed previously reported findings regarding the negative correlation between in-lecture media use and academic performance. Of course, this correlation may be interpreted in a variety of ways and does not

necessarily suggest that in-lecture media use impedes learning. A more detailed analysis of this phenomenon is forthcoming. However, it is our proposition that the high levels of media use observed among students encourage a *culture of distractibility* [7] which has, under the guise of blended learning, become ingrained in structured academic contexts at higher learning institutions.

6 Conclusion

The current generation of students, as members of the net generation display a propensity for continuous media use throughout their lives, as well as in structured academic contexts. This behaviour is further encouraged by increased institutional moves towards blended learning and e-learning strategies. This is especially the case for the fields of computer science and, information science, where these digital artifacts are often the medium and the subject of interest.

The findings presented in this study indicate that demographic factors are irrelevant as predictors of media use. For all students, using media for off-task purposes during lectures has become the normal mode of functioning. Viewing this finding in combination with the finding that no link has been found between institutional attempts to curb off-task media use and changes in students' behaviour, suggests that such behaviour is so widespread, and entrenched, that it has come to define the current generation of students in higher education.

Several of the more important limitations require attention. First, this study employed a self-report survey methodology as a data gathering technique. While yielding a large number of responses, there do exist potential limitations in the nature of the findings that can be generated through this technique, potentially limiting the insights possible. The second limitation present in this study arises due to the use of discrete media activities in the survey design. This design potentially limits the reporting of other media (either on or off-task) engaged in by students. This may imply that students use of media is in fact under-reported. Third, by limiting the scope of students responses, through the use of Likert scales, the potential for further qualitative insight into their beliefs and behaviour is limited. However, despite limitations such as these, the study findings are of interest because of the large sample size, the unique context, and the novel insights into students behaviours and beliefs uncovered.

Extending from this study are a number of potential future research directions. This study primarily focused on the behaviour and beliefs displayed by students in regards to their use of media. Future research should focus on the role media play in fostering a distracted state of mind in both students, as well as in the general population. In addition to this, it is believed that the issue of students' beliefs and perceptions of behavioural norms is nuanced to such a degree that further research in this area would benefit from adopting a qualitative methodology. In particular, we encourage those educators undertaking blended learning initiatives to carefully and continuously monitoring student behaviour through the collection of qualitative data. This feedback should reveal differences between the desired behaviour and the actual behaviour of learners in

terms of media use. We propose, accordingly, that researchers are sensitive to the emergence of unforeseen behavioural patterns in which technology obstructs rather than aids learning. In addition to this, these findings should be shared with colleagues at the appropriate institutional fora.

The pervasive ubiquity, and extensive media use within educational institutions continues to raise profoundly important questions about the impact of such media within these contexts. We acknowledge the potential of digital media in learning. However, we argue for a balanced perspective which acknowledges both the positive and negative consequences arising from digital media use in academic contexts. In this regard, we hold the view that those with technical knowledge have an important role to play in acknowledging the changing nature of the student population and, how academic institutions propose to meet this challenge.

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