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Undergraduates' collaboration and integration of new technologies in higher education: Blurring the lines between informal and educational contexts

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Undergraduates' collaboration and integration of new technologies in higher education: Blurring the lines between informal and educational contexts

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Abstract

To better understand how students' familiarity with digital media in their daily lives can be harnessed in learning environments, a survey about their informal and educational use of new technologies was administered to undergraduates in three schools at a private university in the United States. The results indicated that undergraduates (n=282) transferred their skills in technology use for personal purposes to their higher education coursework, infusing digital technologies that were not required or used by their professors into their educational endeavours. As in prior research, respondents used new technologies and created online content more for informal purposes than for course-related activities. However, they forged a participatory and collaborative digital culture within their courses despite their professors' scarce use of such technologies. The results suggest that further research and insight into undergraduates' voluntary use of technology in educational contexts can contribute to the effective integration of digital media into higher education.

Keywords: collaboration culture, digital media, digital natives, technology use, undergraduate education

Introduction

Those born after 1984 have been termed digital natives, the Net generation, Generation M, or even Neomillenials (Dede, 2005; Oblinger & Oblinger, 2005; Prensky, 2001; Rideout, Foehr & Roberts, 2005, Tapscott, 1998). The time that this group spends online, the ways in which they use various digital technologies and the ease with which they use those technologies have been the topic of much discussion in education, communications and anthropological research. Some educators have asserted that these children, teenagers, and students are high users of technology who learn differently from their parents and educators, and will have to be taught differently (Dede, 2005; Tapscott, 1998). In response, recent research has criticised such claims and cautioned against categorising a complete generation or age group and attributing it with characteristics that might not be true of all members. Researchers have reported both differences and no difference between the level of technology used by digital natives and immigrants (Garcia & Qin, 2009; Guo, Dobson, & Petrina, 2008) and called attention to the lack of empirical evidence for an entire generation that learns differently (Bennett, Maton, & Kervin, 2008; Bennett & Maton, 2010). Indeed, results from surveys conducted since 2002 indicate that there are huge discrepancies in the ways that members of the so-called Net generation use technology, over and above contextual conditions like geography, access, and socio-economic status (Caruso & Kvavik, 2005; Jones & Madden, 2002; Kennedy et al., 2008; Oliver & Goerke, 2007; Roberts, Foehr, & Rideout, 2005; Sandars & Schroter, 2007; Smith, 2009). Lorenzo, Oblinger and Dziuban (2006) point to student diversity in higher education institutions, variance in information

literacy skills, and their unequal access to the latest technologies as reasons why this demographic cannot be categorised as one group.

Despite the different facets of the argument, the common goal of researchers and educators is to provide students of today with the skills to succeed in jobs of the future. Educators on both sides of the argument related to technology use amongst adolescents and young adults recognise that online and digital technologies are ubiquitous in informal environments and should therefore become an integral part of formal learning environments. They acknowledge that newer generations are growing up with varying levels of exposure to digital technologies, and that educators will have to leverage students' prior technical experience in formal learning environments (Jenkins et al., 2009).

In order to better understand how students' familiarity with digital technologies in their daily lives can be harnessed in learning environments, and to compare how students currently use new technologies for both informal and formal purposes, a survey was administered to undergraduates at three colleges in a large private university in the United States. The survey was designed to answer the question: What new technologies do undergraduates use informally (for personal purposes) and for educational purposes? In order to integrate technologies that are regularly used by students outside of their coursework into their coursework, it is important to understand what technologies students use, the manner in which they use them and whether they also apply specific technologies in their coursework of their own accord. Jenkins et al. (2009) postulate that students graduating from the colleges of today will be part of a "participatory culture" (p. xi) consisting of formal and informal affiliations (online communities), creative production, collaborative problem solving (formal and informal), and circulations of online content. Jenkins et al. argue that educators cannot presume that youth will acquire skills to participate in these affiliations informally, but should provide them with educational experiences that will facilitate their participation in media creation and the online world, thus preparing them for future work in participatory environments where media and virtual collaboration are ubiquitous. In order to investigate the ways in which current undergraduates create digital content informally and in educational environments, a second research question was added to the study: What new technologies do undergraduates use to create online content informally (for personal purposes) and for educational purposes?

Literature Review

Research studies in different parts of the world have surveyed teens' use and access to Web-based and mobile technologies (Caruso & Kvavik, 2005; Jones & Madden, 2002; Kennedy et al., 2008; Jones, 2009; Lenhart & Madden, 2005, 2007; Roberts, Foehr, & Rideout, 2005; Sandars & Schroter, 2007; Smith, 2009). The participants in this research study were undergraduates between the ages of 18-24, therefore the research reviewed in this paper is restricted to studies that reported the informal and educational use of technology by participants in that age group.

Informal Technology Use and Content Creation by Undergraduates

Undergraduates enrolled in institutions of higher education in different parts of the world have been reported to have an extremely high level of familiarity with communication technologies, social networking tools, and audio and video media-sharing (Caruso & Kvavik, 2005; Kvavik, Caruso & Morgan, 2004; Jones & Madden, 2002; Lenhart & Madden, 2005; Nagler & Ebner, 2009; Sandars & Schroter, 2007). In the United States, the EDUCAUSE Center for Applied Research (ECAR) reported high

use of social networks by over 27, 000 respondents in 2008, 2009, and 2010 (Salaway et al., 2008; Smith, Salaway & Caruso, 2009; Smith & Caruso, 2010). In Germany, Nagler and Ebner (2009) found that over 90% of undergraduates (n=821) had used YouTube, StudiVz (a popular German social network) and MySpace, and that 60-70% had used wikis, blogs, audio podcasts, video podcasts, and SecondLife. In Austria, Safran, Guetl and Helic (2007) surveyed three groups of computer science students (n=183) who were very familiar with wikis (90-100%) and blogs (76-96%), and the use of these technologies for learning, but were not as familiar (40%) with social bookmarking. Both groups of researchers, along with White (2007) in the UK, found that large percentages of 'digital natives' had never heard of social bookmarking tools or had very limited experience with them. College students' technology use in an Australian university was also found to vary greatly depending on their familiarity with digital devices and online learning (Cameron, 2005).

In addition to undergraduates' use of technology, their participation and creation of online content informally have also been studied by researchers (Kvavik, Caruso & Morgan, 2004; Kennedy et al. 2008; White, 2007). In the latest ECAR study in the US, 42% of respondents said they contributed to video websites, 40% to wikis, and 36% to blogs (Smith & Caruso, 2010). Likewise, Kennedy et al. (2008) reported that 58.6% participants regularly read blogs and 43.9% had contributed to blogs but only 34.9% had created blogs. They also found that only 18.4% had contributed to wikis, similar to White's (2007) research in the UK where 82% of respondents had not contributed to wikis. This resounds with prior research by Kvavik, Caruso and Morgan (2004) where only 21% of 4374 undergraduate freshmen and seniors surveyed in the US had created Web-based content. Given the potential of new technologies to facilitate the creation of online content and the easy contribution of participants to the creation of shared content, the gap between undergraduates' use and creation of online content has surprised researchers.

Educational Technology Use and Content Creation by Undergraduates

Educators have been particularly interested in students' Web 2.0 use because such technologies are perceived as easily accessible, collaborative, and beneficial in learning environments. Compared to their high use of technologies informally, 25% and 33.1 of the US respondents in the ECAR 2009 (n=30,616) and 2010 (n=36,950) studies respectively had used wikis and 11.6% had used blogs for educational purposes (Smith, Salaway, & Caruso, 2009; Smith & Caruso, 2010). In 2009, 35% of respondents used podcasts informally, but only 5.8% used podcasts in courses the semester they were surveyed. Likewise, 90% of respondents used Social Networking Systems for social purposes but only 27.8% for educational purposes. Six percent had used video creation software and 5% audio creation software in their coursework compared to 33% who had used such technologies informally. The researchers concluded that students used technology mainly for social, but not educational purposes (Smith, Salaway, & Caruso, 2009). Likewise, in a survey of first-year engineering and business students in Western Australia in 2005 (n=413) and 2007 (n=290), Oliver and Goerke (2007) also found that 29.8%, 87.8%, and 21.9% of respondents had used blogs, instant messaging, and podcasts socially. Further, only 6.5% of respondents had used blogs, 39.5% instant messaging, and 11.5% podcasting for educational purposes. These data correspond to prior findings by Kvavik (2005) and Sandars and Schroter (2007) that high levels of technology use did not always translate to students' use of technology for educational purposes, and by Caruso and Kvavik (2005) that students are extremely comfortable with certain basic technologies but are not comfortable with more advanced technologies or specialised applications of technology. "We cannot assume that being a

member of the 'Net Generation' is synonymous with knowing how to employ technology based tools strategically to optimise learning experiences in university settings" (Caruso & Kvavik, 2005, p. 4), so it falls to professors to find ways to integrate technologies that are often used by students socially into their course work and course activities (Oliver & Goerke, 2007).

Undergraduates do value the use of technology in their learning environments - 79% of college students in 2002 and 84% in 2006 agreed that their educational experience was positively impacted by their Internet use (Jones et al., 2008). In the 2009 ECAR study, 49.4% of respondents agreed or strongly agreed that the use of technology in courses improves their learning and 45% reported that all or almost all their instructors use IT effectively in their courses (Smith, Salaway, & Caruso, 2009). Moreover, 73.1% of respondents reported using college or university library websites, and 70% the university course management system (CMS) for their coursework, similar to Oliver and Goerke's (2007) Western Australian study where 90% of first-year college students used online resources for study purposes. These data might reflect the penetration of online resources and CMS on university campuses, because prior research reported that communication with instructors or peers was the main focus of students' Internet use for educational purposes (Jones & Madden, 2002; Jones et al., 2008).

Methodology

The instrument used in this study collected descriptive data about undergraduates' use of technology for personal and educational purposes and consisted of items in four areas: Demographics, informal (personal) use of emerging technologies, educational use of emerging technologies, and online content creation using emerging technologies. The instrument was developed following focus groups, a pilot survey, and input from experts. Initial focus groups were conducted with 21 undergraduates from different disciplines who were asked about their perspectives on Web 2.0 technologies and asked to choose from a list of technologies that they used regularly. The focus group data was used to develop a pilot survey that contained questions about students' informal use of new technologies, students' educational use of new technologies, and open-ended questions about how students had used those technologies. Students (n=26) in an undergraduate course in education completed the survey, simultaneously providing feedback on the clarity of questions and adequacy of the answer choices. Key feedback from participants involved distinguishing educational use as the professors' and students' use of an application in an educational environment (Kumar, 2009). Following the pilot survey, the section on educational use was changed to reflect professors' and students' use, and open-ended questions about the ways in which applications were used in educational environments and why students perceived them as enhancing the learning experience were added. Four measurement and evaluation faculty members reviewed the survey and provided feedback on the scale and responses.

All undergraduates enrolled in the College of Education, College of Communication, and College of Health and Rehabilitation Sciences at a large private university were contacted by email and invited to participate in the online survey (hosted in SurveyMonkey). There was no incentive provided to participants. Follow-up emails were planned after the first round of responses, but could not be implemented due to administrative changes. Following collection, data was analysed using SPSS PASW v.17. Both descriptive and categorical statistical procedures (chi-square for percentage comparison) were used to analyse the data.

Findings

The 282 respondents to the survey ranged in age from 18-24 years old. The sample was primarily female (77.9%). Table 1 provides demographic data on the respondents.

Major	Male	Female	Total
Education	8 (14.8%)	46 (85.2%)	54
Communication	41 (26.2%)	115 (73.8%)	156
Health and Rehabilitation Sciences	13 (18.5%)	57 (81.5%)	70
Total	62 (22.1%)	218 (77.9%)	280

Table 1: Demographics of respondents

Undergraduates' Informal Use of New Technologies

The undergraduate respondents to this survey were frequent users of social networking sites – 98.5% had Facebook accounts and 28% were members of least three social networking sites. Online videos, photo-sharing, online forums, and blogs were the technologies most used by them for informal purposes (Table 2). Only 2.5% of respondents had used SecondLife, a multi-user virtual environment.

	Yes	No	Do not know what it is	No response
Online forums	63.5%	27.7%	0.0%	8.9%
Google Docs	42.2%	40.1%	8.5%	9.2%
Blogs	60.6%	30.1%	0.7%	8.5%
Wikis	47.5%	33.7%	8.5%	10.3%
Podcasts	42.9%	46.1%	1.1%	9.9%
Photo-sharing	64.5%	24.8%	1.4%	9.2%
Online Videos	86.9%	4.3%	0.4%	8.5%
SecondLife	2.5%	48.6%	35.1%	13.8%

Table 2: Informal Use of new technologies (n=282)

A Chi-square test was used to compare male and female undergraduates' "Yes" responses to their informal use of new technologies in the survey (Table 3). Male students aged 18-24 were found to be more frequent users of online forums, Google Docs, wikis, and SecondLife in an informal context ($p<.05$). There was no significant difference between male and female students' informal use of blogs, podcasts, Photo-sharing, and online videos.

	Male	Female	Chi square	P value
Online forums	82.7%	66.7%	5.060	.02
Google Docs	63.5%	41.9%	9.448	.01
Blogs	78.8%	63.4%	4.644	.10
Wikis	70.0%	48.5%	7.768	.02
Podcasts	61.2%	44.6%	4.779	.09
Photosharing	64.7%	73.0%	3.085	.21
Online Videos	94.2%	95.1%	.426	.81
SecondLife	4.4%	2.5%	7.749	.02

Table 3: Comparing male and female undergraduates' informal use of new technologies

Undergraduates' Educational Use of New Technologies

Fifty-nine percent of undergraduates had used the social networking site Facebook in an educational context. Students were asked whether the technologies were used by them, by their professors, or not used at all in their educational experiences. Students (28%) and their professors (46%) used online videos the most for educational purposes. Google Docs (21%), and wikis (16%) were the other technologies used frequently for educational purposes by the respondents. Podcast use was generally low by students (1.8%) and professors (3.5%). Students' open-ended responses indicated that they primarily used Google Docs to collaborate on course projects and share their work with their peers.

Undergraduates' use of new technologies for educational purposes was much lower than their use of technology for social purposes (Table 4). For example, 47.5% of them had used wikis informally but only 16% had used them in their coursework. Students reported that few instructors (6%) used wikis as resources in their coursework. Likewise, 60.6% of students had used blogs informally but only 12-14% of students and their professors had used blogs in courses. McNemar's test (Chi-square for within-subjects) was used to compare students' informal and eduational use of the different technologies and report the difference between students' responses (Table 4). There was a significant difference between students' informal use and educational use ($p<.01$) for all the technologies listed in this question.

	Informal use	Educational use	P value
Online forums	63.5%	47.9%	<.01
Google Docs	42.2%	21.3%	<.01
Blogs	60.6%	12.4%	<.01
Wikis	47.5%	16.0%	<.01
Podcasts	42.9%	1.8%	<.01
Online Videos	86.9%	28.4%	<.01

Table 4: Comparing respondents' informal and educational use of new technologies

Undergraduates' Informal and Educational Creation of Online Content

Respondents' informal creation of online content using digital media was higher than their creation of online content in their coursework, except for their creation of websites (Table 5). Students' open-ended responses revealed that a large number of education and communication majors had taken a required course in their programs where they learned to create websites, which accounts for the results.

	Yes for a class	Yes, but not for a class	No	Do not know what it is	No response
A website	35.5%	19.1%	33.7%	0%	11.7%
A blog	6.7%	35.1%	46.5%	0%	11.7%
A wiki	2.8%	6.4%	68.4%	9.6%	12.8%
A podcast	0.4%	2.1%	84.4%	1.1%	12.1%
Electronic portfolio	5.0%	13.1%	60.6%	8.9%	12.4%

Table 5: Creation of online content using digital media (n=282)

The Chi-square test used to compare male and female undergraduates' informal creation of online content highlighted a significant difference in their creation of websites, wikis, and podcasts ($p<.05$, Table 6). More male students used these technologies to create online content informally than female students.

	Male	Female	Chi square	P value
A website	40.0%	17.2%	12.250	<.01
A blog	54.0%	36.4%	5.503	.06
A wiki	20.8%	4.1%	16.129	<.01
A podcast	6.0%	1.5%	8.094	.04
An electronic portfolio	26.0%	12.2%	6.143	.11

Table 6: Comparing male and female students' informal creation of online content

	Informal creation	Educational creation	P value
Websites	19.1%	35.5%	.019
Blogs	35.1%	6.7%	<.01
Wikis	6.4%	2.8%	.547
Podcasts	2.1%	0.4%	.834
Electronic portfolios	13.1%	5.0%	.453

Table 7: Comparing Respondents' informal and educational creation of online content

McNemar's test of the difference between student content creation using technology for informal and educational purposes (Table 7) was significant for student creation of websites ($p=.019<.05$) and blogs ($p<.01$) but did not provide any evidence that students' creation of a wiki, podcast, and electronic portfolio for educational purposes differs significantly from their informal creation of the same.

Undergraduates' Use and Creation of Online Content

Undergraduates were also found to *use* online content rather than *create* online content both informally and for educational purposes. McNemar's test was used to compare students' responses for informal use and informal creation of online content (Table 8), and for educational use and educational creation of online content using different technologies (Table 9). A significant difference was found between students' informal use and informal content creation using blogs, wikis, and podcasts ($p<.01$), and between their educational use and educational content creation using wikis ($p<.01$). Students were more likely to use blogs and wikis as resources for informal and educational purposes than create content using these two technologies.

	Informal use	Informal creation	P value
Blogs	60.6%	35.1%	<.01
Wikis	47.5%	6.4%	<.01
Podcasts	42.9%	2.1%	<.01

Table 8: Comparing respondent's informal use and informal creation of online content.

	Educational use	Educational creation	P value
Blogs	12.4%	6.7%	0.03
Wikis	16.0%	2.8%	<.01
Podcasts	1.8%	0.4%	0.15

Table 9: Comparing respondents' educational use and creation of online content

Discussion

There are several limitations associated with this study. First, data was collected from a convenience sample of students at one private post-secondary institution, and the participants were volunteers, limiting the ability to generalise the results to other bodies of students. Within the sample, males were underrepresented. Further, the data was collected from a subset of the student population, students enrolled in Colleges of Education, Communication, and Health and Rehabilitation Sciences. It is certainly feasible that students enrolled in other colleges or institutions may have different experiences with technology both in the classroom and informally. Notwithstanding the limitations, the findings of this research are discussed here in the context of prior research.

Creation of a digital culture in educational environments

At the beginning of this study, undergraduates' use of technology was categorised as informal use (for personal purposes) or educational use of new technologies based on prior research. The findings revealed a third category – undergraduates' *informal* use of new technologies in their *educational* endeavours (i.e. students used new technologies that were not required or not used by their professors in their educational activities, thus creating a digital and participatory culture independent of the structure provided to them). Contradicting prior findings where researchers claimed that educators do not transfer their familiarity with technologies to educational contexts (Caruso & Kvavik, 2005; Oliver & Goerke, 2007; Sandars & Schroter, 2007), undergraduates in this study used new technologies of their own volition in many different ways in educational contexts. Kvavik (2005) identified convenience, communications and control as factors influencing the Net Generation's adoption of technology and Smith and Caruso (2010) highlighted undergraduates' use of technology for collaboration in their coursework. Likewise, convenience, communications, and *collaboration* drove undergraduates' use of new technologies in this research. They found it convenient to schedule meetings and share resources using social networking tools like Facebook and to back-up resources using Google Docs. They stayed connected with latest developments and topics of interest using blogs, shared photographs online, and communicated with their peers to organise study groups or elicit information about professors and assignments using social networking sites. They used wikis and Google Docs to collaborate – 16% of students used wikis as a resource compared to 5.7% of their professors, and 21.3% students used Google Docs compared to 2.8% of their professors. Undergraduates in this study thus recreated a digital culture of collaboration, participation, and knowledge

exchange with which they are familiar with in their personal lives, in their educational environments.

In this research, undergraduates were self-directed in their use of social networking technologies or collaborative online tools, using them when not required or used by their professors. Except for online videos, undergraduates reported that their professors' use of all technologies listed in our survey were comparable to or lower than students' educational use of those technologies. The fact that students integrate new technologies into their coursework in areas not required by their professors indicates that they no longer distinguish between their use of technology in informal and educational environments for communication and collaboration, and are able to find innovative ways to informally learn with new technologies in their courses. Undergraduates continue to view the term 'educational use' of technology as technology use by their *professors*, which is an important finding for future surveys or research that investigates students' use of technology for educational purposes – researchers will have to define what they mean by educational use as participants increasingly infuse their learning activities with new technologies. Future research could further investigate *how* undergraduates use these digital media in educational environments, in order to enable educators to learn from the ways in which undergraduates learn with new technologies and purposefully use those new technologies in learning environments. It is also important to determine how critically and appropriately students use online resources for educational purposes.

Informal & educational use of new technologies

Despite their self-directed use of digital media and their creation of a collaborative culture using digital media in their courses, undergraduates in this study used and created digital content more in their personal lives than for course-related activities. They were also more familiar with and skilled in some technologies over others – they were high users of online videos, photo-sharing, online forums, and blogs informally but did not have much experience with social bookmarking or virtual worlds. These findings correspond to those of prior researchers who reported undergraduates' high use of communication technologies, social networking tools, and media-sharing, and their low use of social bookmarking (Caruso & Kvavik, 2005; Kvavik, Caruso & Morgan, 2004; Nagler & Ebner, 2009; Safran, Guetl, & Helic, 2007; Sandars & Schroter, 2007; White, 2007). Likewise, compared to their high *use* of online content, undergraduates in this research did not *create* as much online content either for social or educational purposes. Given the future participatory culture in which undergraduates of today will work (Jenkins et al., 2009), higher education course work has to include increased opportunities for students to actively engage in the creation of online content. In addition to communicating and collaborating in online communities in the future, they will also have to be creative contributors and circulators of online content.

Male undergraduates were found to be higher users of new technologies informally and to also create more online content than female undergraduates. This finding differs from the ECAR survey (Smith, Salaway, & Caruso, 2009) where the only significant difference was between male and female students' preferences of learning with video games and simulations. Although the difference can be attributed to the low number of male participants in this sample or in the disciplines that were represented in this sample, research with a larger sample and more disciplines could provide further insight. In further analyses of this data to compare undergraduates' use of technologies in the different disciplines included in this survey, we will investigate the use of technologies by males and females in each discipline.

Conclusion

Notwithstanding the existing research on students' informal use of technology, it would be valuable to study the ways in which undergraduates who have grown up with digital media transfer their familiarity with such media to learning and teaching contexts, to further define digital literacies in the context of emerging technologies, to explore how undergraduates demonstrate such literacies in their personal environments and educational endeavours, and to investigate how professors currently encourage students to develop and apply such literacies in their coursework.

Regardless of the different terms used to describe students who have grown up with digital technologies, and the discussion around whether those terms should be used to categorise a generation of group of students, it is clear that the ways in which they use digital media and transfer their digital collaborative culture has to be studied and leveraged in educational environments. There is insufficient empirical evidence about how students of today use new technologies in their educational endeavours, to what extent they infuse and manage their learning with technology, and whether exposure to new technologies at the college level can make up for lack of exposure to the latest technology in their prior educational endeavours. While it is valuable to attempt to identify the learning styles of new generations, it is equally important to craft an educational environment that provides the diverse body of undergraduates entering universities with learning experiences that use new technologies to prepare them for jobs of the future.

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